



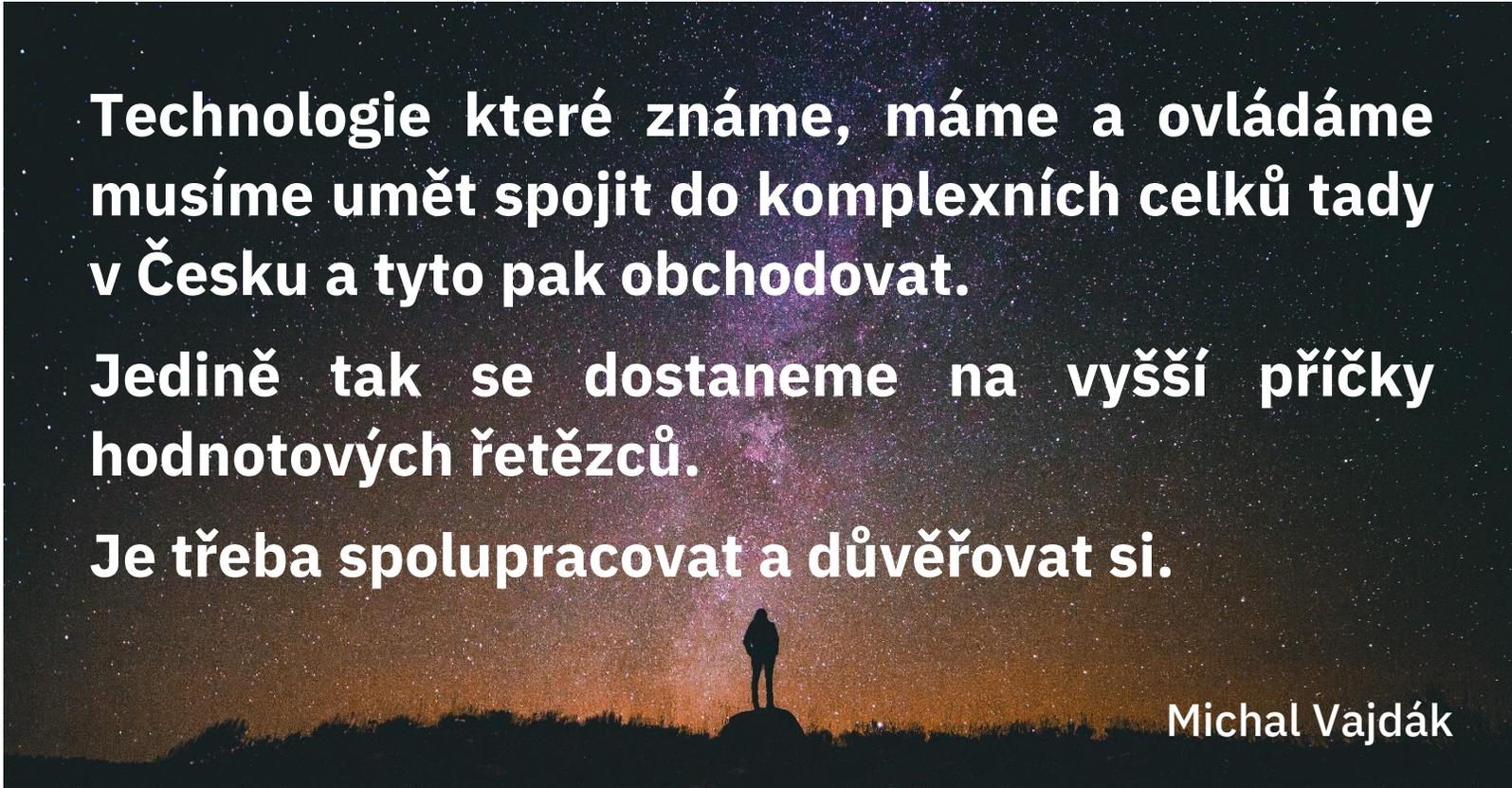
SPACE IN SPACE



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16.5.2019

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Technologie které známe, máme a ovládáme musíme umět spojit do komplexních celků tady v Česku a tyto pak obchodovat.

Jedině tak se dostaneme na vyšší příčky hodnotových řetězců.

Je třeba spolupracovat a důvěřovat si.

