

Introduction to Post-NESTS Ultra-Green Launch & Space Transportation Systems

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12/10/2022

Ref. ESA-STS-FLP-HO-2022-0002

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Preamble





NESTS: New European Space Transportation Solutions

In this frame industrial European consortia investigated preliminary elements for future space transportation solutions, to be exploited in the period 2030-2050

-> These studies were performed by 0/A phases in 2021

NESTS studies provided

- roadmaps to new solutions
- identified capability gaps
- proposed some consolidation areas to be studied before CM-22

These consolidation areas were the object of **post-NESTS studies**, one of them having the goal "to pave the way towards sustainable ultra-green space transportation solutions"

 \rightarrow This is the object of some of presentations in this Clean Space Conference

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Background



Post-NESTS phase 0/A studies have been performed in 2022 in different fields, in order to consolidate elements that could serve as inputs for ESA files at ESA Council Ministerial Meeting 2022 (CM22).

One of this fields post-NESTS is Ultra-Green (*) Launch & Space Transportation Systems (**).

This presentation explains:

- The main difficulties to set-up and frame the activities
- The structure of these 0/A phases
- Some useful conclusions

(*) Ultra-Green: See next slide

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 ESA STUDIES

- **) Launch & Space Transportation Systems: In the frame of these activities:
 - Space Transportation System: ground infrastructure and flight means necessary to fulfil a Space
 Transportation Service
 - Space Transportation: Access to space, transport in-space and return from space

Difficulties setting-up and framing the activities



- What does it mean "Green" / "Ultra-Green"?
 - We tried to frame it:
 - In the frame of the SoW: related to the aim of decreasing the Earth environmental impact.
 Topics to be considered:
 - Reduction in the consumption of resources and energy,
 - Environmental legislation,
 - Residual waste and polluting substances as a result of activities.

-> We need elements to decide if something (a Launch and Space Transportation System) is green or not

Indicators? Requirements? Guidelines

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Difficulties setting-up and framing the activities

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 Reluctance to impose a methodology and high level requirements for the activities: risk of conditioning the outcomes

→ We asked the consortia to select the methodologies and requirements they found more relevant



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Structure of post-NESTS Ultra-Green and expected outcomes



- Main tasks requested to the consortia and expected outcomes:
 - Building of main high level requirements,
 - Identification of Concepts and trade-off, and selection of an Ultra-Green Launch & Space Transportation System(s),
 - Assessment of the selected system(s) including:
 - Assessment of feasibility



- Benefits and drawbacks of selected Concept, identifying the impacts (penalties or advantages), of the Ultra-Green choices compared to traditional ones
- Technology gaps, needed maturations in order to ensure the feasibility of the selected System(s), proposing roadmaps and, as relevant, de-risking demonstrators
- Environmental impact file

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Some useful conclusions

- Globally all activities provided:
 - Very good and detailed outcomes
 - Very interesting conclusions
 - Very useful technology gaps to focus in the coming years
- They all highlighted however:

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- The difficulties of the exercise
- The lack of complete data for the different elements traded: some choices were done about the environmental impact data available or not or on engineering judgement

Need to define what does it mean to be "green" (in Space Transportation)

-> The positive and the negative aspects obtained are very useful for us to know where to focus in the coming years



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