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EU space projects responding to REACH & space environmental footprint

4th ESA REACH workshop on

EU REACH Regulation and its impact on the Space Sector

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Where we come from

- REACH is a regulation of the European Union, adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals
- The regulation has an impact on most companies across the EU including the space sector
- It entered into force on 1 June 2007.

Where we are going

- The European Commission DG in charge for Defence Industry and Space is well aware of the impact of REACH on the space sector
- In addition to a close collaboration with DG-GROW aiming at supporting the implementation of the REACH regulation while preserving competitiveness of the sector worldwide, DG-DEFIS has taken specific actions to support the transition
- The EU Space WP, through H2020 and HE, has been fostering and financing the developments of alternative solutions for REACH space chemicals/materials e.g. **hydrazine, chromates and lead**

H2020 space projects with dedicated REACH developments

HYPROGEO: Hybrid Propulsion Module for transfer to GEO orbit

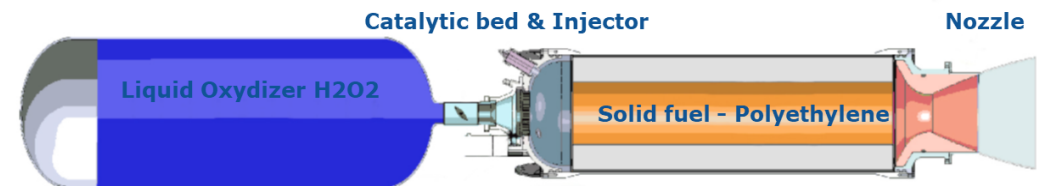
Project timeline 01/02/2015 -> 31/01/2018

Budget: ~3ME

Consortium: AIRBUS DS (FR), ONERA (FR), NAMMO (NOR), SpaceTec (BE), Evonik (DE), DELTACAT (UK), UPD (IT), VKI (BE), AIRBUS DS (DE), AIRBUS DS (UK), IOA (PL), MOOG (UK), STRATHCLYDE UNIVERSITY (UK), EVONIK RE (UK), ARIANEGROUP (FR), ARIANEGROUP (DE)

Objectives specific to REACH:

- Development of a propulsion module based on **Hybrid chemical propulsion**
- Design a **catalytic bed & injector compatible to high H₂O₂ concentration**, working at high temperature and capable of high decomposition efficiency
- Design a **combustion chamber for long duration burns** and stable low thrust in vacuum
- Produce a lightweight **nozzle capable of withstanding the specific erosion** caused by the long term exposure of the hybrid engine reaction products.



RHEFORM: Replacement of hydrazine for orbital and launcher propulsion systems

Project timeline 01/01/2015 -> 31/12/2017

Budget: ~3ME

Consortium: DLR (DE), FOI (SE), CNRS (FR), UNIVERSITE DE POITIERS (FR), FHWN (AT), ECAPS (SE), FOTEC (AT), LITHOZ (AT), AIRBUS DS (DE)

Objectives specific to REACH:

- **Replacement of toxic hydrazine with ADN-based propellants** (ammonium dinitramide)
- **Development of a cold-start capable ignition system** to replace hydrazine in the whole operational area (Development of catalytic and thermal igniters)
- Verification of the technology within thruster demonstrator(s) to reach TRL 5



GRAIL: Green advanced high energy propellants for launchers

Project timeline 01/02/2015 -> 31/01/2018

Budget: ~3ME

Consortium: FOI (SE), ICT FRAUNHOFER (DE), The Inner Arch (FR), Politecnico di Milano (IT), EURENCO (FR), AVIO (IT), CNRS (FR), UNIVERSITE DE POITIERS (FR)

Objectives specific to REACH:

- **Development of green solid propellants** to be used for the 1st stage of VEGA; TRL 3-4
- State of the art **solid** rocket propellants are **based on the oxidizer ammonium perchlorate (AP) and aluminium powder as fuel**, embedded in a polymer binder matrix. Unfortunately, AP has a negative impact on the environment and is highly toxic.



DETOX (Detox SatDrive Propulsion)

Project duration: 01/04/2022 to 31/10/2023

Budget: 2M Euro (EU contribution: 1,4M Euro)

Consortium/Beneficiary: Dawn Aerospace Nederland B.V.

Projects Objectives:

- In-space propulsion development of a bi-propellants thruster for small satellites (between 100-500kg)

Activities/tasks focused on responding to REACH regulations:

- **Avoiding hydrazine by using nitrous oxide and propene as propellants.** These propellants are stored separately and injected into the thruster and ignited using a spark plug.



