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BB09
100-200N Low Cost de-Orbit Engine
Airbus DS GmbH, Lampoldshausen

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OHB
ThalesAlenia Space
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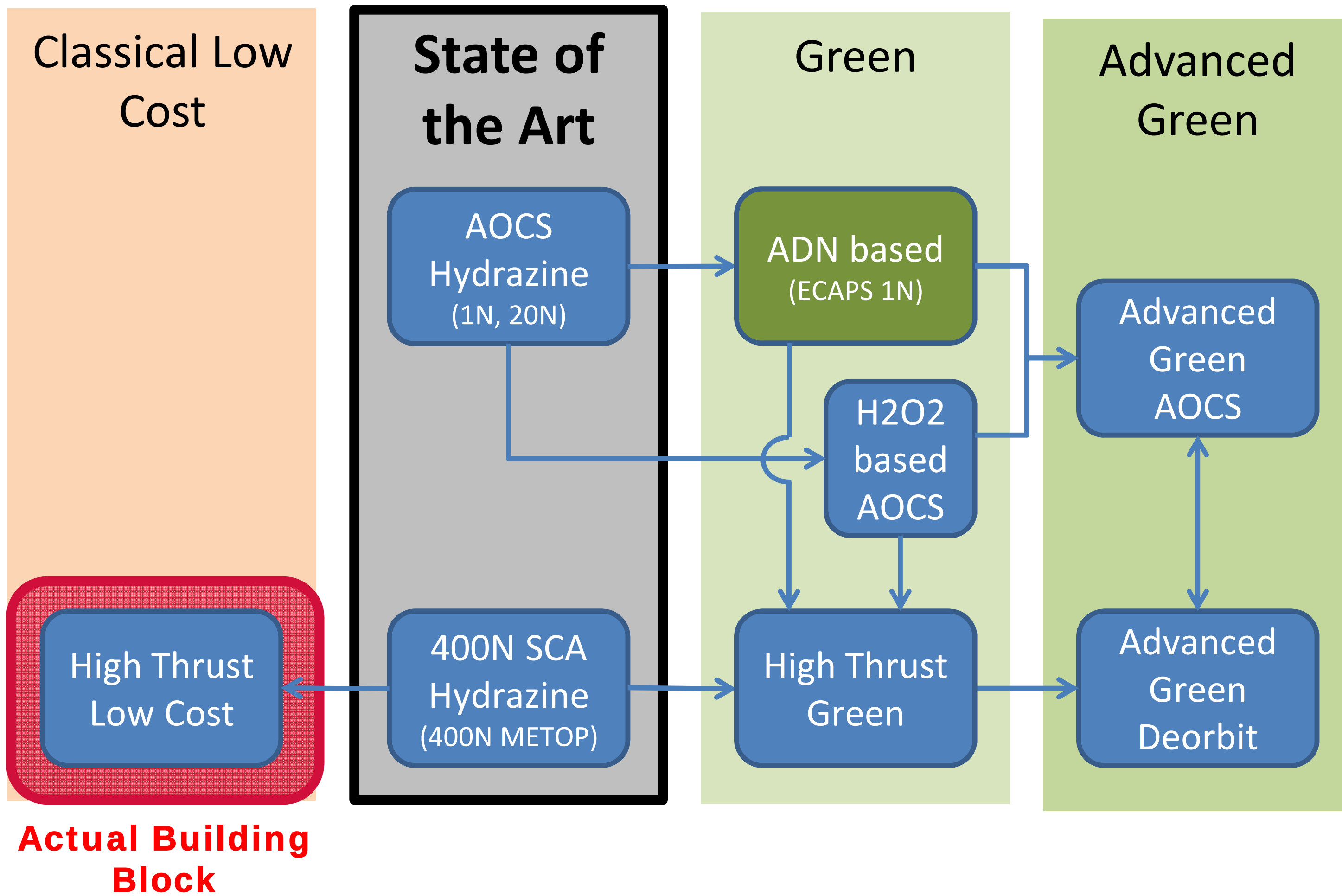
Propulsion Technology Roadmap



Description of proposed technology Building Block

Based on the successful heritage of the 400N SCA engine a dedicated deorbit engine with optimized performance and lower cost is proposed.

- The **applicability range** would be larger LEO satellites in an orbit that requires an active deorbiting
- The expected **Building Block performance** is estimated to be a 25% reduction in cost due to simplified design and a 5s higher ISP due to a higher expansion ratio
- The expected **system level impacts** would be lower cost and a lower overall propellant mass for the deorbit phase
- The **Heritage** for this new engine are Airbus DS monopropellant thrusters in a thrust range of 1N to 2.5kN and recent cost optimization processes applied to the 1N and 20N thrusters. Another heritage brick is the successful development of a fully ALM manufactured 250N thruster demonstrator that offered significant cost advantages compared to a classically manufactured thruster.

Description of proposed technology Building Block

Baseline for the development will be the existing 400N monopropellant SCA thruster (see following figure) that is currently in qualification for METOP deorbit purposes. In order to optimize its performance and lower the cost a design to cost approach will be performed that assesses the main building blocks of the thruster

ALM manufactured 240N thruster

Classical 400N SCA thruster

- FCV - assessment if the existing FCV can be produced as a low cost version or if other COTS (commercial off the shelf) valves can be used
- Heat barrier - assessment if the heat barrier can be simplified when purely multiple steady state firings are required
- Injector - assessment if the injector can be simplified
- Interface to the structure: currently the interface is at the chamber in order to allow a heat sink
- Catalyst chamber - assessment if size and if the currently used 2 bed design can be changed to a cost effective solution. Catalyst type - assessment if a low cost catalyst can be used
- Nozzle - assess performance as a function of expansion ratio and a canting requirements at a given geometric envelope

Work Package Description

Inputs:

- Propellant: Hydrazine with an inlet pressure of 24 bar (repressurized) down to 5 bar (blow down)
- Thrust level: between 100N and 400N; assess impact on thruster design
- Target volume, mass, throughput, operational mode and thruster orientation. Remark: if these values cannot be given realistic assumptions will be used

Output: Summary report according following work logic:

- Market overview (SOA deorbit engines)
- External component assessment (FCV, CBH, TFS) with focus on available COTS equipment
- Overall design options within specified envelope (level / inlet pressure range). Within this part elaboration of optimized nozzle (orientation, expansion ratio)
- Heat barrier and injector design simplifications (baseline 400N SCA thruster currently used for METOP deorbiting) based on actual requirements
- Thruster performance assessment (Fvac, ISP)=f(inlet pressure)
- Catalyst bed (type and dimensions) simplifications based on actual requirements
- Overall manufacturing assessment including 3D printed parts
- *Development Road Mapping and Development & Unit cost estimates*