

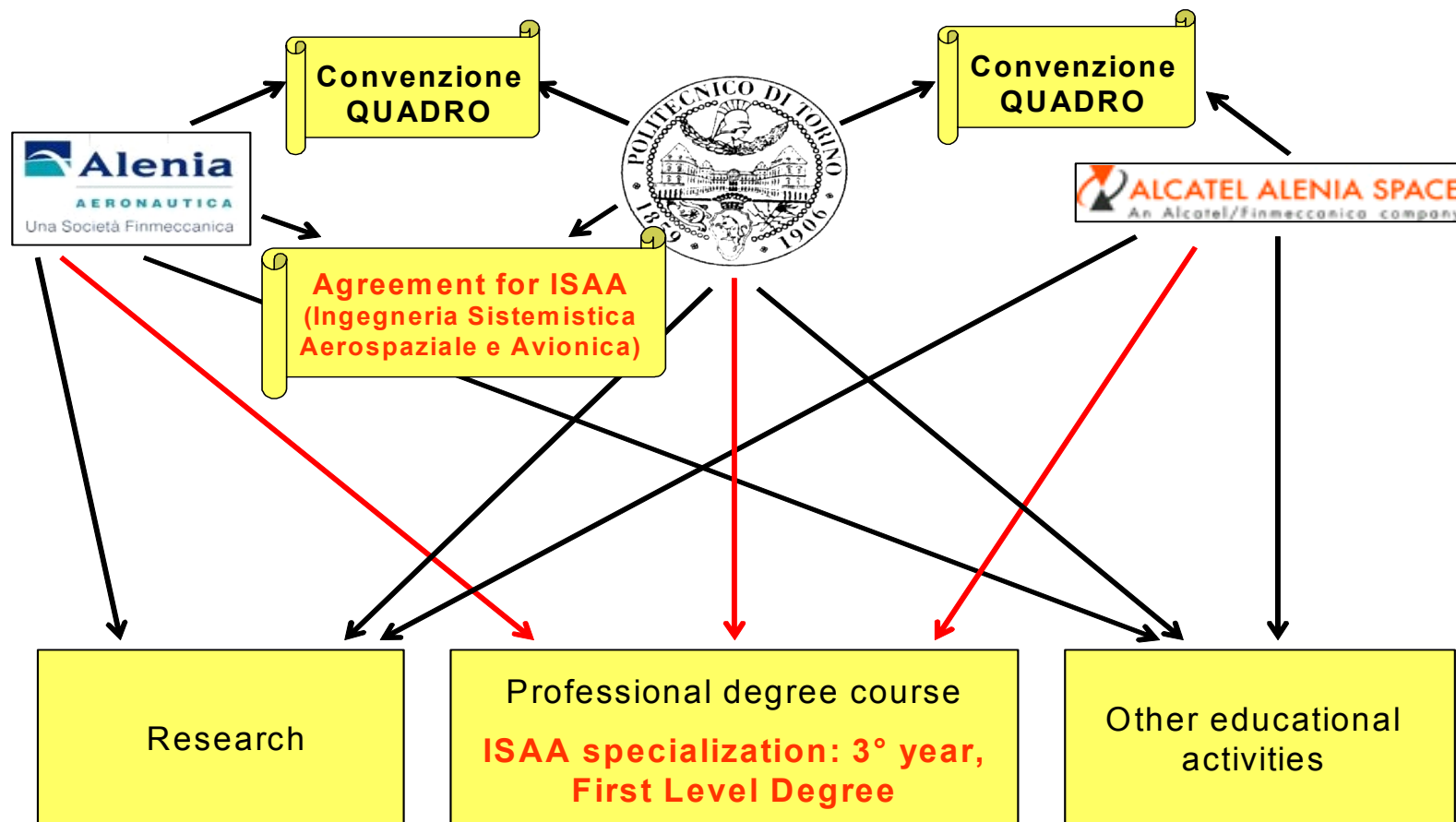
The Cooperation of Alcatel Alenia Space Italia and Politecnico di Torino on Space Exploration Scenarios

Authors

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Politecnico and Aerospace Industries



AAS-I (Turin Plant)

Space Infrastructures & Transportation Business Unit

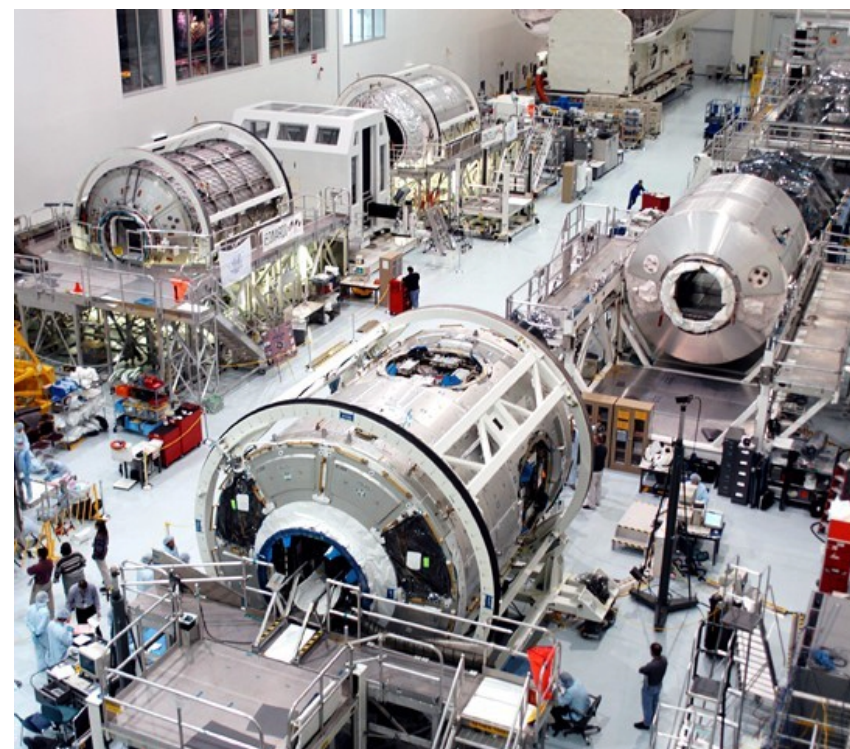
☐ **Very unique role in the frame of the space station**

