RFA
Rocket Factory

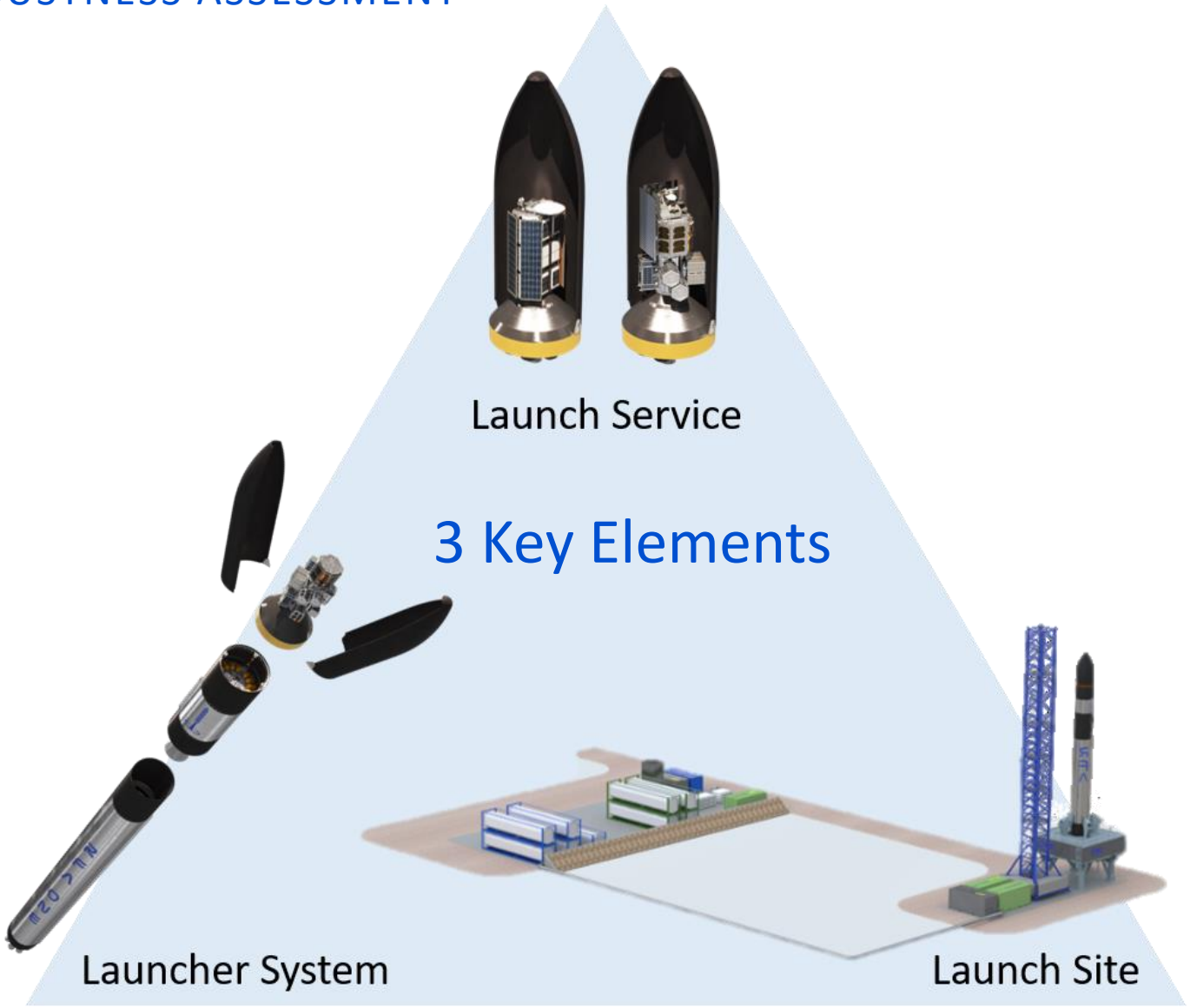
ESA MINI/MICRO-LAUNCHER FINAL PRESENTATION

Augsburg, 19 June 2024

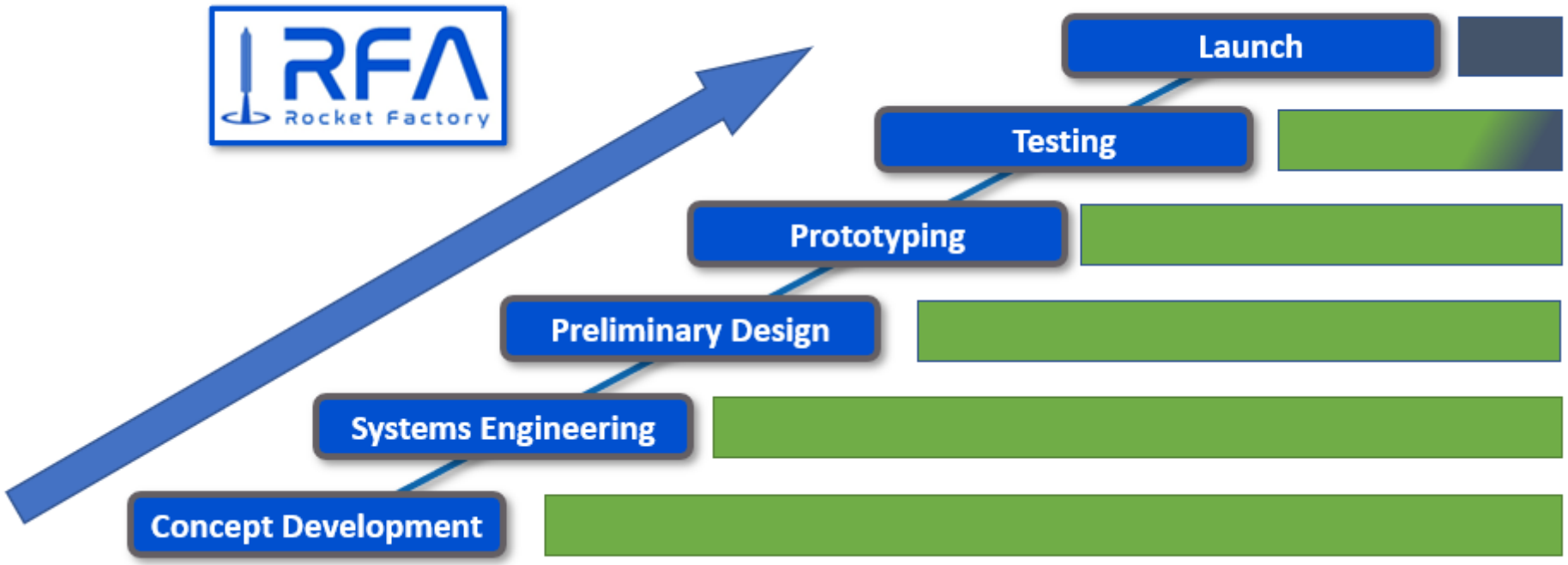
AGENDA

- Project Overview
  - WP 1000 Company Robustness Assessment
  - WP 2000 Launch Service Feasibility
  - WP 3000 Gap Analysis & Roadmap