Michal Vajdák

*Mezi občany nesmějí platit jiné privileje, diplomy a erby, než které spočívají v zásluhách, práci a rozumu.
(krédo bratří Grégrů na pamětní desce při vstupu do pražského Žofína)*

AREA IN SPACE OPPORTUNITY

Space Business

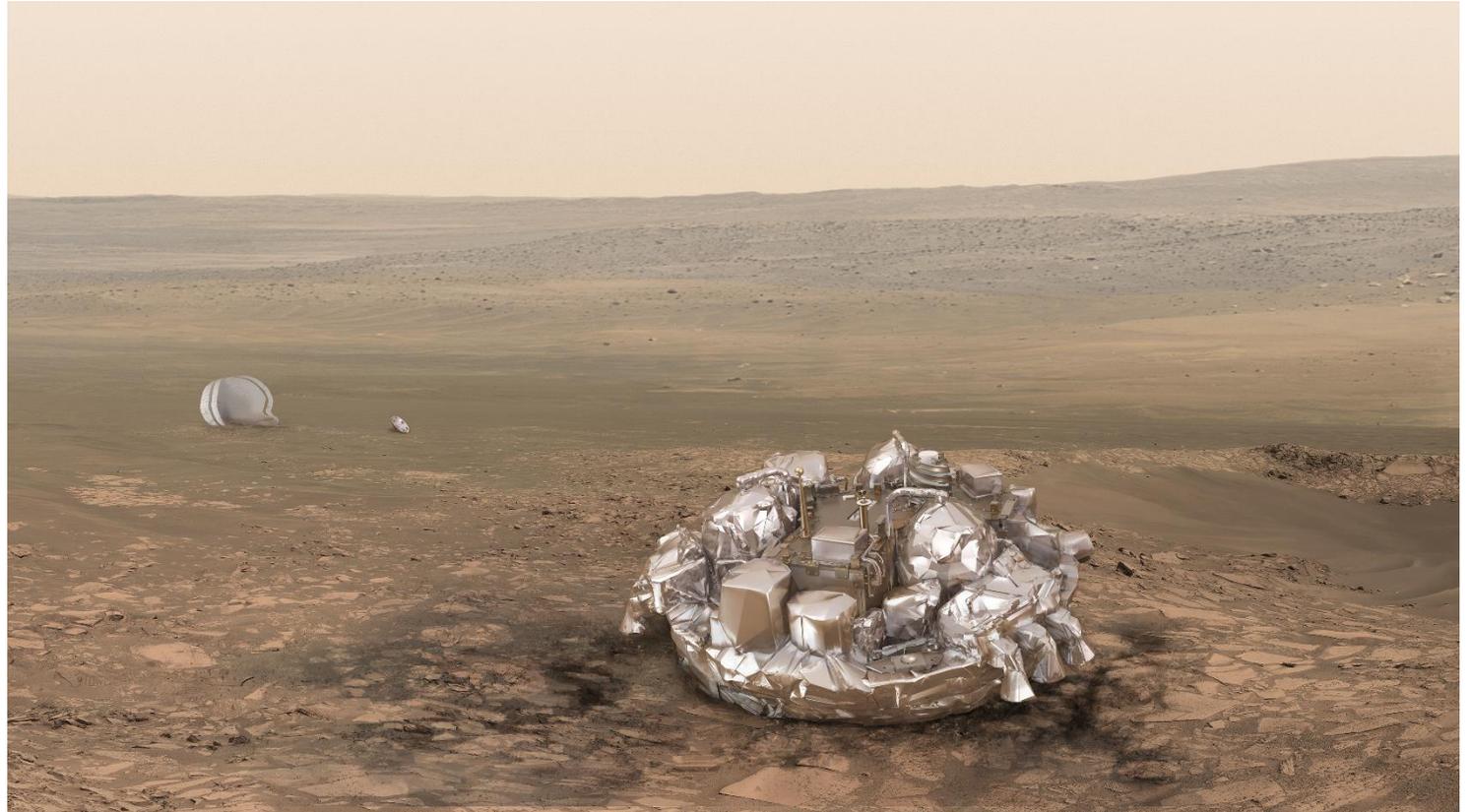
- Higher levels of value chains opportunity
- Space - the technology development driver
- No boundaries in expansion
- Space - the unique integrator of human activities
 - Research activities to explore NEW
 - Development of new technologies
 - Commercialization of new technologies
 - A new age of autonomous systems and businesses
 - UP and DOWN stream of technology transfer



WHY IS IT STILL HERE ?

