

Architect function for optimizing Launch System design and its operations

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Whatever its location worldwide or type of business organization, a Launch System includes four major items or tasks:

- the launch vehicle aka Launcher itself,
- the set of facilities aka Launch complex, part of a spaceport, from where the launch vehicle is autonomously and directly prepared (for flight) and operated for launch and recovery operations in case of Reusable Launch Vehicle (RLV),
- the interfaces, a large category including boundaries between Launcher and Launch Complex themselves, but also between Launcher and the launch range that is the other side of a spaceport, and environment as well,
- the set of end-to-end operations for getting the space vehicle ready for flight and mandatory during the flight for a safe and reliable mission.

Beside design of launch vehicle and launch complex themselves for optimizing overall cost of ownership including operating costs, one key way for getting a step further in (i) costs optimization, (ii) increased availability aka readiness for launch vehicle operator complying with safe regulations is to take care to:

- functional architecture consistency and products design accordingly,
- multiple interfaces in between launch vehicle, launch complex and launch range on one hand,
- operations themselves on the other hand.

That is one role of the Launch System architect.

This paper will detail its role relying on the showcase of CALLISTO Project

The CALLISTO vehicle is a flight demonstrator for future reusable launcher stages. The program involves three countries and their space organizations: CNES for France, DLR for Germany and JAXA for Japan. The first tests will be conducted in 2024 from the CSG, Europe's Spaceport for commercial launches in French Guiana. The challenge is to develop, all along the project, the skills of the partners. This knowhow includes Products and Vehicle design, Ground Segment set up, and post-flight operations for Vehicle recovery then reuse.

For the sake of comprehension, different possible scenarii or arrangements will be emphasized and that result in cost-optimized Launch System including its operations and according to a set of safety rules that are enforced locally at a given spaceport.