- 50% of the pressurized volume
- an experience in this field since the 70's.

☐ **Prime contractor to ASI and ESA for:**

- Manned infrastructures
- Space transportation systems and space exploration
- Payloads and facilities for space station

☐ **Wide experience in space transportation and re-entry vehicles**



AAS - Major Current Programs

- **MPLM – Multipurpose Pressurized Logistics Module**
- Columbus laboratory
- Node 2 and 3 – **International Space Station**
- Cupola
- **ATV (Automated Transfer Vehicle)**
- **FLECS (inflatable technologies)**
- **EXPERT - a ballistic flight re-entry demonstrator**
- Delta II second stage tank



CUPOLA Under Pressure



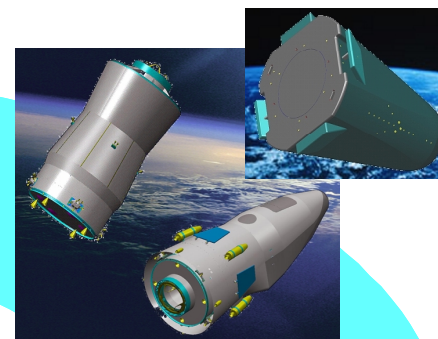
Columbus Integration Facilities

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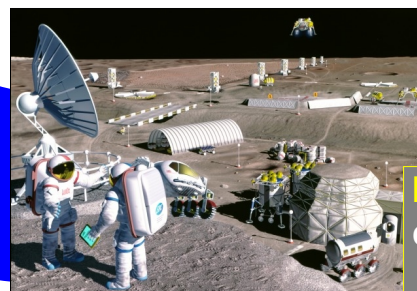
AAS-I Evolving Lines



ISS completion and full capability exploitation and preparation for human exploration



Crew and Cargo Transportation & Re-entry Systems



Robotics and human exploration of Moon, Mars and beyond

The lines are synergetic each other and must be pursued as a whole

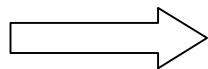
■ Politecnico di Torino develops a cooperation with Alcatel Alenia Space - Italia at three main levels:

- ❑ Industrial contribution to education of students via teaching
- ❑ Research and development activities cooperation
- ❑ Common development of new didactic initiatives

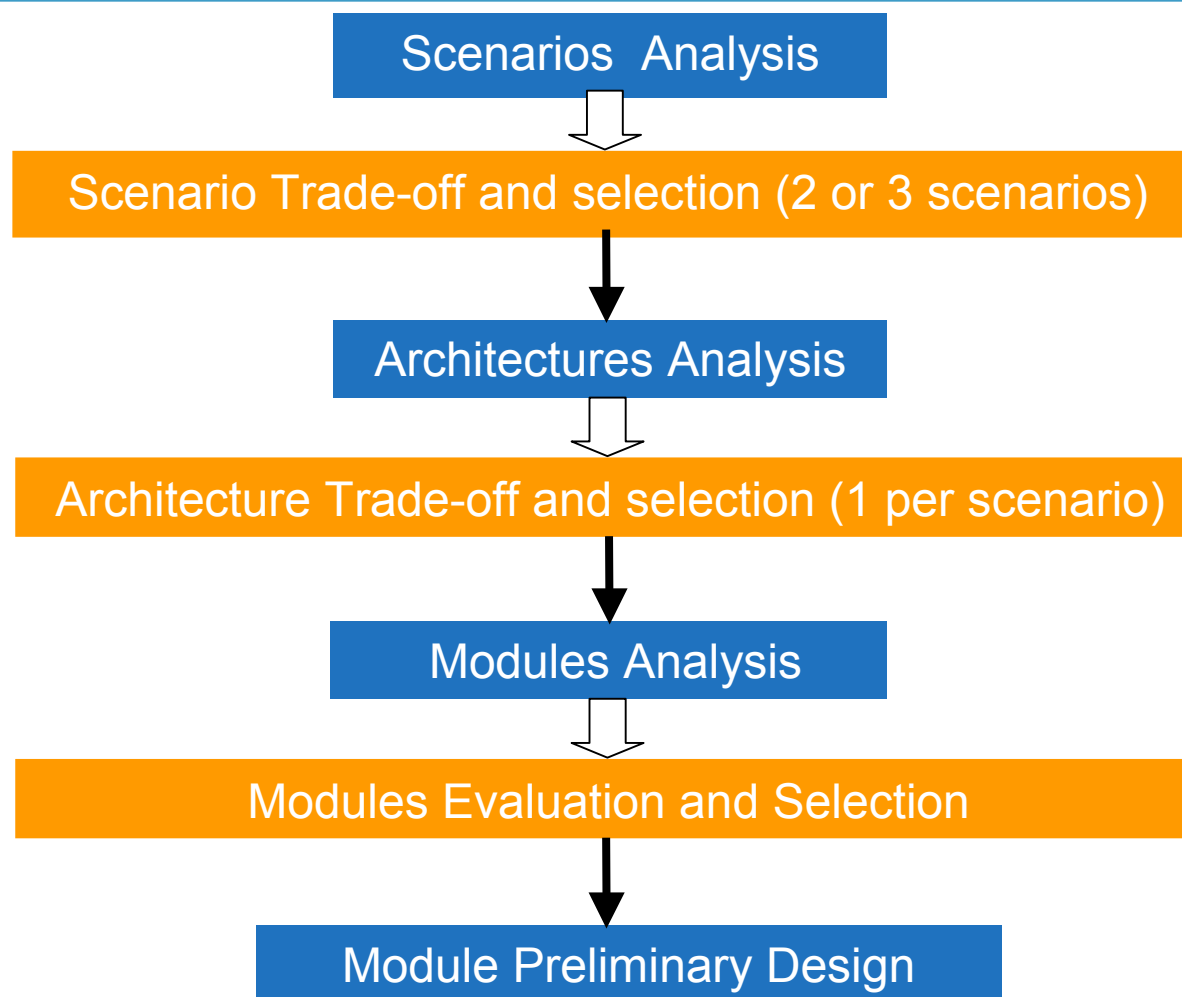
Example of “Common development of new didactic initiatives”