Business Specifics

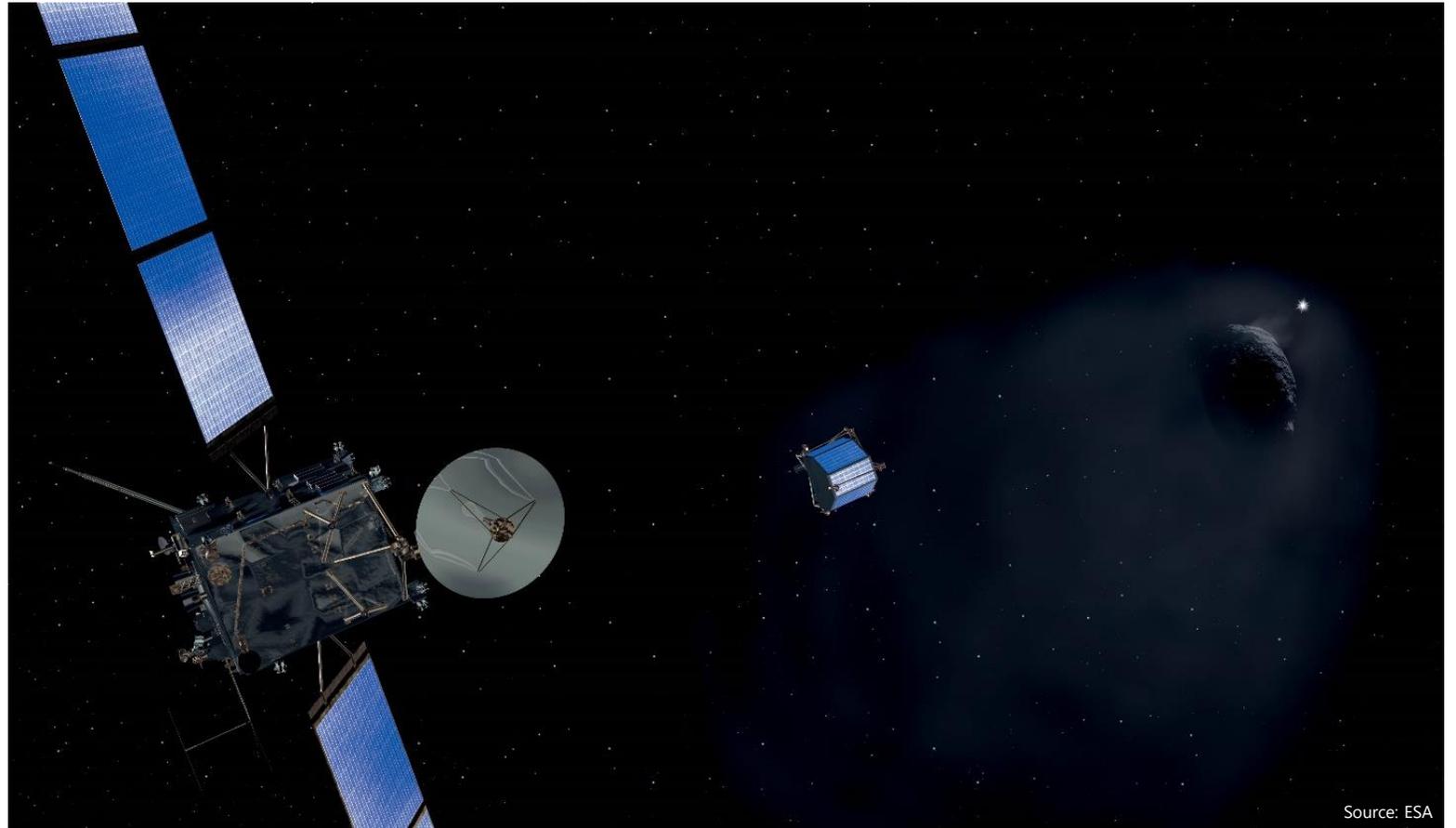
- Low volume production
- National interests and limitations
- New technologies maturation needs
- Significant SME support
- Need for autonomous systems