PEGASUS: Flight Qualification of Deployable Radiator using Two Phase Technology

Project timeline 01/01/2015 -> 30/09/2018

Budget:~3.5 ME

Consortium: IberEspacio(ES), ThalesAlenia(FR), ThalesAlenia(IT), TECNALIA(ES), SENER (ES), ActiveSpace (PT)

Objectives specific to REACH:

- One of the objectives was also to **perform the selection and testing of Cr(VI)-free conversion coatings and primers fulfilling the requirements of the space sector**
- The project investigated the:
 - ❑ Replacement of Alodine 1200S for 6082-T6 and 6063-T6 aluminum alloys:
 - ❑ Replacement of BR127 primer for 6063-T6, 2024-T81 and 7075-T7351 aluminum alloys



HEATPACK: new generation of High thermal efficiency components Packages for space

Project timeline 01/01/2019 -> 31/03/2023

Budget:~3ME

Consortium: Thales Alenia Space (FR), ADAMANT (GR), ALTER (ES), CSEM (CH), EGIDE (FR), OPTOCAL (UK), RHP (AT), Uni Bristol (UK), Poli
Warszawska (PL) , ALTER (UK)

Objectives specific to REACH:

- **Develop and industrialize a REACH-free, non-dependent high dissipative film adhesive** for 2nd level TIM (TIM2, i.e. for package to equipment's mechanical structure assembly)
- Improve the thermal conductivity of the TIM2 film adhesive by 40% targeting 10W/mK

Achievements up to now:

- Thermal characterization and mechanical tests of TIM2 adhesives
- **Characterisation campaign ongoing**



EU Space WP 2021 – Lead free transition



- As part of the topic covering Critical Space Technologies for European non-dependence, in 2021 COM has opened a call for projects focused on:
 - Replacement solutions for metallic lead (Pb) used in solder paste, assembly, finishings, terminations
- Although we received high level of interest and positive response from space industry, no proposals reached sufficient score to be retained for immediate funding
- Lead-free transition in response to REACH regulation is considered by DG-DEFIS an urgent and critical task
 - Discussions are on-going to propose the same call in the Space WP2023, expected to be adopted at the end of November 2022



Environmental Footprint – Space Sector

Making the EU Climate neutral by 2050

MAKING THE EU CLIMATE NEUTRAL BY 2050



December 2019



European Green Deal: climate neutrality by 2050

March 2020



European Climate Law: 2050 target becomes binding legislation

55%



September 2020

Commission: new EU target to cut emissions by at least 55% by 2030

December 2020



European leaders endorse target

April 2021



Political agreement reached on European Climate Law

June 2021 European Climate Law enters into force



July 2021



Commission: proposals to transform our economy, to reach our 2030 climate targets

European Parliament and Member States to negotiate and adopt legislation



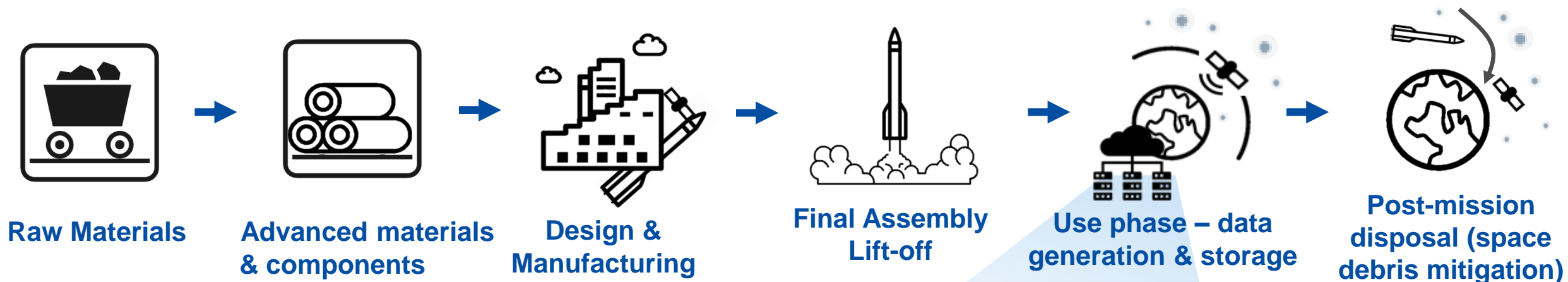
2030

EU to deliver a reduction of emissions of at least 55% compared to 1990 levels

2050

EU to become climate neutral

The **EU space value chain** must be aligned with EU green policies in the frame of the **EU Green Deal**



More particularly, it supports the EU Green Deal & the Digital transition



Green Transition is taking place!

- EC (2021)9332 **Commission recommendation on the use of the Environmental Footprint methods** to measure and communicate the life cycle environmental performance of products
- EC(2022)142 final Proposal for a Regulation establishing a framework for setting **ecodesign requirements for sustainable products** and repealing Directive 2009/125/EC:
*“the space industry is strategic for Europe and for its technological non-dependence. As space technologies operate in extreme conditions, any ecodesign requirements for space products **should balance sustainability considerations with resilience and expected performance**”*
- **Aerospace & Defence Transition Pathway for green**, digital, and resilience: **public consultation by the end 2022!**



Secure Connectivity - new COM Space programme proposal

- n. 2 art. 17: In **procurement procedures** for the purpose of the Programme, complementing the principles laid down in the Financial Regulation, the contracting authority shall act in accordance with the following principles: (...) “**to satisfy environmental criteria**”
- n. 7 art. 15: The contracts referred to in this Article shall contain provisions on the **establishment of a scheme to offset the CO₂ emissions** generated by the launches of the infrastructure referred to in Article 5.



Thank you

Any Question?

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