Thesis : Academic study / Industry program

- ☐ Thesis : Preliminary study and design of a future module, subsystem of the architecture for lunar exploration
- ☐ Industry project : The first phase of the Lunar Exploration study for ESA



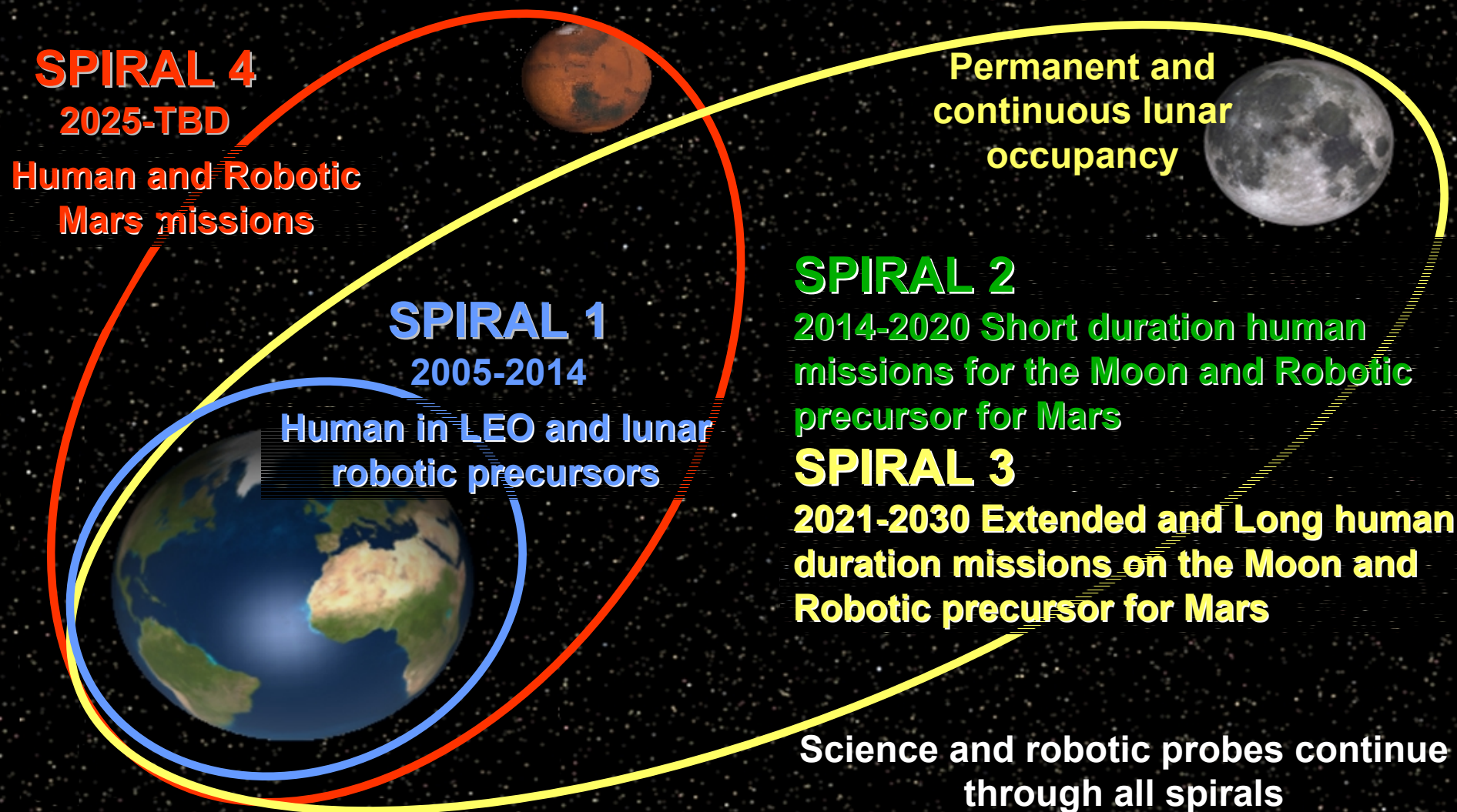
The thesis is performed in integrated way with the study