WHAT IS IN PROGRESS = ALREADY GONE

Space Areas

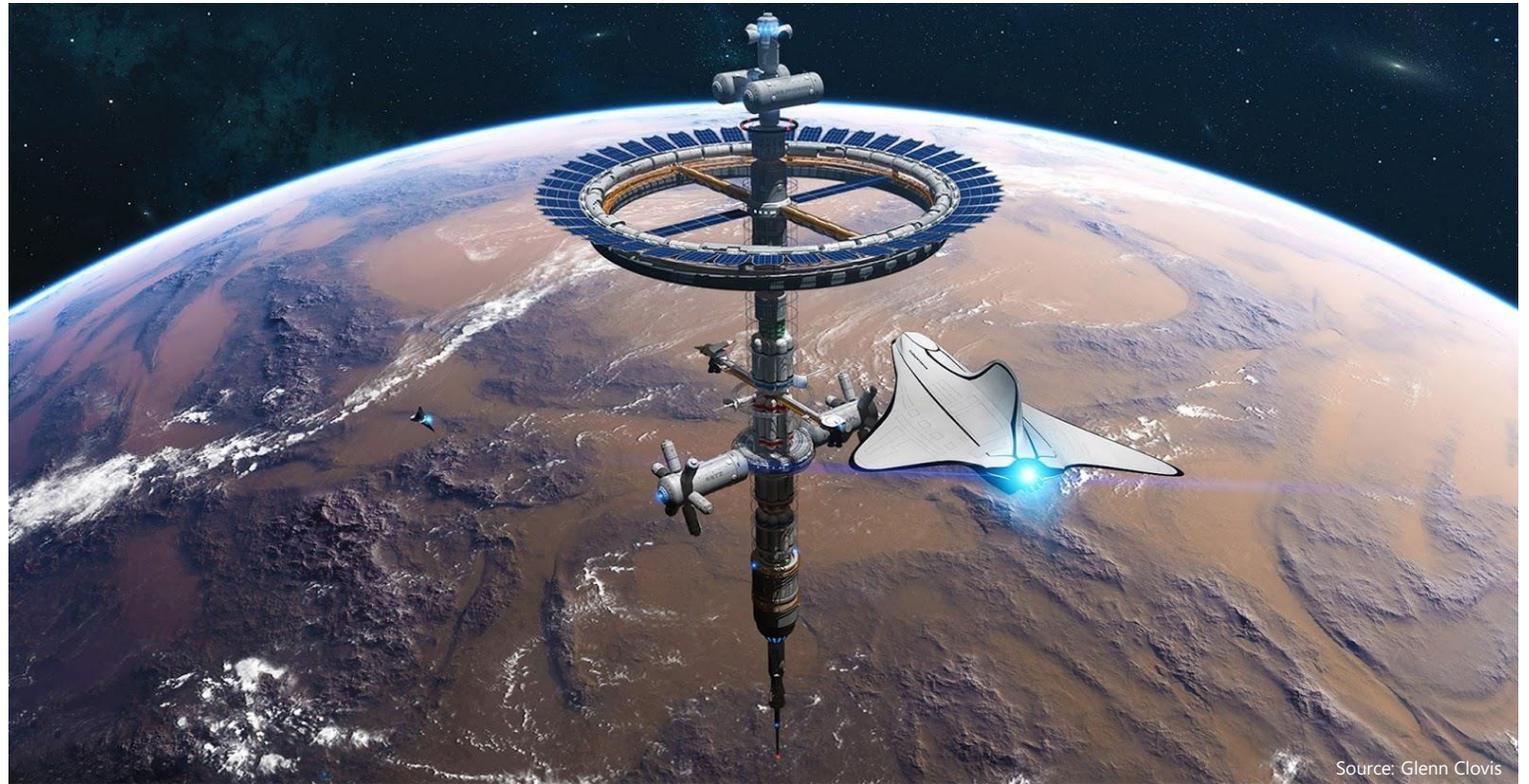
- Low Earth orbit satellites
- Defense on orbit
- Stratospheric applications
- Mission spacecraft
- Launchers under development (VEGA-C/E, Ariane 6/7)



WHAT IS THE FUTURE ?

