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THINK LOGISTICS – SPACE LOGISTICS !

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Strategy for civil launchers

Space School - 25 June 2019

#spaceenablers

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DISRUPTION IN THE SPACE MARKET COMPETITIVE LANDSCAPE

Existing
Space Economy
has real economic value
to society

Meteorology

Science &
Exploration

....

Navigation/Positioning

Earth Observation

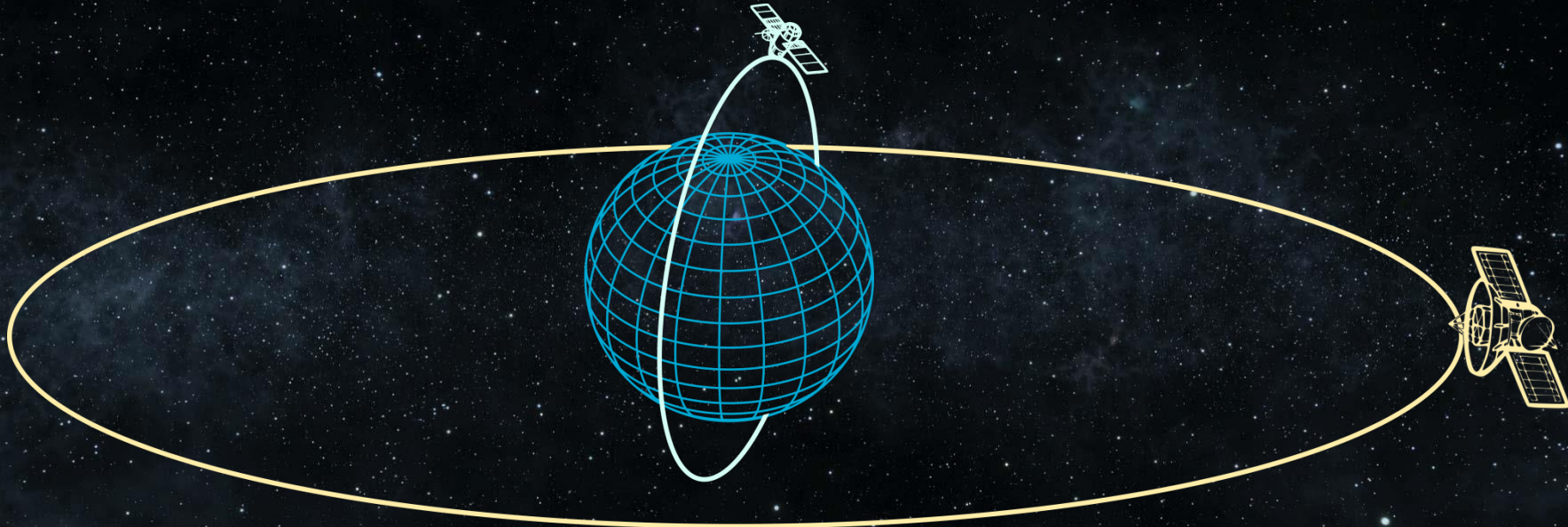
Telecommunications



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THE GOOD OLD DAYS: A FEW WELL SEGMENTED LAUNCH SERVICE MARKET SEGMENTS