WP1000: RFA ROBUSTNESS ASSESSMENT



WP1000: RFA LAUNCH SYSTEM DEVELOPMENT



WP1000: RFA ONE LAUNCH SYSTEM

Helix Propulsion System Cluster

- Staged-combustion technology
- Up to 1,300kg to 500 km SSO

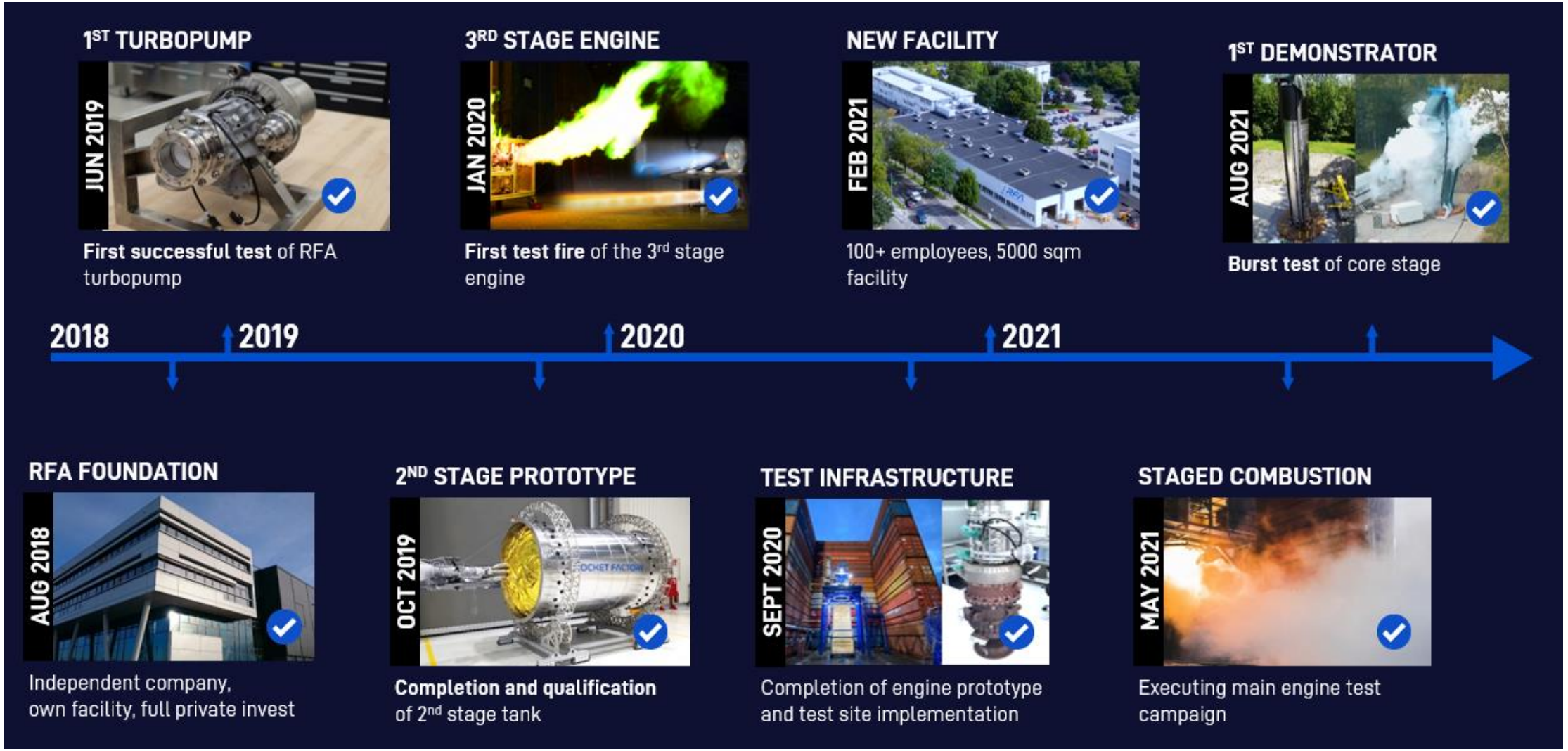
Redshift OTV

- Proprietary orbital stage
- On orbit maneuvers
- In-plane phasing
- Inclination & RAAN changes