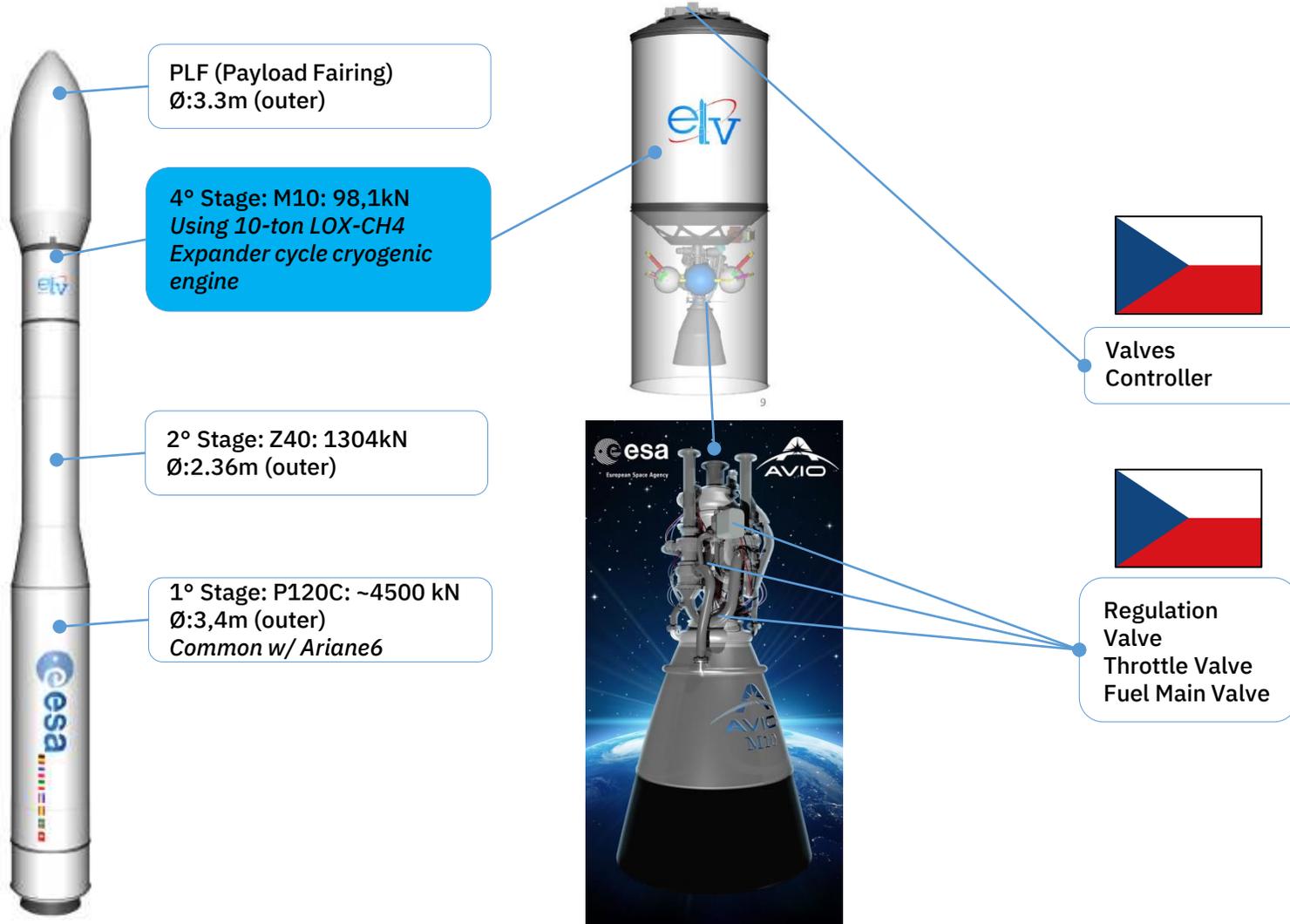
Future Space Areas

- New launcher technologies
- Human flight technologies as space safety and security, transportation of humans and cargo or sub-orbital spaceflights
- Spacecraft technologies to be used for a variety of purposes, including deep space missions (e.g. Moon and Mars missions and planetary explorations), asteroid mining etc.



VEGA-E

REGULATION VALVES DEVELOPMENT



VEGA-E

Avio's M10 liquid oxygen-methane engine

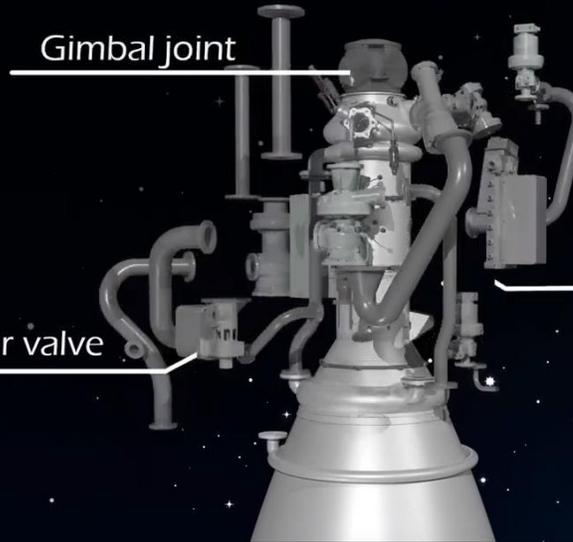
https://www.youtube.com/watch?v=A_GgRdgrBaE