ARIANE 5

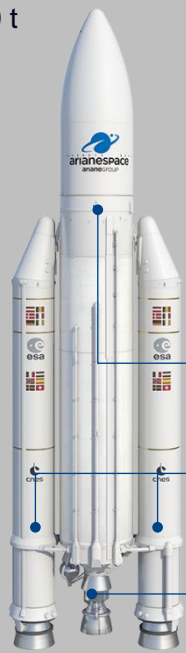
THE EUROPEAN WORKHORSE WITH 104 LAUNCHES PERFORMED

ARIANE 5 ES

Launch weight: 760 t

Thrust: 1,340 t

Last mission in 2018



Fairing
Height: 17 m
Ø 5.4 m

Dual Launch System (SYLDA)
Ø 4 m useful

HM7B engine
Thrust: 6.5 t

Reignitable Aestus engine
Thrust: 2.7 t

2 boosters

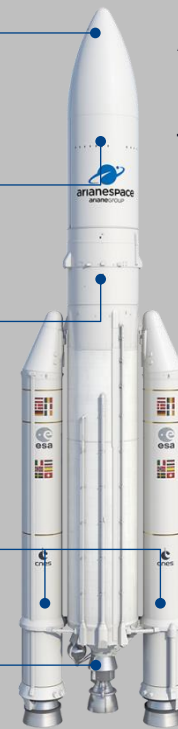
Vulcain 2 engine
Thrust: 136 t

ARIANE 5 ECA

Launch weight: 780 t

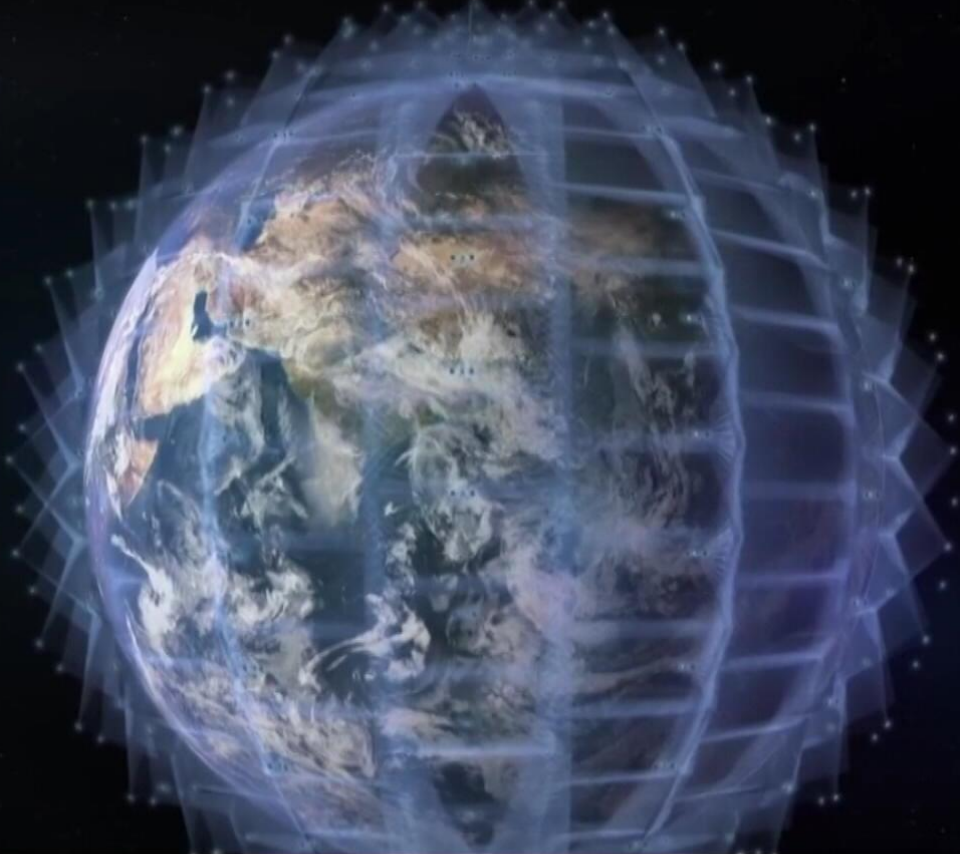
Thrust: 1,340 t

Still the benchmark for GTO missions



REVOLUTION: LEO SMALLSATS CONSTELLATIONS

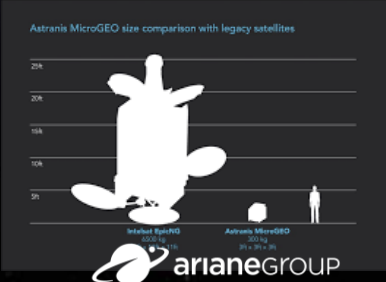
SOURCE: ONEWEB



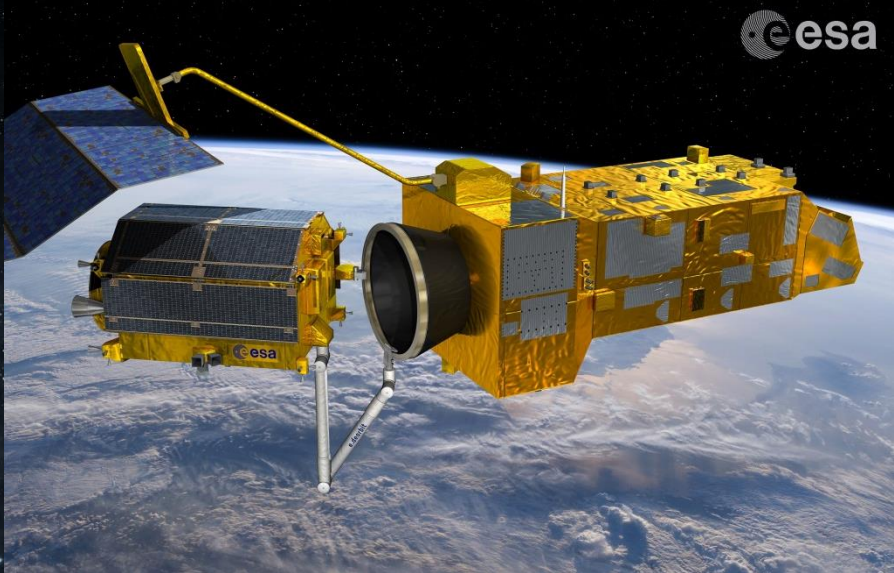
Bloomberg

SPACE RACE FOR SATELLITE INTERNET

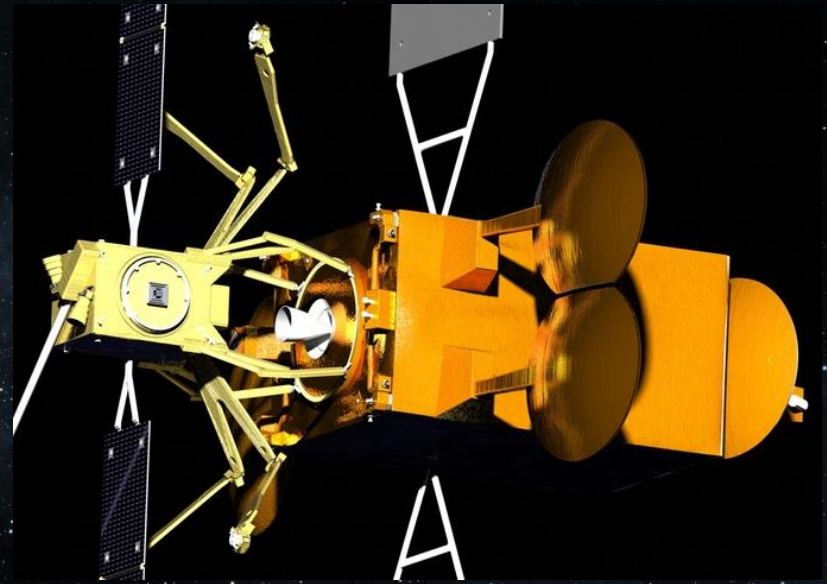
REVOLUTION: GEO SMALLSATS



REVOLUTION: IN ORBIT SERVICING



Source: ESA.blog.int



Source: Effective Space Solution

**Institutional market complemented
with Digital Economy financing**

→ New business models



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What Disruption is
taking place?

High Tech Industry

- Industrial optimization
- Acceleration of Innovation Cycles
- New work methodologies
(digitalization, Agile...)

Geopolitical environment

- National interests of contributing nations
- Sovereignty and strategic / military interests



.....