Scenario analysis :

- ☐ Criteria definition
- ☐ Scenario's study to extract characteristic parameters (objectives, technologies involved, benefices, risks, schedule, costs, ...)
- ☐ Trade/off between scenarios of the same type (scientific, commercial, pioneeristic)
- ☐ Selection

The Spirals Approach to Exploration

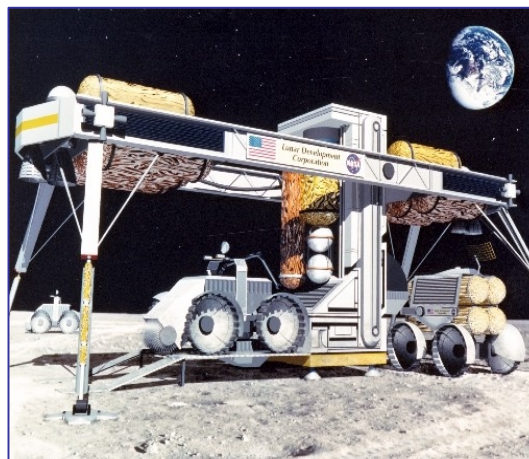


The Multi-step Approach to Exploration

Exploration Multi-step Approach



Precursor Robotic Missions

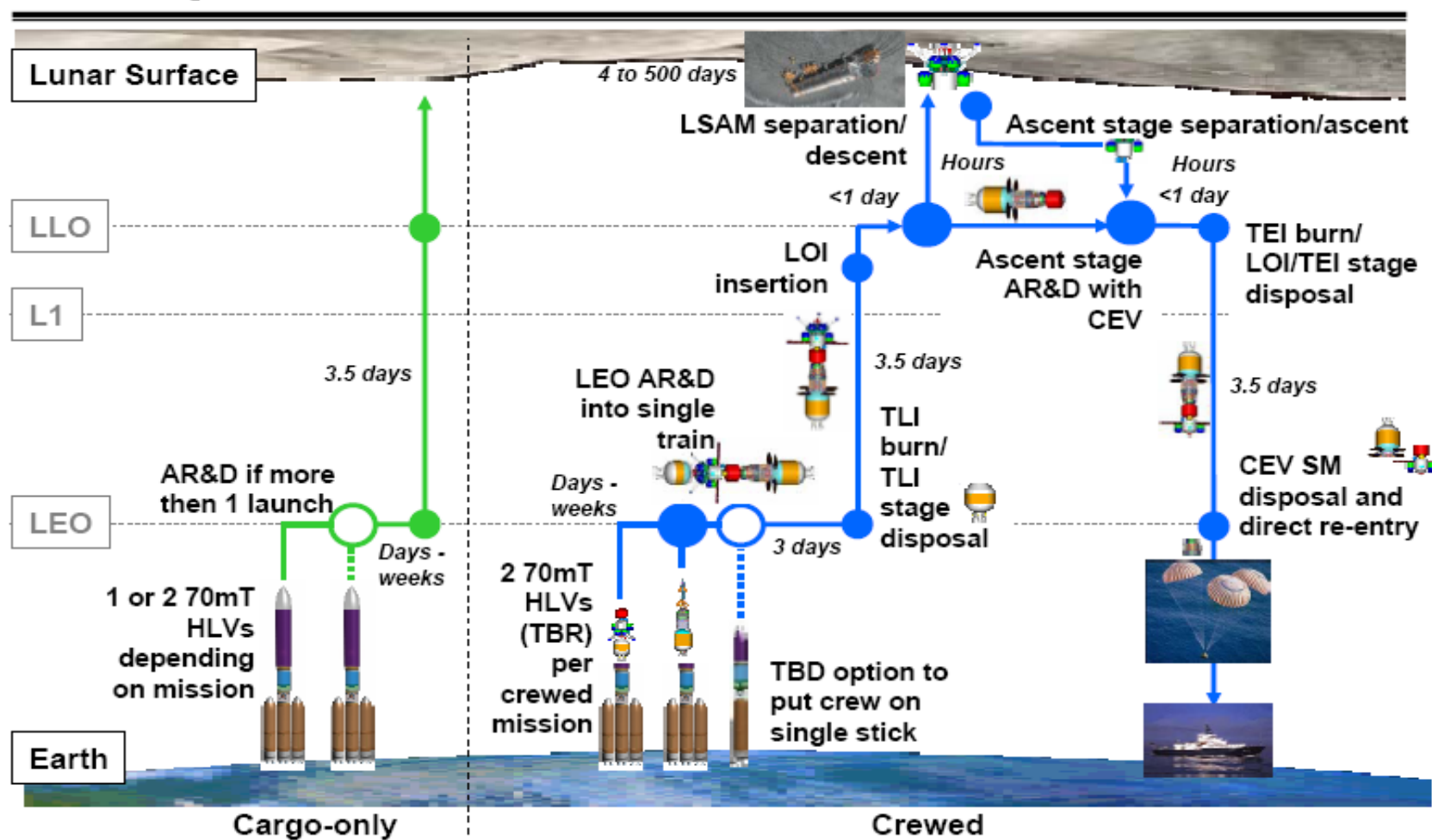


Outpost Development

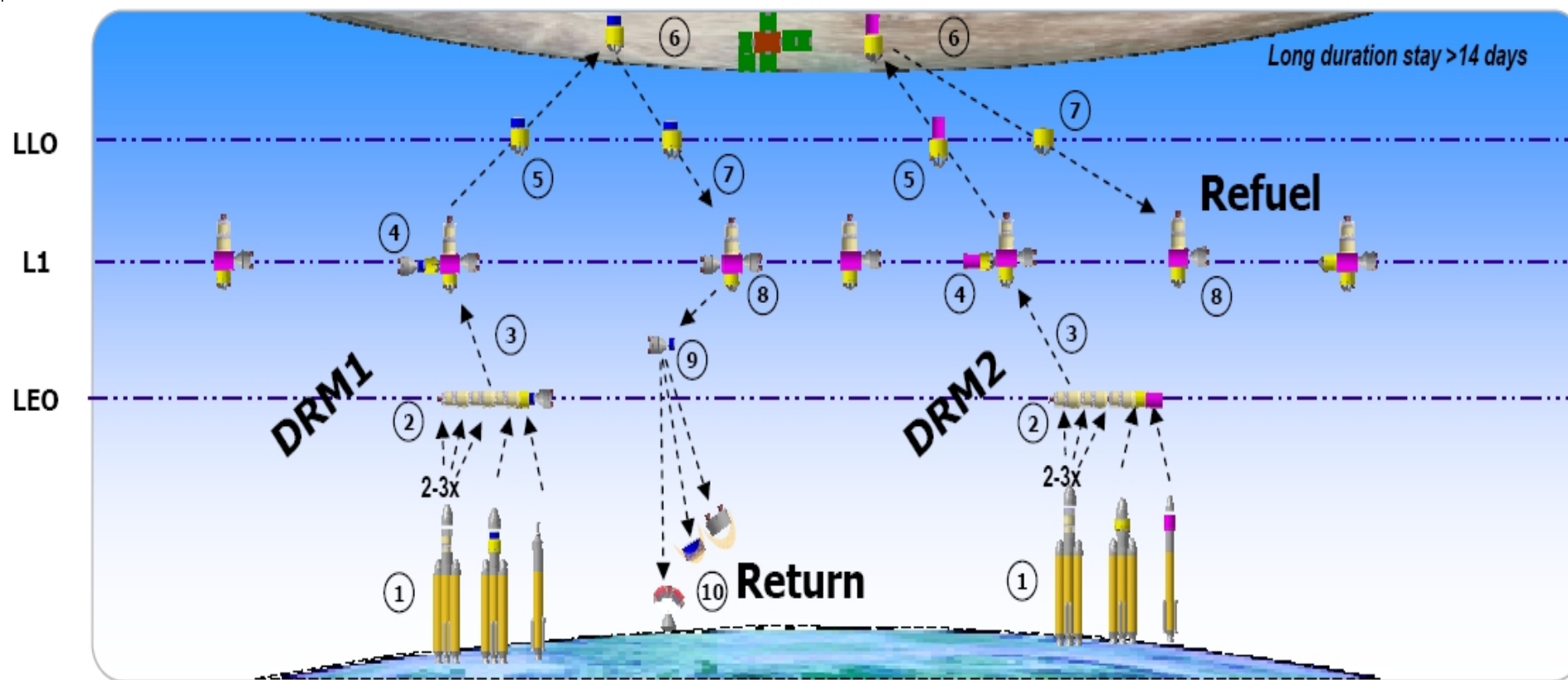


Crewed Missions

