THE VEGA SPACE TRANSPORTATION SYSTEM DEVELOPMENT: STATUS AND PERSPECTIVES

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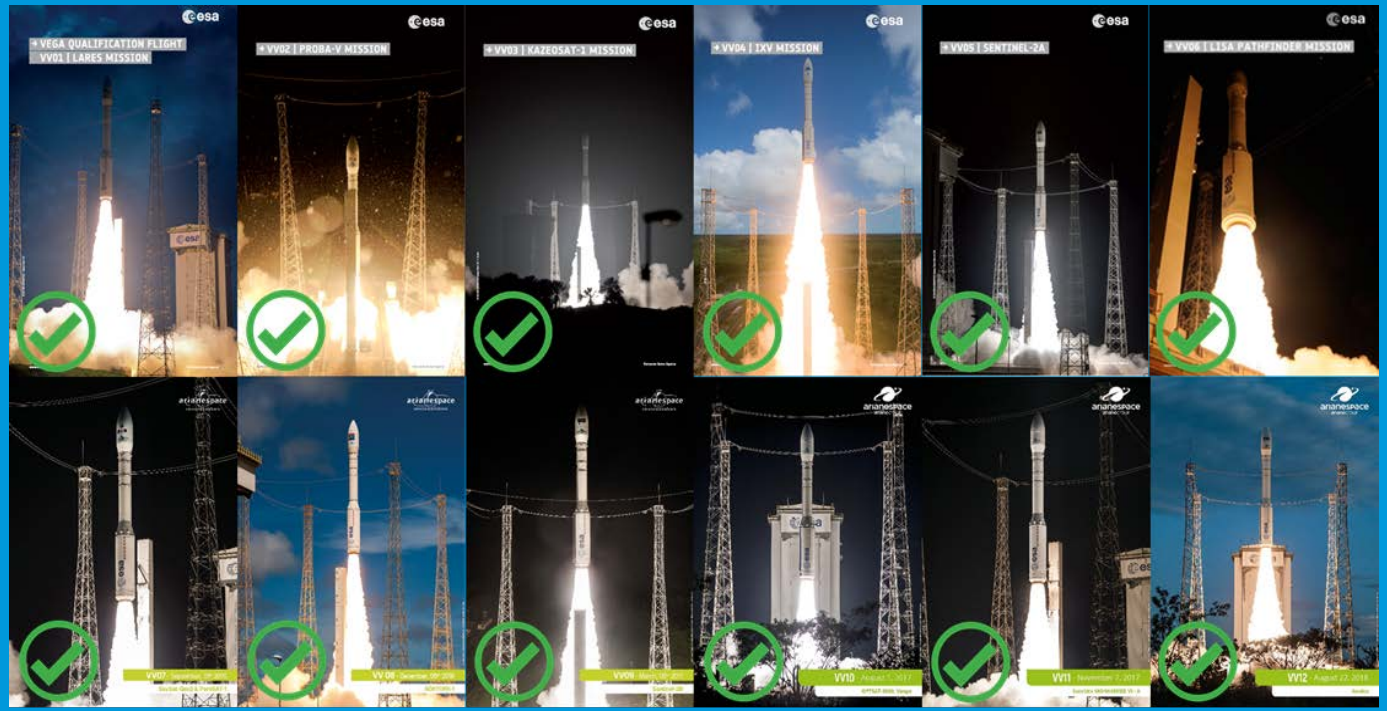
The Heritage

The Vega Launch System

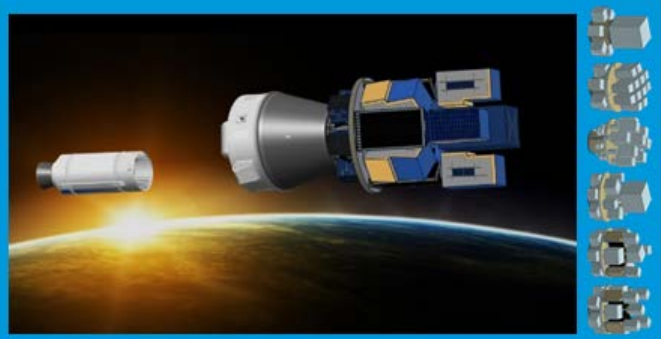


The IXV Re-entry System

The Products

Vega C *for Larger Payloads*

SSMS *for Smaller Payloads*



Space Rider *for Payloads Return*

Venus *for Higher Orbits*

Vega E *for Higher Competitiveness*

Vega-C for Larger Payloads *(1/2)*

Objective:

Access to space fulfilling wider market needs with respect to Vega for larger and heavier payloads with mass up to 2300 kg in PEO at 700 km, with Europeanization of key non European components.

Development Lines:

- 1st Stage, P120C with 142 t of propellant, instead of Vega P80;
- 2nd Stage, Z40 with 37 t of propellant, instead of Vega Z23;
- 3rd Stage, Z9 with 10 t of propellant, same as Vega;
- 4th Stage, AVUM+ with respect to Vega with:
    - *lower inert mass;*
    - *higher propellant loading;*
    - *higher avionics segregation, versatility and reliability;*
    - *higher payload fairing volume.*

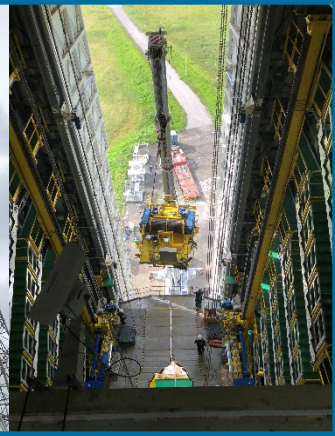
Vega-C for Larger Payloads *(2/2)*

Launch Vehicle




Launch Base



ESA

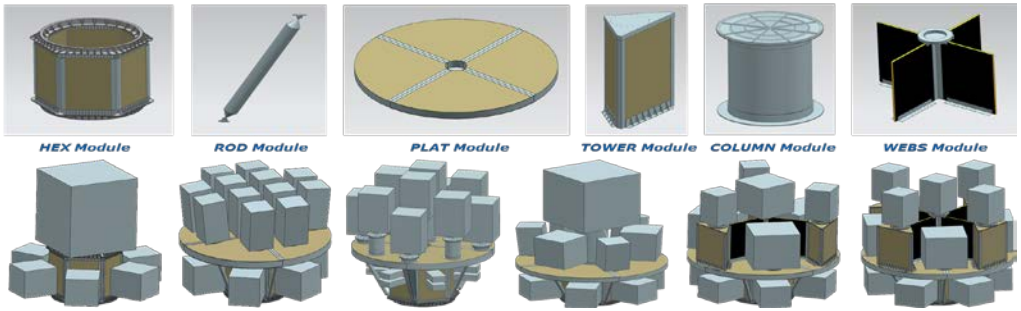
Vega-C for Smaller Payloads (SmallSpacecraftsMissionService)

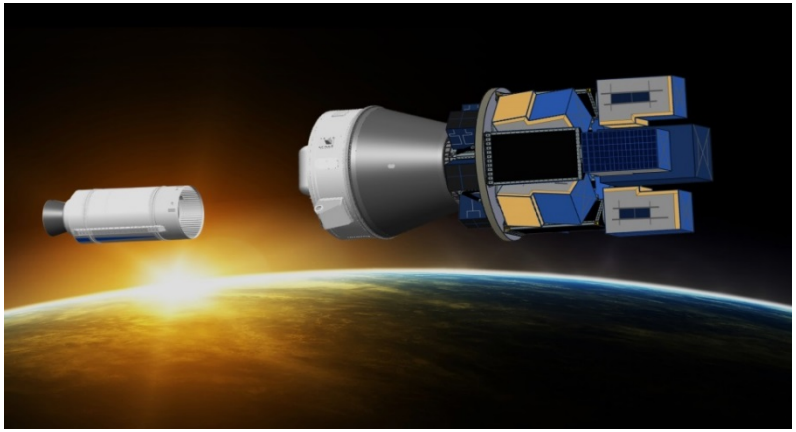
Objective:

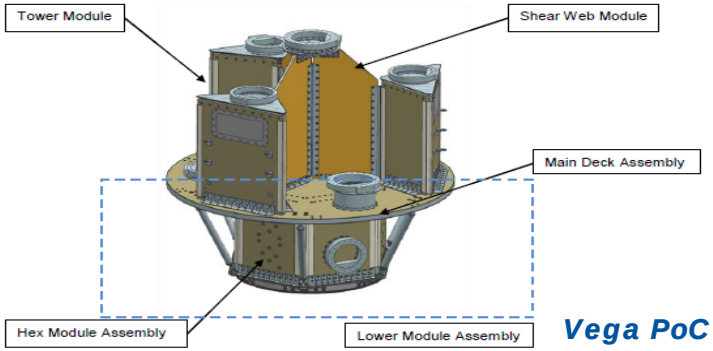
Benefit from the higher Vega-C performance to fulfil the growing market needs of small satellites from universities and research organizations.

Development Lines:

- Standardised qualification and integration processes;
- Modular dispensers and adapters to place multiple configurations/aggregates of small satellities.







Vega-C for Payloads Return (Space Rider) *(1/2)*

Objective:

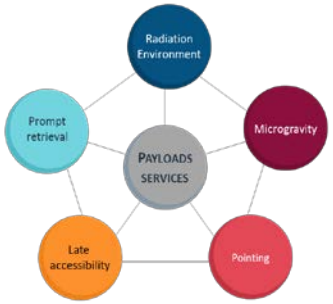
Provide a reusable orbital customisable/ standardised space laboratory for multiple applications (microgravity, Earth observation, science, robotic exploration), integrated with Vega-C, able to perform in-orbit payloads operations, de-orbit, re-enter, land on ground, be relaunched after limited refurbishment.

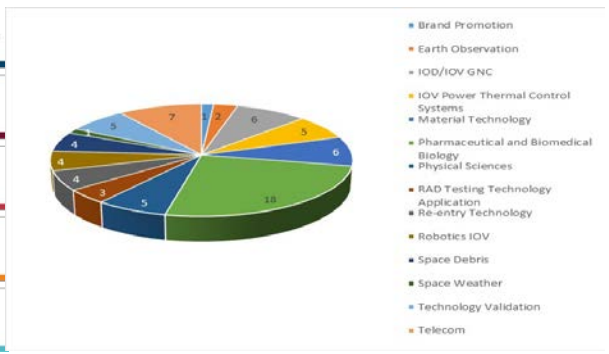
Development Lines:

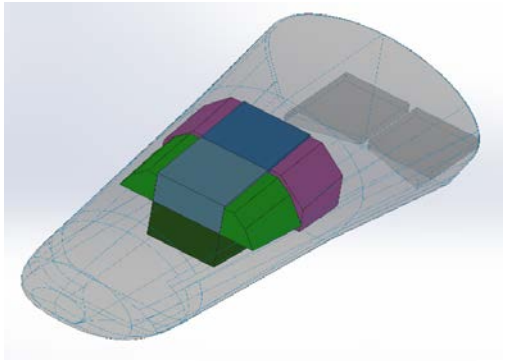
- Orbital Service Module, a modified version of the AVUM+ to extend the orbital life-time;
- Re-entry Module, a modified version of the IXV to integrate a multi purpose payloads bay (MPCB) and land on ground.