Stage Structures

- Common tank design made of stainless steel
- Maximum cost efficiency

WP1000: RFA PAST MILESTONES



WP1000: RFA ONE ON THE ROAD TO LAUNCH

ENGINE QUALIFIED

Integrated **flight engine qualification**

INTEGRATED 1st STAGE

Fully integrated first stage with 9x engines

RFA ONE FIRST LAUNCH

Inaugural test flight with 150 kg DLR Payload

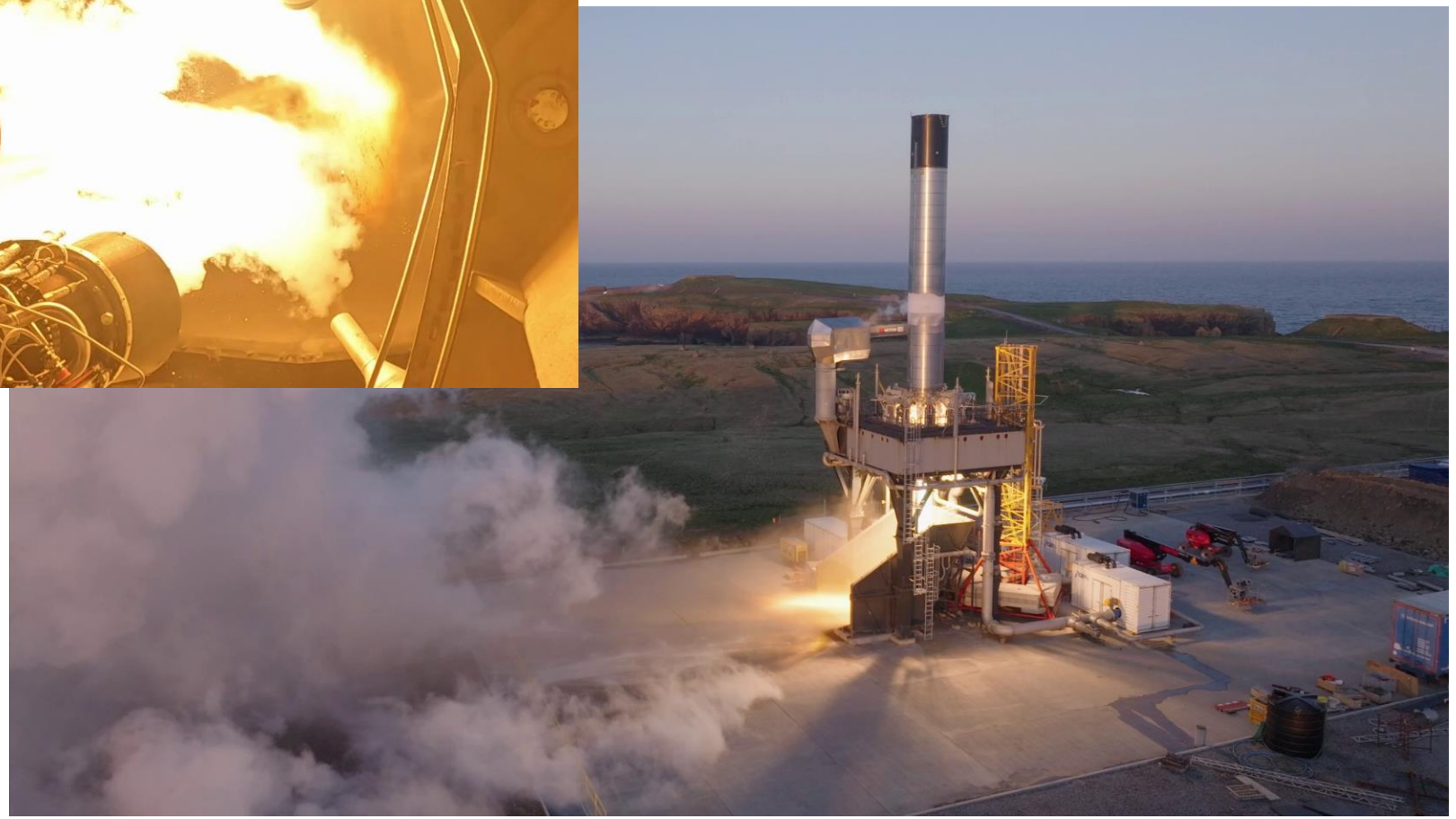
INTEGRATED 2nd STAGE

Fully integrated 2nd **stage test**

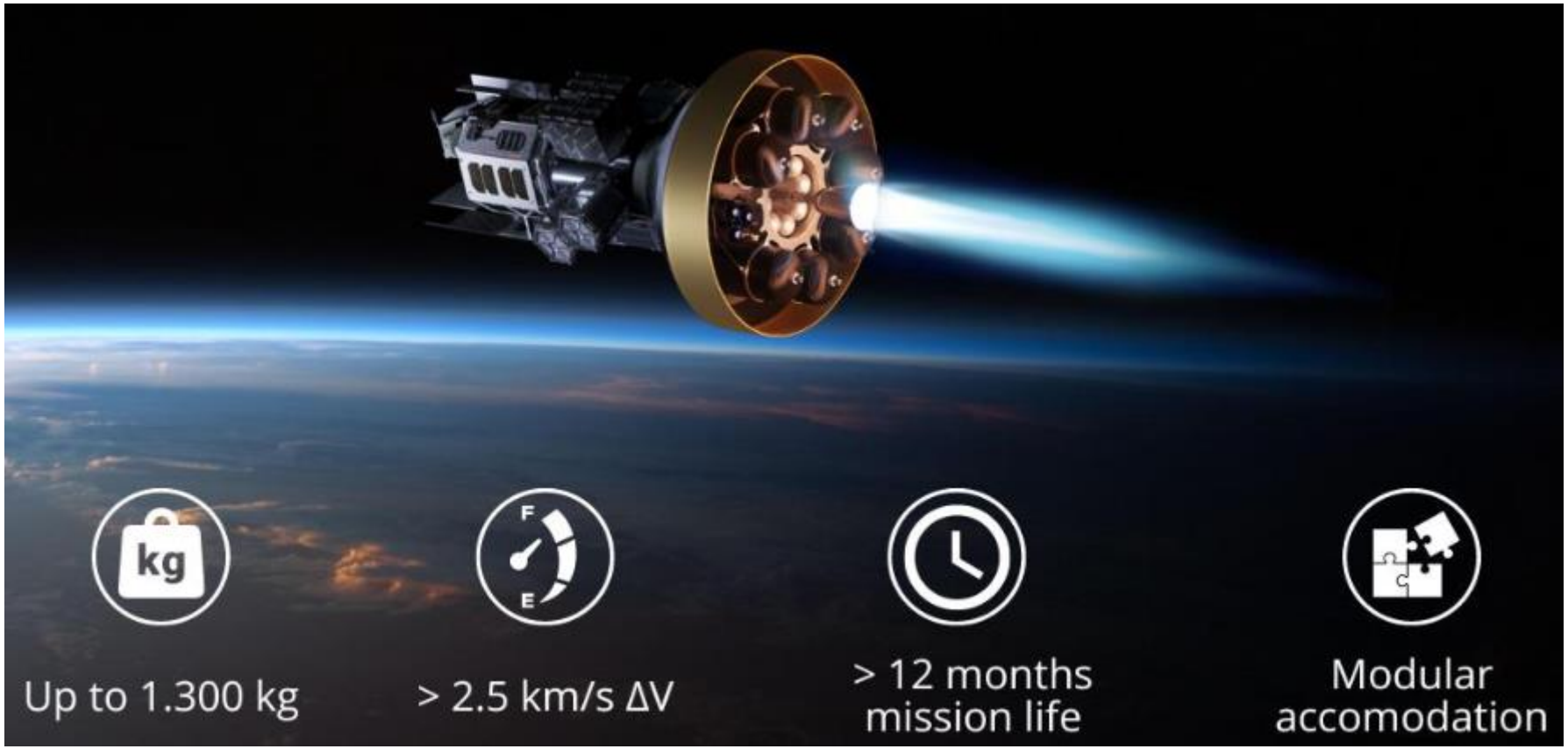
3rd STAGE STACK TEST

Fully integrated 3rd stage with 1x Fenix engine

WP1000: RECENT S1 HOT-FIRE TEST



- Provide among the best price in the space industry by achieving high levels of frugality and efficiency for development and manufacturing
- Deliver the highest lift-off performance of small launch vehicles



- Review of the satellite interface requirements document
- Conducted mission design and compute flight trajectory
  - Launch vehicle model created
  - Preliminary mission constraints derived
  - Launch site options considered
- Establish launcher performance and conduct trajectory optimization
  - Conducted 3D of trajectory calculations for performance assessment
  - Created deployment propagation of re-entering stages

- Review of the safety submission
  - EEZ areas and hazard areas defined for DRACO
  - Ground safety analysis performed
- Perform payload accommodation analysis
  - Dedicated payload dispenser created for each satellite
  - Fairing clearance analysis performed
  - Preliminary structural analysis performed for each payload

- DRACO satellite will be securely positioned on RFA's dedicated adapter