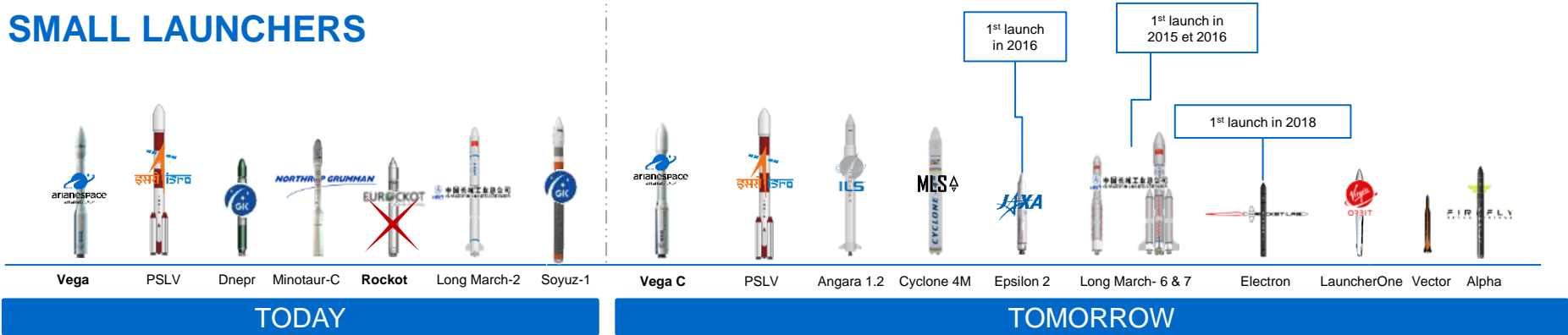


QUICK EVOLUTION OF COMPETITIVE LANDSCAPE

MEDIUM / HEAVY LAUNCHERS



SMALL LAUNCHERS



TODAY

TOMORROW

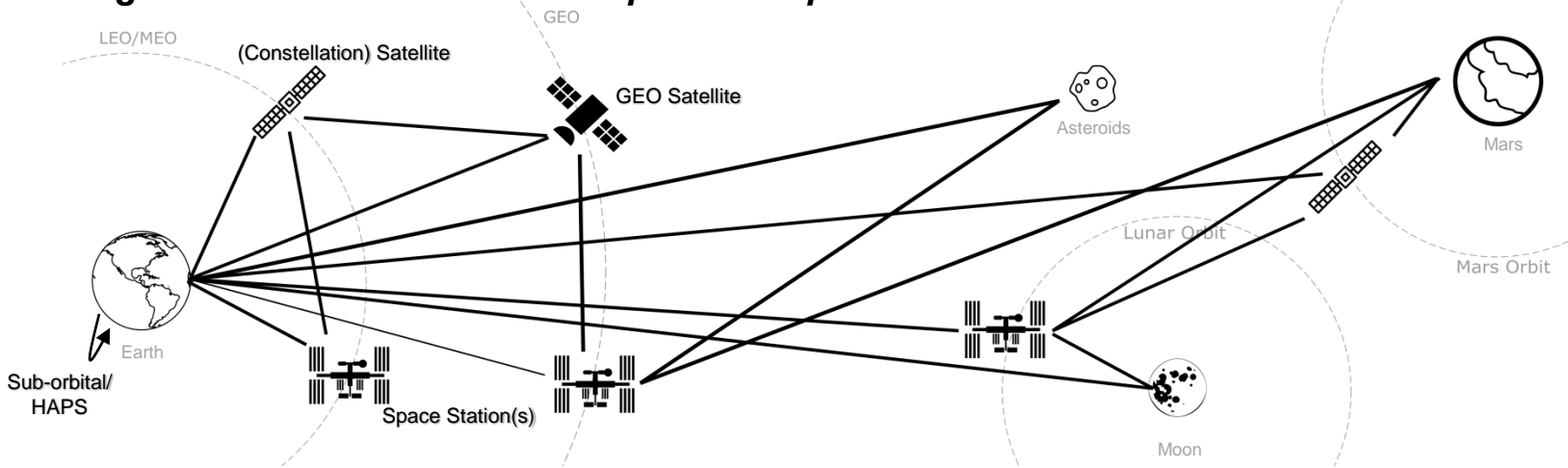
2

TOWARDS SPACE LOGISTICS SERVICES

SPACE LOGISTICS CONCEPT

ADAPTING END-TO-END TRANSPORTATION SERVICE TO CLIENT NEEDS

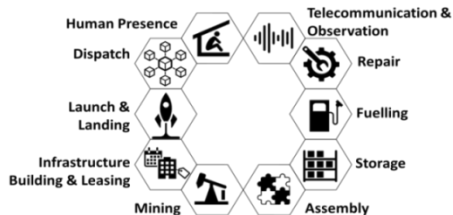
Defining the nodes and flows of the space transportation network



To transport:

- Micro/small to large satellites
- Cargo / payloads
- Humans
- Raw materials
- Fuels
- ...