Vega upper stage M10 engine

Expander cycle
LOX-methane engine

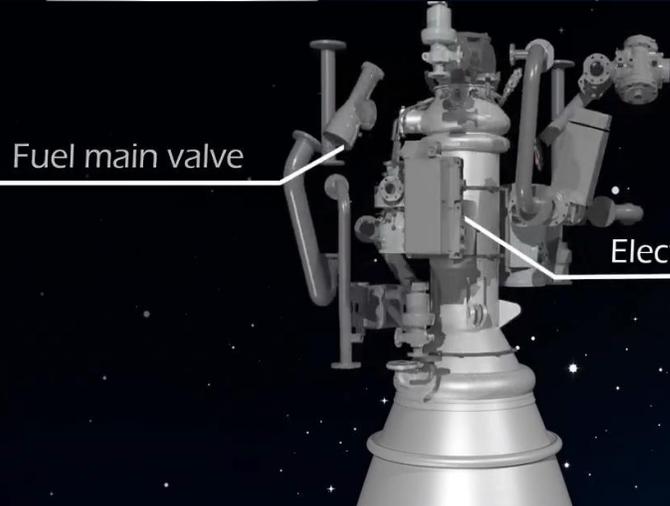
98kN thrust
364s specific Impulse
236kg weight



Regulator valve

Fuel turbopump
assembly

Oxygen discharge valve



Fuel main valve

Electro-valve package



Throttle valve

Methane discharge valve



E-PUMP