- Interface with the DRACO satellite through its dedicated payloads node
- After the circularization the deployment sequence is initiated to deploy the rideshare payload (optional)
- Unique flexibility for microlaunchers because of Redshift OTV to select the impact point location caters to the needs of tracking aircraft during re-entry

- RFA ONE launch vehicle ideally suits this mission due to its payload class, low-cost, and flexibility of utilising the Redshift OTV
- Trajectory of the LUMIO mission with the aim to go to a lunar Halo orbit starts with a launch into a highly elliptical orbit towards either the Earth-Sun Lagrange 1 or 2 point
- Mission insertion is feasible both from Kourou and SaxaVord, while a launch from Kourou enables higher performances due to Earth's rotation

- Leveraging the remarkable dV performance of Redshift, depending on payload mass, RFA ONE minimizes steering losses and maximizes payload performance
- Similar to the LUMIO mission, the launch trajectory from Kourou follows an elliptical transfer orbit
- Flexibility of the number of burns required for payload delivery allows for tailored mission durations, ensuring efficient and precise insertion

- Redshifts flexibility and performance enables to deliver all four satellites at the same launch/time as a constellation
- Targeted orbit for the final orbital insertion is a 500 km SSO
- Studied the most optimal dates to launch the different LEO-PNT missions
- Perform a direct RAAN shift manoeuvre, to efficiently place two pairs of Pathfinder-B satellites into separate orbital planes
- Quickest delivery of the Pathfinder satellites within a dedicated launch