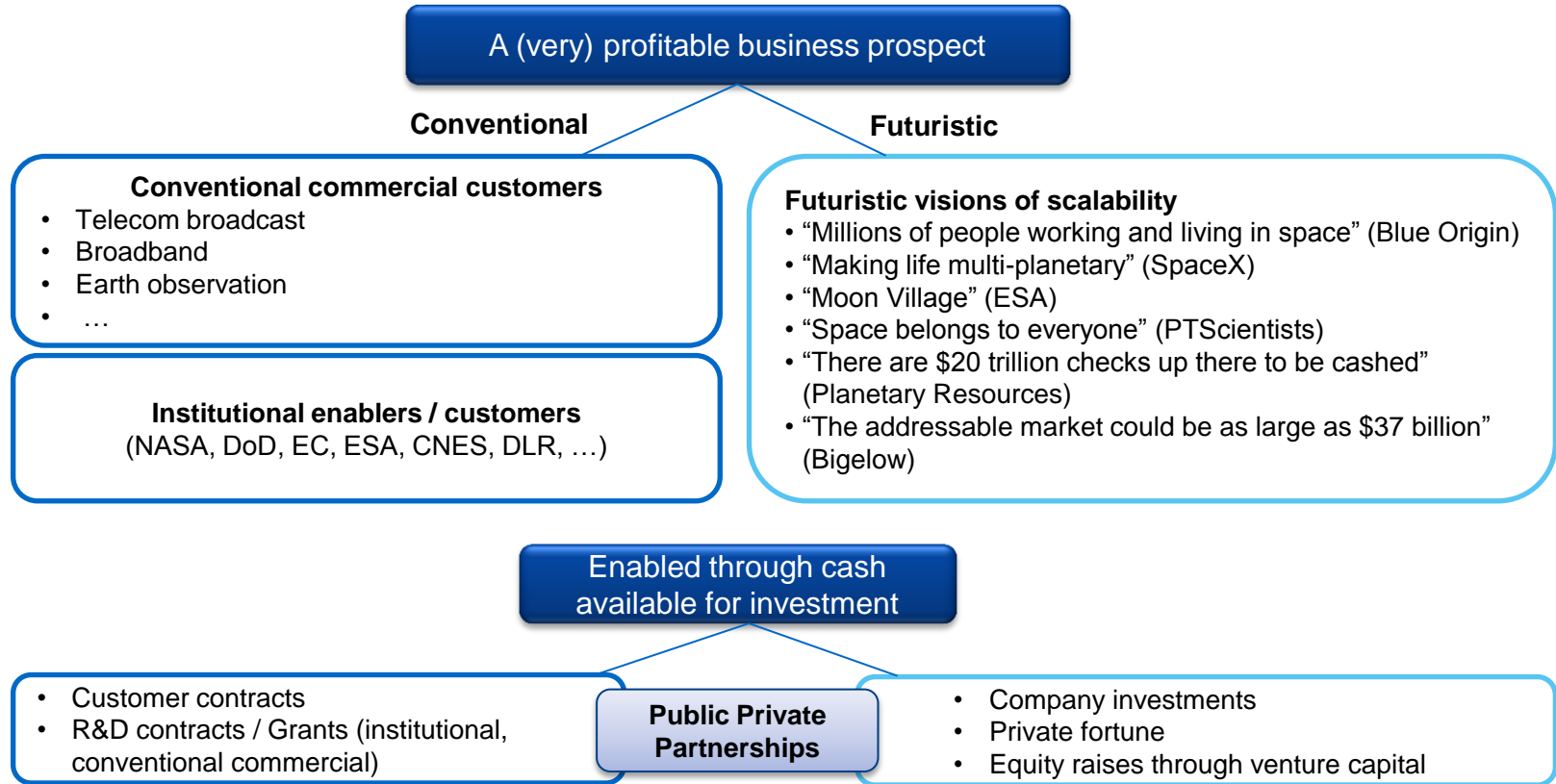
For activities on nodes



Enabling growth in market segments



THE DRIVERS FOR SPACE ECONOMY



What is our European answer ?

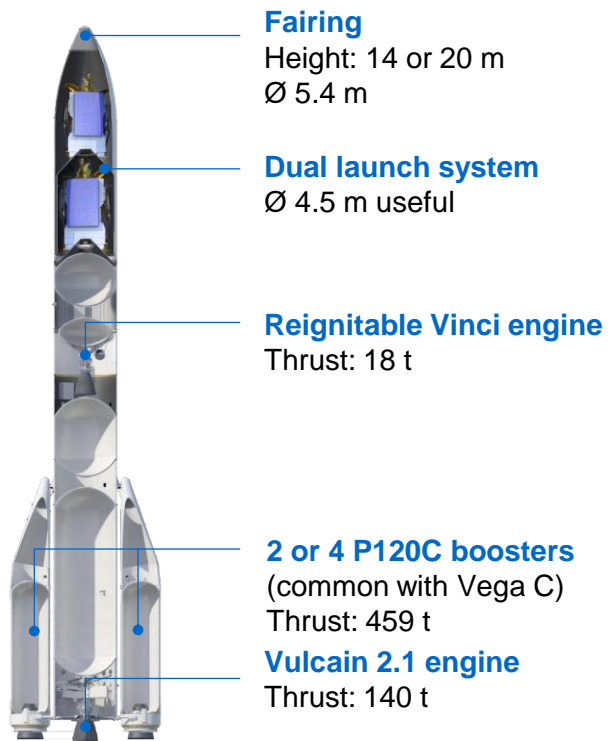
Enabling Space Economy

- ✓ Identification of minimum bricks for an efficient transport service