Lockheed Martin Reference Scenario



Boeing Reference Scenario

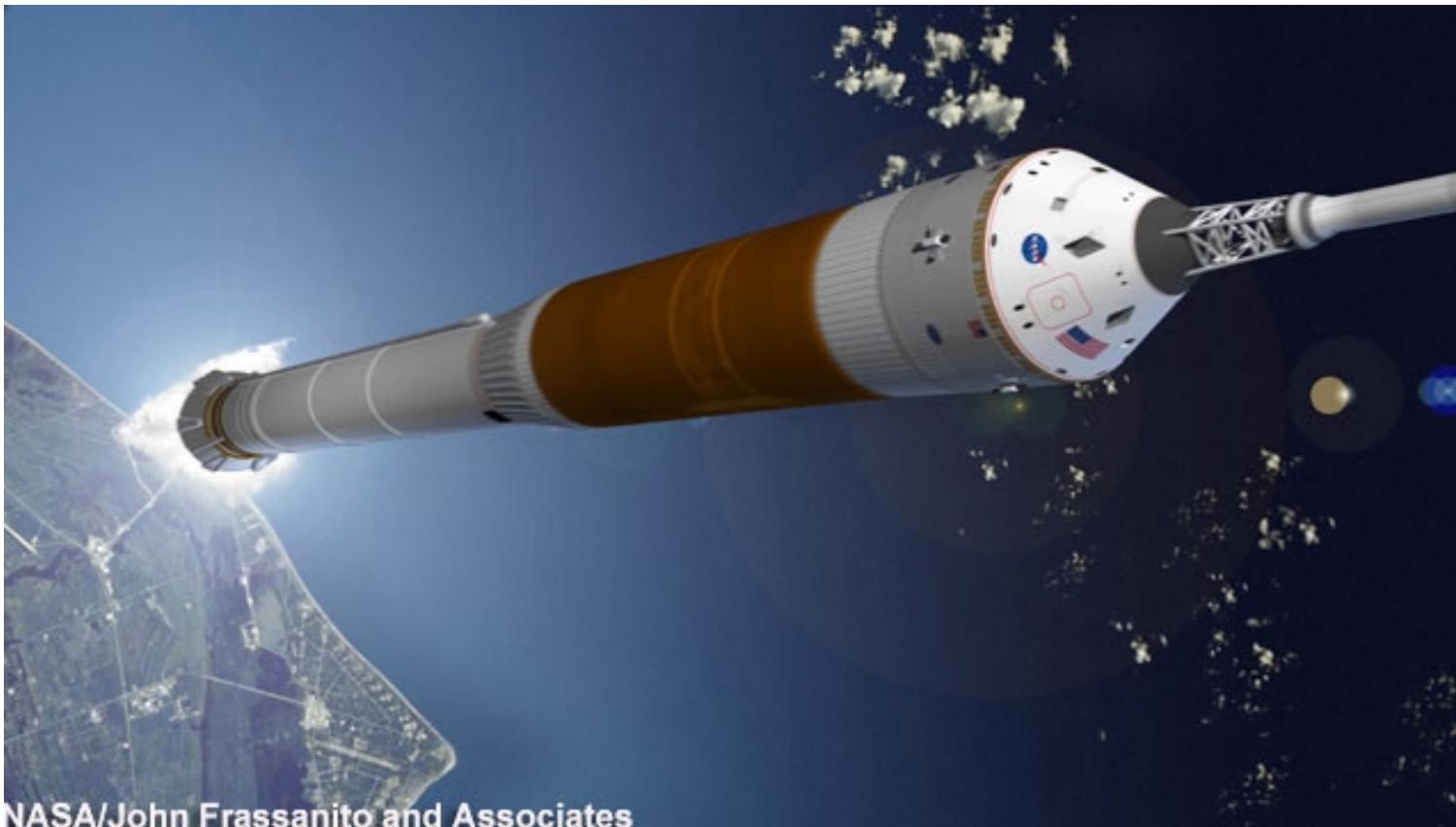


NASA Reference Scenario

NASA's new Reference Scenario for Space Exploration as
presented 22th September 2005

[animation film](#)

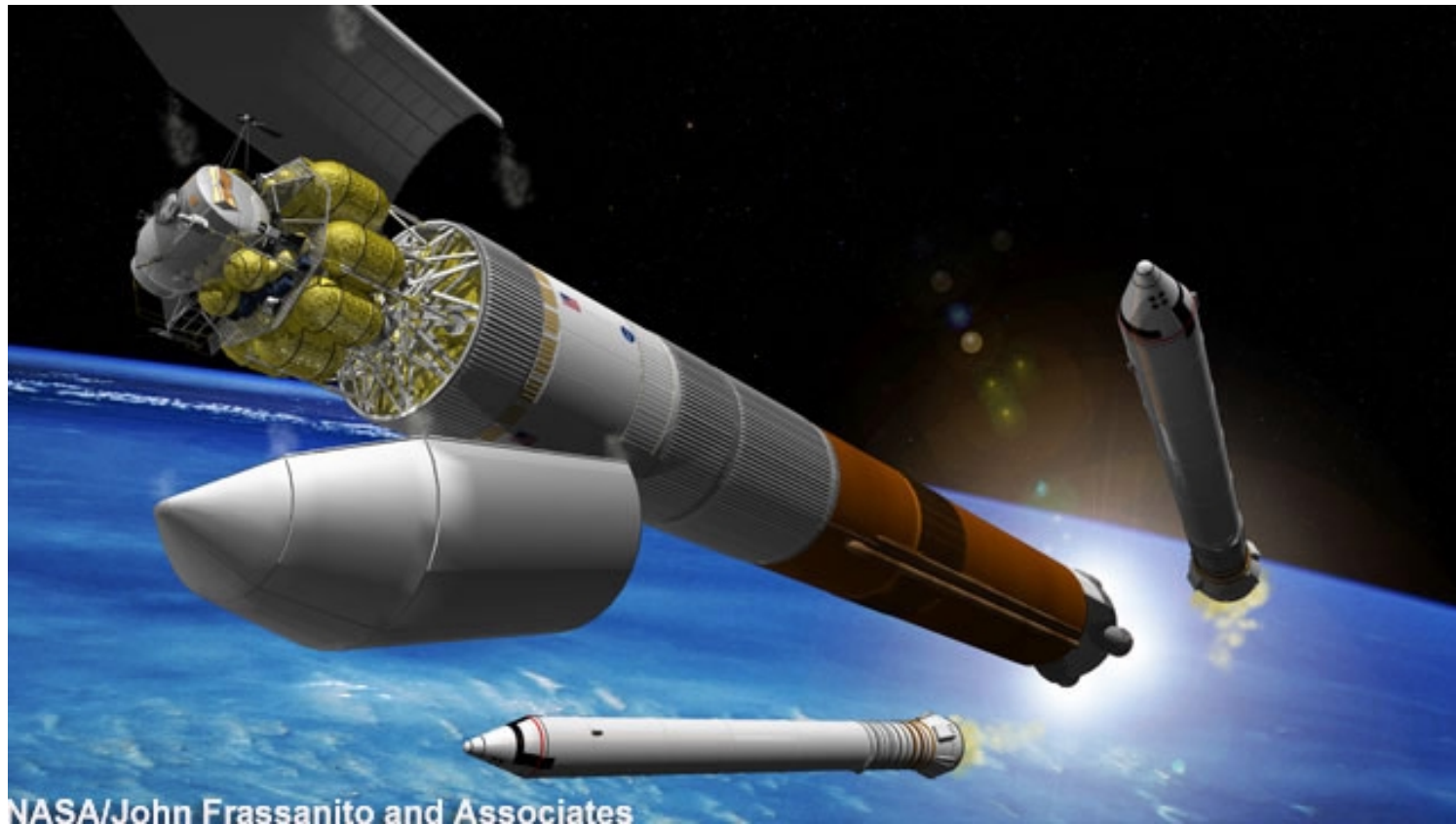
Example of Architectures (1)