ELECTRIC PUMP DEVELOPMENT

Development of electrically driven pump for rocket propellants



E-PUMP TIMELINE

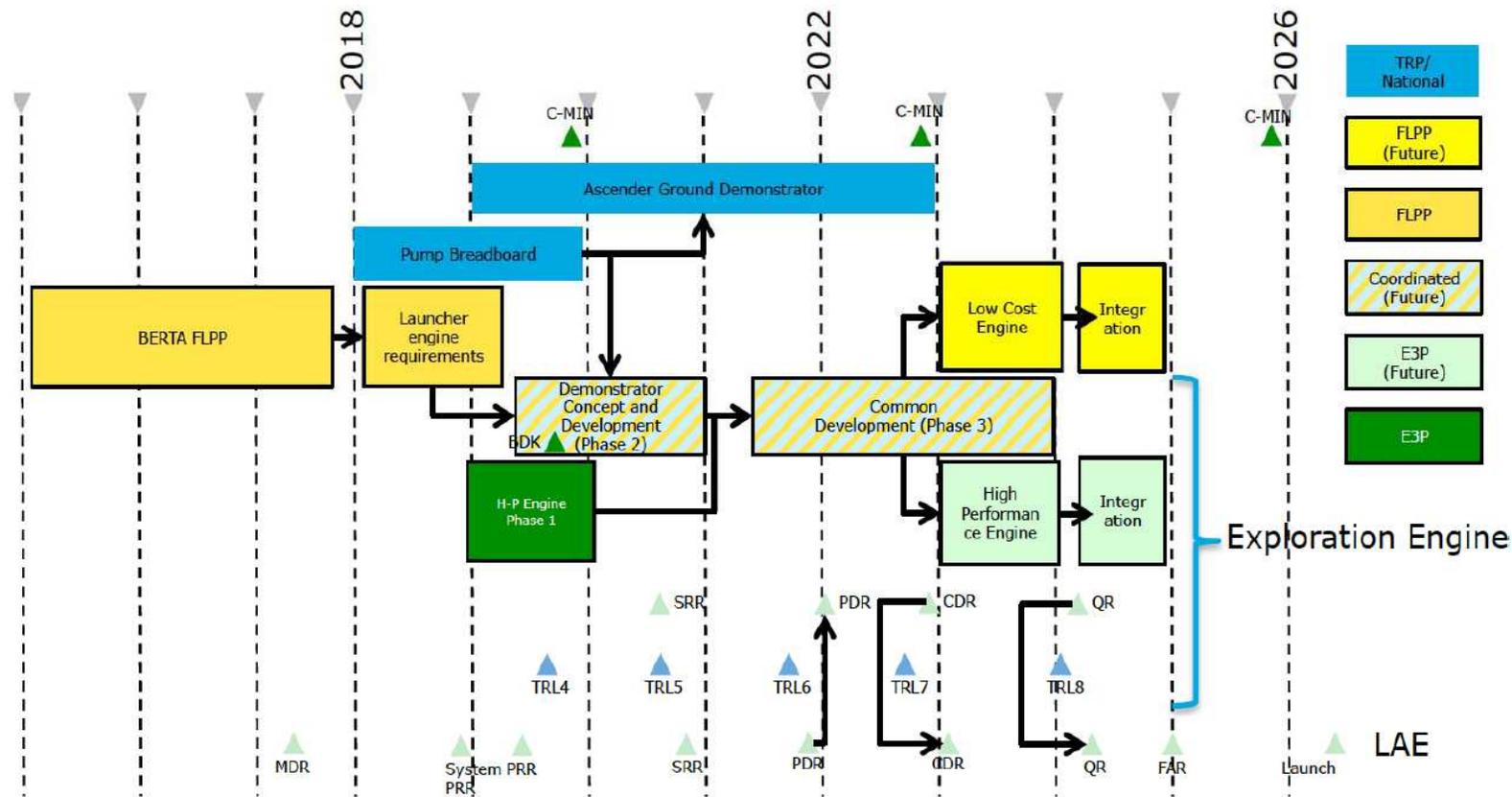
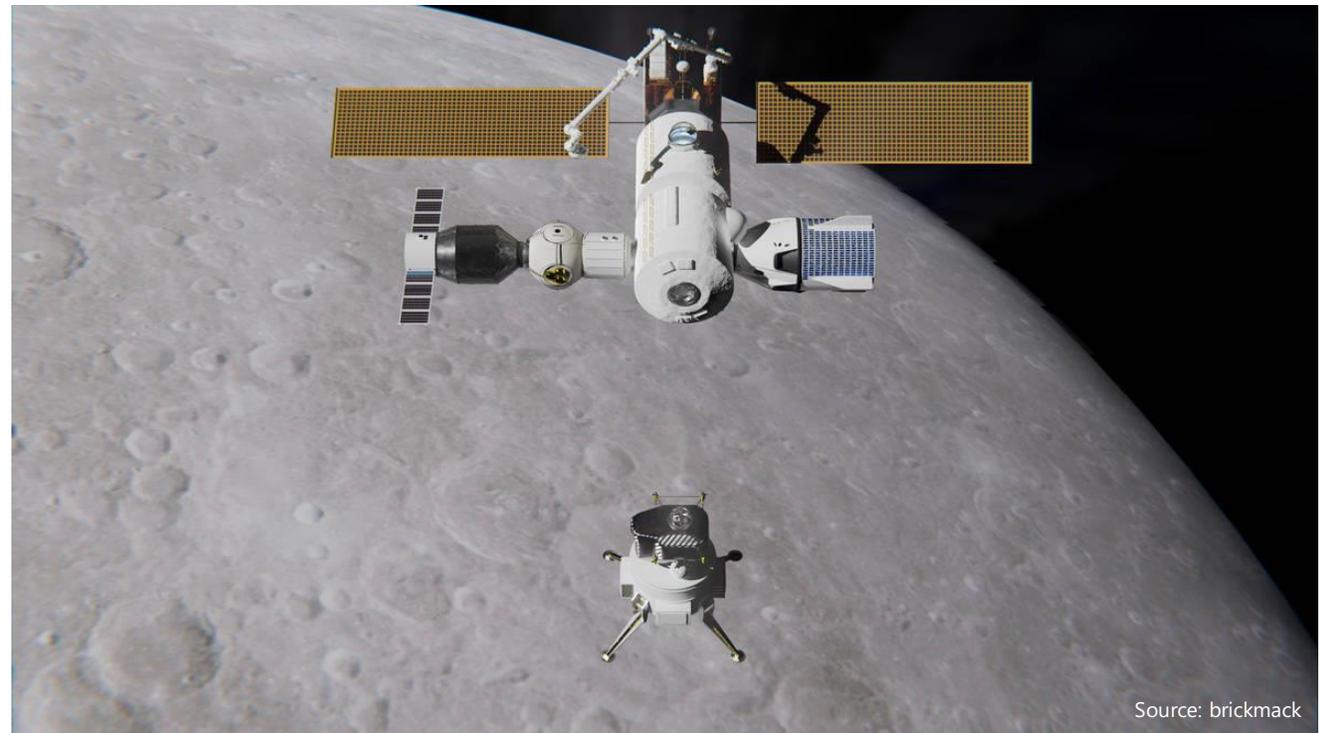


Figure 3²: Schedule for the High Performance Engine, based on a multi user approach for the engine (date: August 2018)

HOW TO MANAGE IT ?