- ✓ Simplification for customer by offering end-to-end service
- ✓ Increasing addressable market by offering extra service capabilities

for increased societal return

ARIANE 6

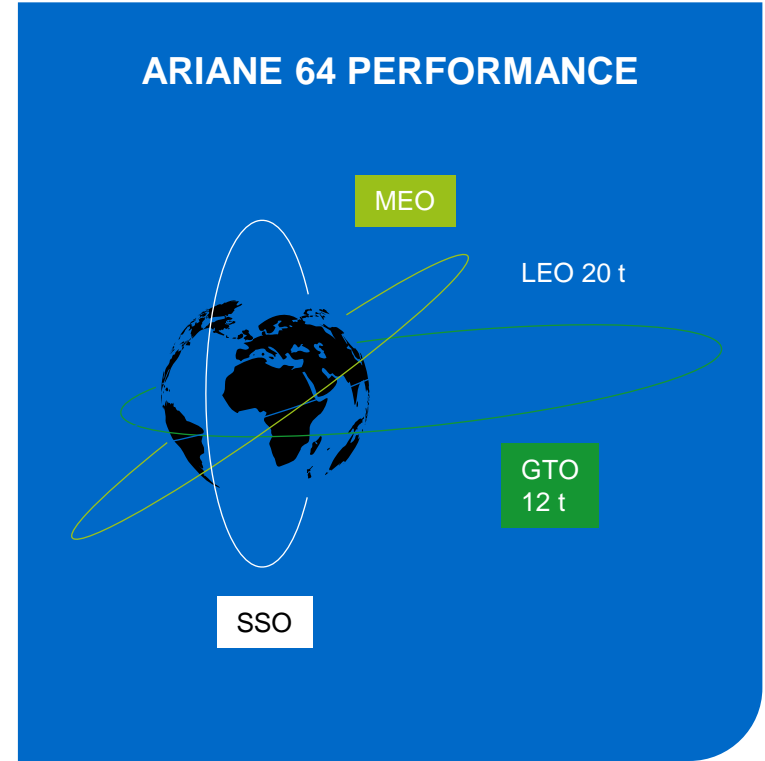
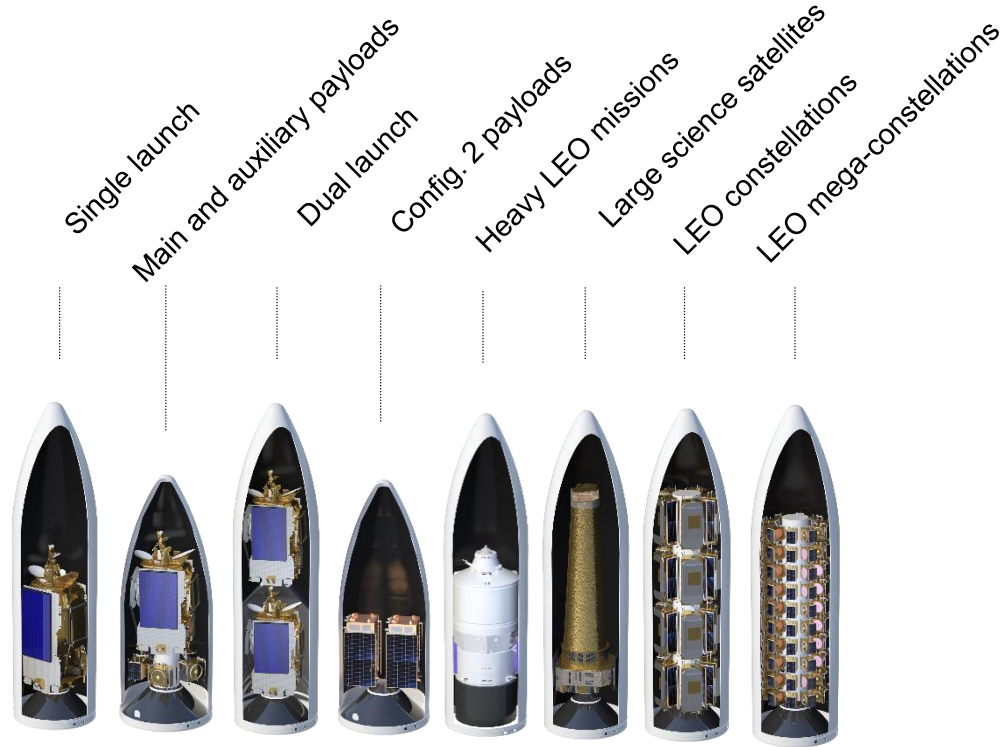
UNPRECEDENTED FLEXIBILITY, MODULARITY AND COMPETITIVENESS