NASA/John Frassanito and Associates

NASA's new spaceship to transport the crew of four

Example of Architectures (2)



A heavy-lift vehicle for carrying cargo

Example of Architectures

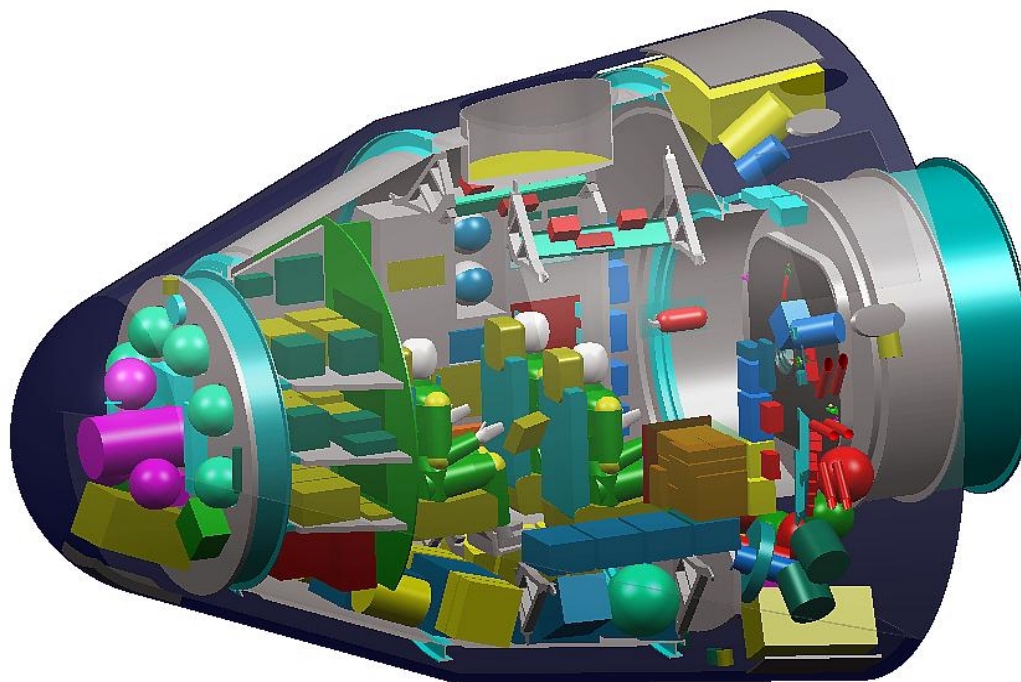
(3)