Vega-C for Payloads Return (Space Rider) *(2/2)*

Market Driven Payloads Services





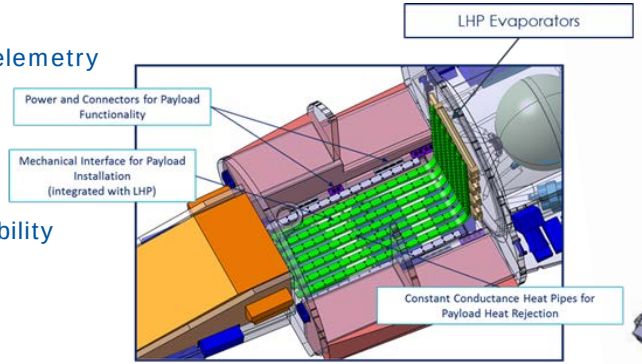


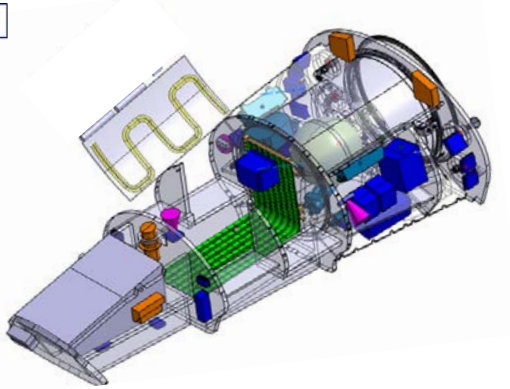
Payloads Services

- Shorter time from/to lab to/from space
- In-space power, thermal, control, data-handling, telemetry
- Lower deceleration during re-entry
- Softer precision landing on ground
- Newer innovative exploitation of Space

Payloads Capabilities

- 1200 litres of conditioned cargo volume, plus:
  - additional unconditioned cargo return capability
  - additional expendable cargo capability
- Accommodation through 8 standardised lockers:
  - 2 lockers for Late Access
  - 4 lockers for µ-G
  - 1 locker for Field of View
  - 1 locker for Space Exposure





Vega-C for Payloads Orbital Transfer (VENUS)

Objective:

Extend the Vega-C market base providing orbit-to-orbit transfer to satellites of approximately 1 ton, up to:

- Medium Earth Orbits, e.g. for constellation replacement services;
- Highly Elliptic Earth Orbits, Escape Orbits, e.g. for scientific/exploration applications;
- GEO, complementary to the GTO by orbit raising from LEO.

Development Lines:

A 16 kW Solar Electric Propulsion Orbital Transfer Module, building on synergies with Space Rider Orbital Service Module based on a modular design of the AVUM Life Extension Kit (so-called ALEK), with:

- 1st Step, extending VEGA-C AVUM+ orbital life-time in LEO, as Space Rider Orbital Service Module;
- 2nd Step, stretching the orbital capabilities up to orbit transfers.

Vega-E for Preparing the Future

Objective:

Continuously improve Vega competitiveness, obtaining Vega-C performance at reduced recurring costs, with no overlap with Ariane performance and market.

Development Lines:

- Identification of a family of configurations, utilizing motors existing or under full development (i.e. P120, P80, Z40, Z23, Z9, Avum, Lox-Methane Engine);
- Development of lox-methane propulsion for an upper stage engine;
- Other developments (e.g. 3D printing for parts reduction, H2O2 propulsion for roll and attitude control) increasing Vega-C flexibility at reduced operational costs.

The Products Master Planning

Products	2018	2019	2020	2021	2022	.....	2025	Applications
VEGA C	Development (Phase-C, CDR)		 Exploitation					Access to LEO (Large P/Ls)
SSMS	Development (Phase-C, CDR, POC Flight)		 Exploitation					Access to LEO (Small P/Ls)
SPACE RIDER	Development (Phase-B, PDR, CDR)			 Exploitation				Return from LEO (IOD/IOV/µG P/Ls)
VENUS	Development (Phase-B, PDR)				 Exploitation			Transfer in/from LEO (GEO/MEO/HEO P/Ls)
VEGA E	Preparation (Phase-A)					 Development		Enhanced Competitiveness

Conclusions

All Products constituting the **Vega Space Transportation System** are:

- progressing their development according to the nominal planning;
- consolidating the widest fulfilment of the market needs, including:
  - Access to LEO for payloads ranging from 1 kg to 2300 kg, competitively;
  - Orbital transfer from LEO, complementarily to other European solutions;
  - Return from LEO, innovatively for a multitude of new space applications.

An European answer to the growing worldwide competition in Space Transportation!

Thank You!