* All references to tons (t) are metric tons throughout

ARIANE 6

ALL COMMERCIAL AND INSTITUTIONAL MISSIONS

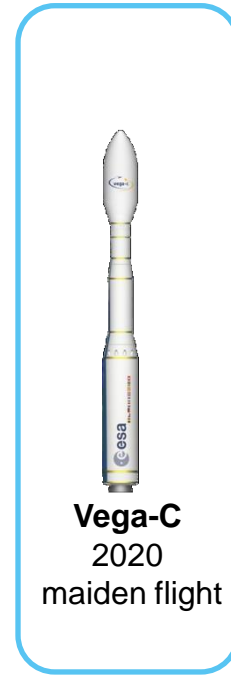
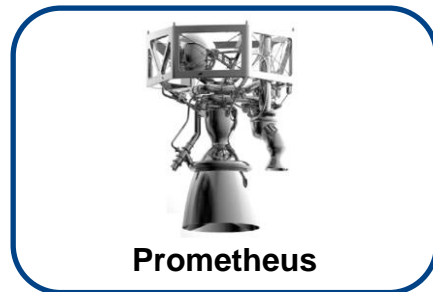


LAUNCHERS ARE THE FIRST KEY ENABLER FOR SPACE LOGISTICS

A competitive and continuously improving launcher family is the first key building block

vs

Development of alternative launch vehicles targeting the same timeframe



MISSION VERSATILITY IS KEY COMPETITIVE ADVANTAGE



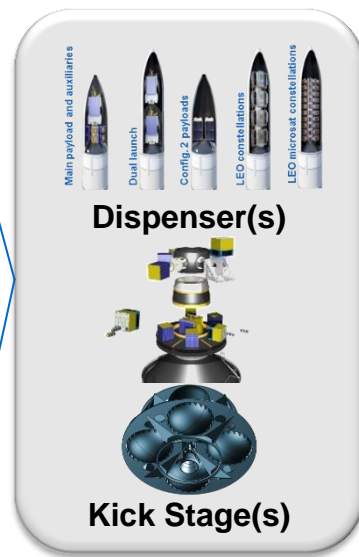
A family of innovative dispensers and future AG kickstage to answer several market needs and improve Ariane 6 market capture

Multi-payload for GTO and GEO

- Dual launch towards GTO
- Transportation of stack of small sats to GEO

MLS Rideshare

- A regular piggyback Launch Service for light Satellites
- Offering affordable tickets to any Orbit, to all segments of the light Satellites market
- From the spare capacity of the Launcher, after the primary passenger mission



M/LEO constellation dispatching

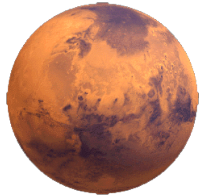
- Deploying (big) constellations
- Replenishing in multiple planes
- Galileo 1st and 2nd generation