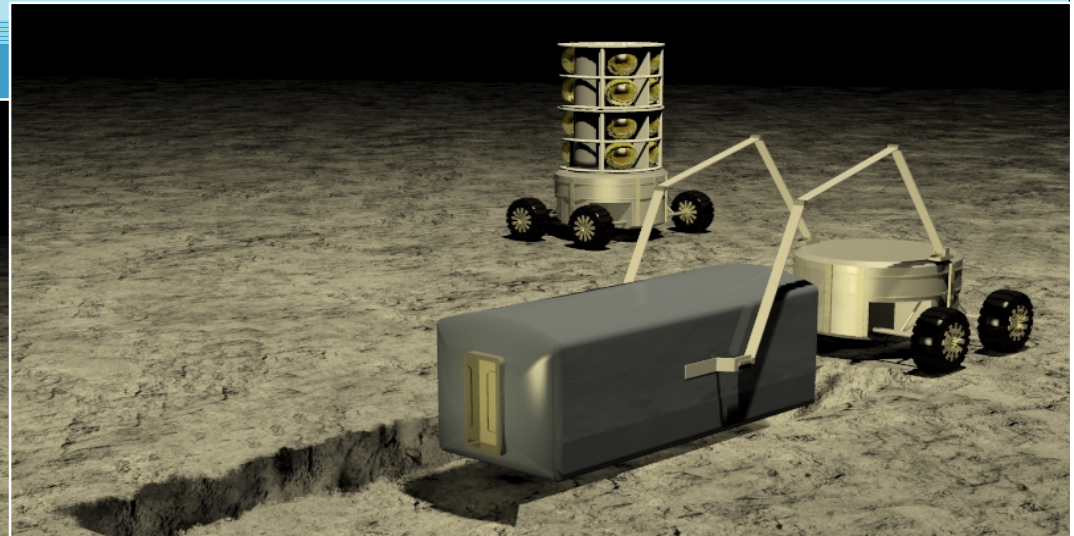
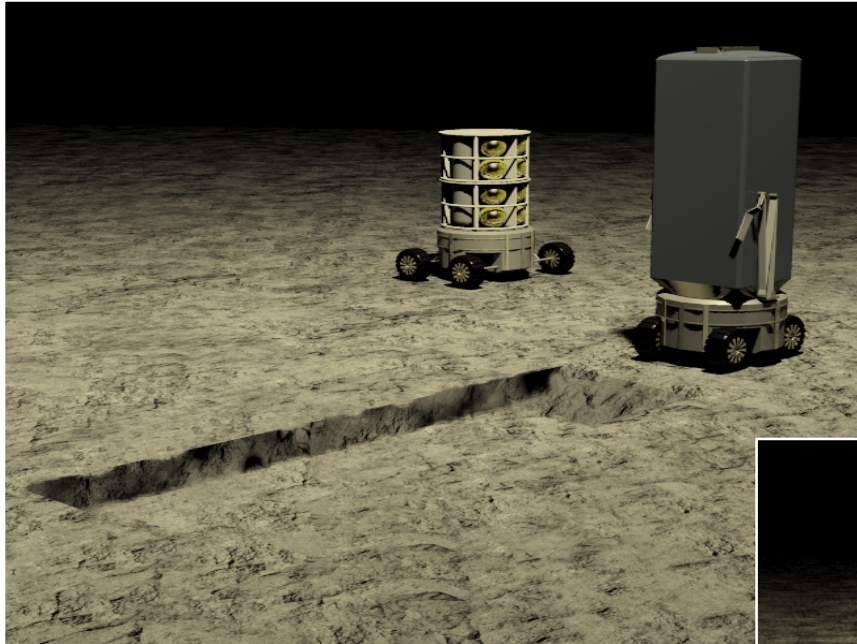
The new lunar lander with three of the four crew members and a lunar rover.

Example of Modules (1)

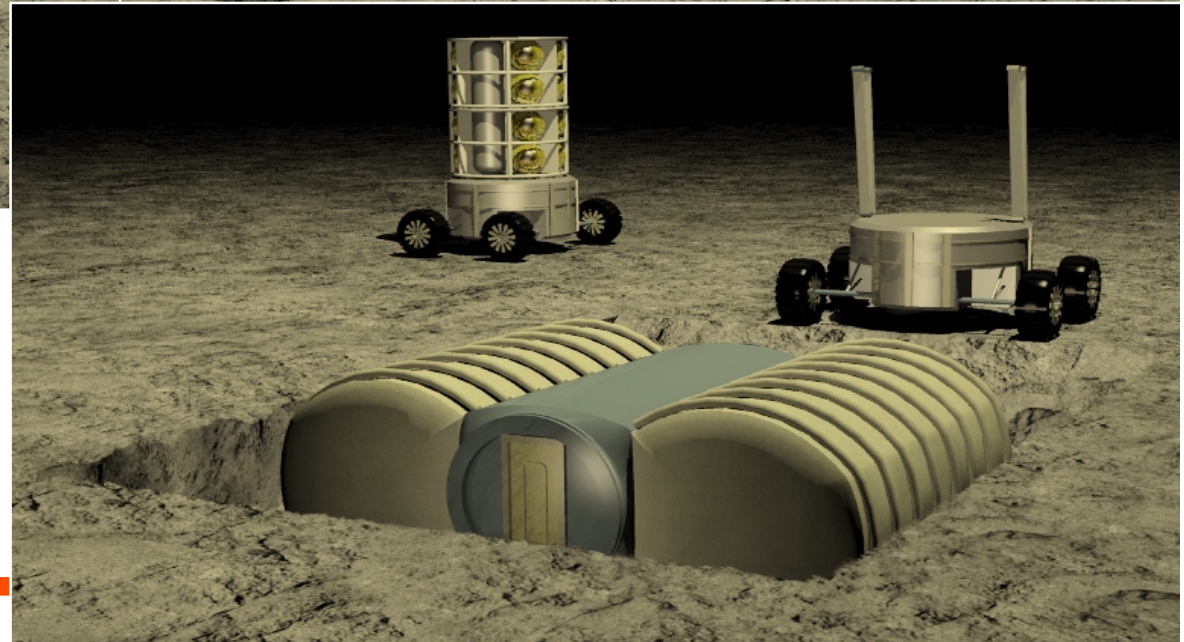
Transportation systems
(Option Blunt Biconic)



Example of Modules (2)



INFLATABLE HABITAT
Study for long
permanence on Moon
surface



Sept. 2002 - June 2004 : Supaero

- Ingeneering cursus 1st and second years

Sept. 2004 - July 2005 : Politecnico di Torino

- Specialist Degree 2nd year
- Double degree agreement
- Pegasus / Erasmus agreement

Sept. 2005 - April 2006 : Thesis Alcatel Alenia Space / Politecnico di Torino

- Full time work in the Lunar Exploration team (AAS - Turin premisses)
- Regular relationship with my tutor of the Politecnico di Torino