TN5 Gap Analysis outcomes:

- All missions of this call can be realized with the RFA ONE launch system
  - 3-stage architecture as key enabler for mission performance beyond LEO
  - Redshift provides mission flexibility thanks to its reignition capabilities that allows for orbit changes
  - Beyond LEO aspects are part of the RFA ONE qualification program

Mission	Launch Site	Orbit
DRACO	SaxaVord	LEO
LUMIO	SaxaVord	Beyond LEO
SATIS	Low Incl	Beyond LEO
LEO-PNT	SaxaVord	LEO

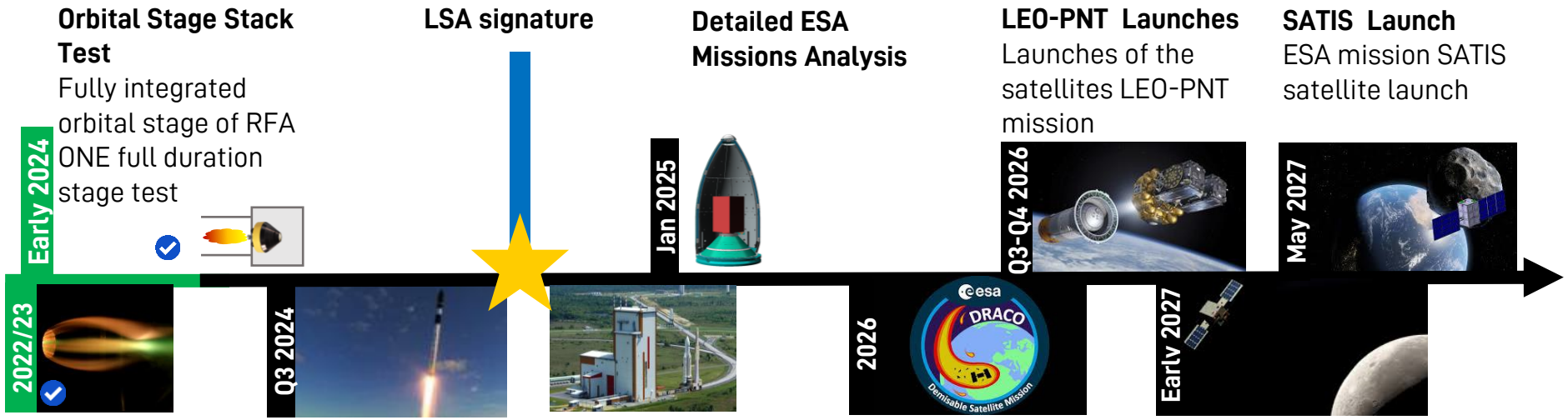
- Main launch site in SaxaVord Spaceport UK soon operational for first launch in summer 2024
- Particular missions such as SATIS will require a low inclination launch site
- Binding term-sheet with CNES for launch pad on Diamant launch complex at CSG in development

- License with UK CAA on track for first SaxaVord launch Summer 2024
- Demonstrates RFA's compliance with the UK Space Industry Act 2018 (SIA), the Space Industry Regulations 2021 (SIR), and the associated CAA
- Launch site partner SaxaVord Spaceport was granted a launch site operator license in December 2023
- Granted range control license in April 2024 by the CAA
- CSG launch site and process in implementation

- Increasingly important not only for ESA but any sustainable actor
- RFA ONE is very favorable
  - Three-stage architecture of non-toxic liquid propellants
  - No pyrotechnical elements
  - Redshift de-orbitation capabilities

  → No space debris from vehicle

- All four ESA missions of this call can be provided with the current development of RFA One launch system



THANK YOU FOR JOINING OUR MISSION!

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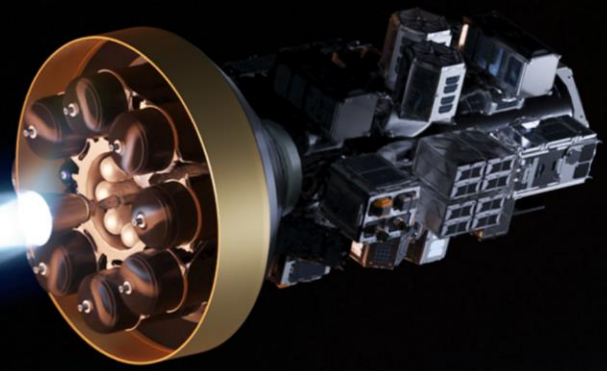

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