Enabling complex and long duration missions

- Exploration (lunar and cargo)
- Large Science missions

LUNAR EXPLORATION

Global interest converging towards the Moon



2008-2017 -> 6 Mars missions

2018-2027 -> 10 Mars missions



2008-2017 -> 8 Lunar missions

2018-2027 -> 50 Lunar missions

Lunar Surface End-to-End Services (ISRU)

End-to-end lunar surface payload delivery and operations service



Ariane 6 + Lander + ~300kg payload transportation to the Moon starting in 2021

A flagship missions for Europe, by Europe, for strategic lunar Exploration capabilities




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Total Government Investment

2013-2017
\$67B


2018-2022
\$81B

2023-2027
\$93B

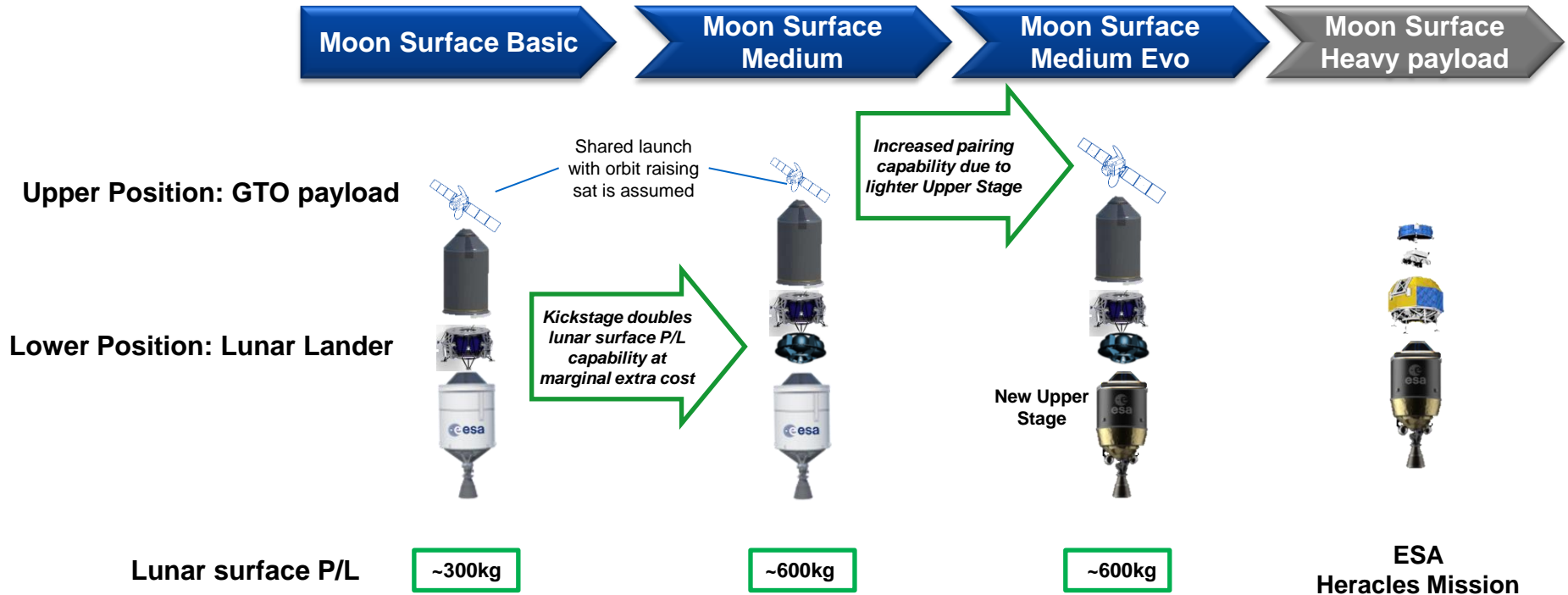
2017 \$15B (74% from US )

53%	25%	10%	9%	3%
transportation	orbital infrastructure	Mars exploration	other deep space exploration	Moon exploration

44%	26%	14%	9%	7%
transportation	orbital infrastructure	Moon exploration	other deep space exploration	Mars exploration

2027 \$20B (64% from US )

LUNAR PAYLOAD DELIVERY SERVICE (ESA HRE STUDY) ROADMAP BENEFITTING OF PLANNED ARIANE 6 IMPROVEMENTS



EUROPEAN INDEPENDENT ACCESS TO THE LUNAR SURFACE

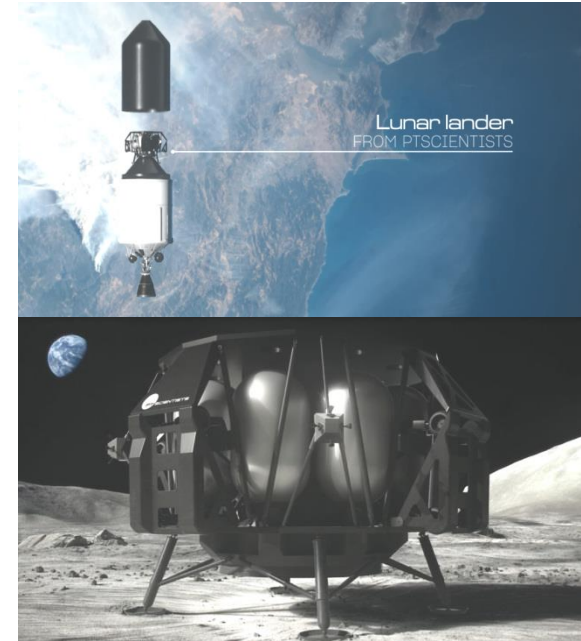
Strategic European positioning on lunar exploration for future cooperation