Space opportunity

- Know-how and used technologies merge into more complex systems in the Czech Republic and market them
- Support it cooperatively with national deputies in ESA
- Support it cooperatively on the national development level
- Support it cooperatively on the research level
- Support it by cooperation increase (WIN-WIN)



VISION

Development of a Universal Small Lander Spacecraft Platform. Such major endeavor enables Czech industry and academia to provide a complex technical solution for a scientific, asteroid mining, space exploration (and exploitation) and other spacecraft in a scalable, ready-to-use manner, which could be the next disrupting approach on how to develop especially lander spacecraft.

The resulting product or product line shall be a universal platform, on which landing, sample & return, asteroid mining and other spacecraft could be built.

Czech Republic industry and academia already possess building blocks necessary to implement such development and production. These are among others:

- Structures, mechanisms and Thermal control, thermal management
- Onboard systems and Avionics
- Power supplies and power management
- Propulsion
- Payload Instrumentation
- Ground SW, GSE

European partners could be invited as either potential primary end-users or to cooperate on the development of a specific subsystem.

Coordination with ESA and other institutional actors (e.g. LuxInnovation) is foreseen, as such kind of application is becoming more and more imminent (ESA Moon Initiative, HERACLES, **Phobos photoprint**, asteroid mining initiatives)



Source: ESA

Universal Small Lander Platform

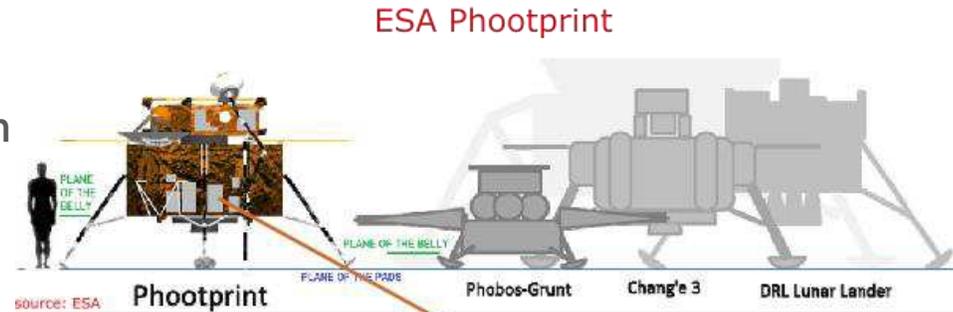
Czech National Initiative

Planetary exploration / exploitation

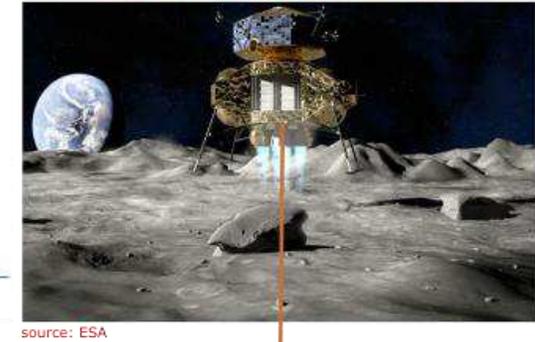
- Universal small lander platform
- SME leadership
- Worldwide services

This will create an unique Czech built complex system, that can be marketed and implemented in broad range of emerging applications e.g.:

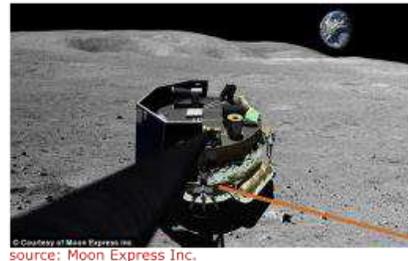
1. Sample and return
2. Planetary landing
3. Moon Initiatives
4. Asteroid mining



ESA/JAXA/CSA Heracles



Asteroid mining



Czech National Initiative

Universal small lander platform

Onboard Avionics	
Propulsion	
Structure and Mechanisms	Engine thrust 6-12 kN
Thermal Management	Platform mass 750 - 1500 kg
Power Management	
Instrumentation	



**MUSÍME CHTÍT BÝT NA VRCHOLU
HODNOTOVÉHO ŘETĚZCE, NEMÁME JINOU
ROZUMNOU CESTU**

**KDYŽ JSME SRAŽENI K ZEMI, JE NUTNÉ UMĚT
VSTÁT A JÍT ZASE DÁL**

Vzhůru !