100% European 'New Space' approach through innovative partnering between ArianeGroup and PTScientists leveraging on private investments

Short term, affordable and feasible sovereign access to lunar surface guaranteeing European interests in future moon village

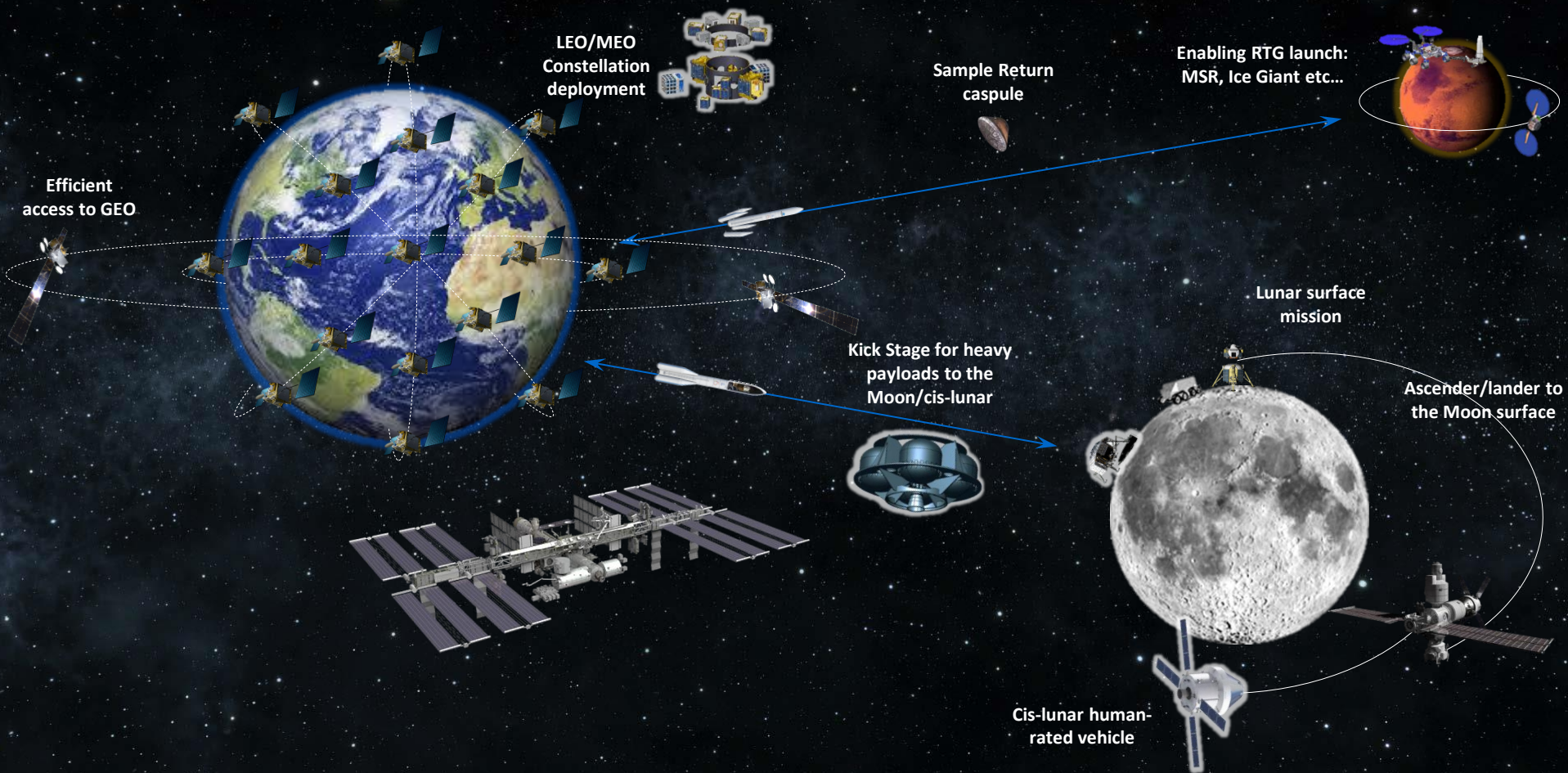
Proving A64 versatility using mixed mission dual launch with Arianespace

Roadmap towards increased lunar surface capability taking benefit of planned improvements of Ariane 6



A mission for Europe, by Europe, for strategic lunar Exploration capabilities

TOWARDS A SPACE LOGISTICS COMPANY



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