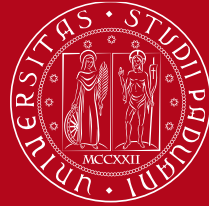


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# Science and Technology for Space Exploration

Simone Fortuna - 38th Cycle

Supervisor: Prof./Dr. Marco Pertile

Meeting - 09/11/2022

## Lunar Space Exploration Scenario

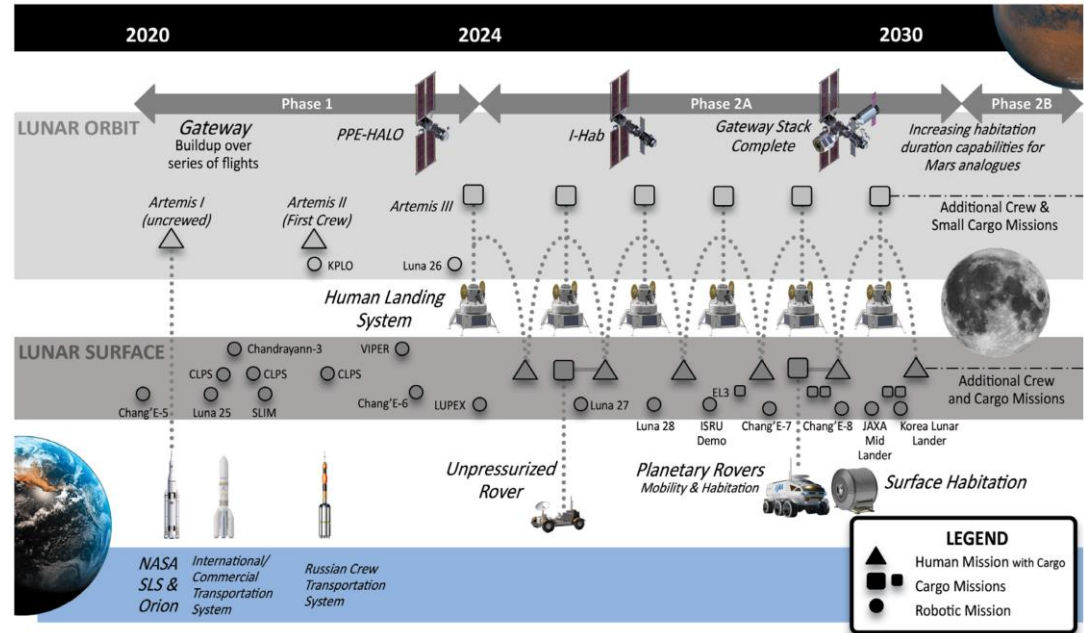
### Global Exploration Roadmap



### LUNAR PROGRAM

#### Phases of the exploration

- 1 - “Boots on the Moon”
- 2 - “Expanding and Building
- 3 - “Sustained Lunar Opportunities”



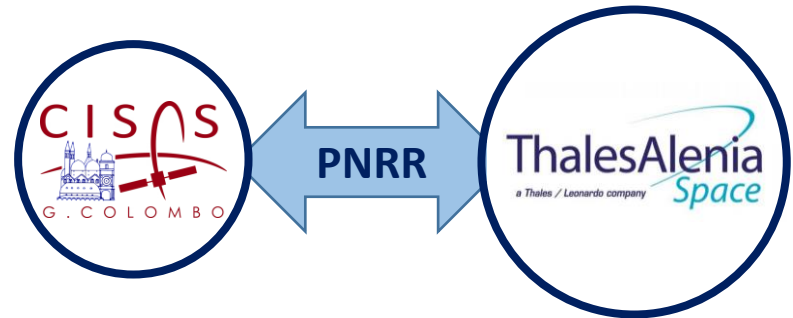
## Thales Alenia Space project: *Creation of a Moon Universal Locomotion System*



- Autonomous rovers for prospecting missions or extraction/use of resources in situ;
- Vehicles/cargo to support ground infrastructure;
- Pressurized and habitable vehicles to support astronauts

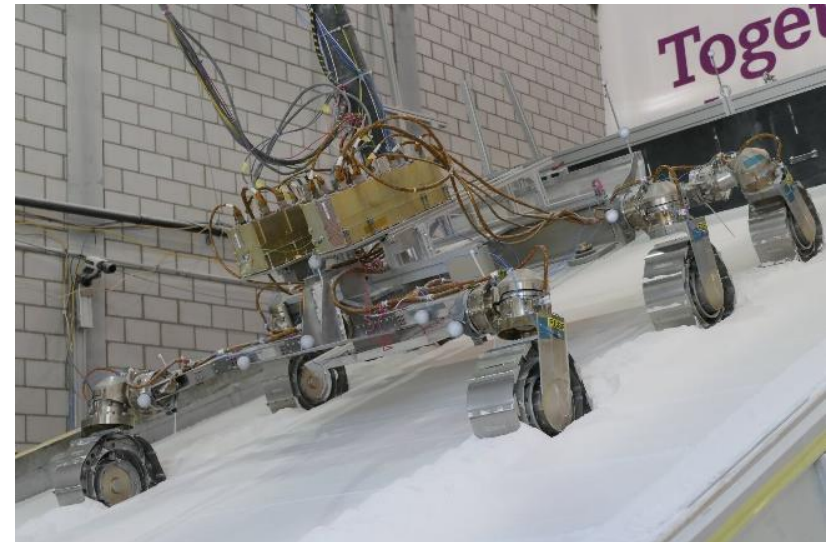
## Design and prototyping of the Guidance Navigation and Control system for a lunar rover

- I. Design and HW implementation of the lunar rover GNC system
- II. SW and algorithms development for path planning and control tasks
- III. SW/HW tests and navigation strategies validation

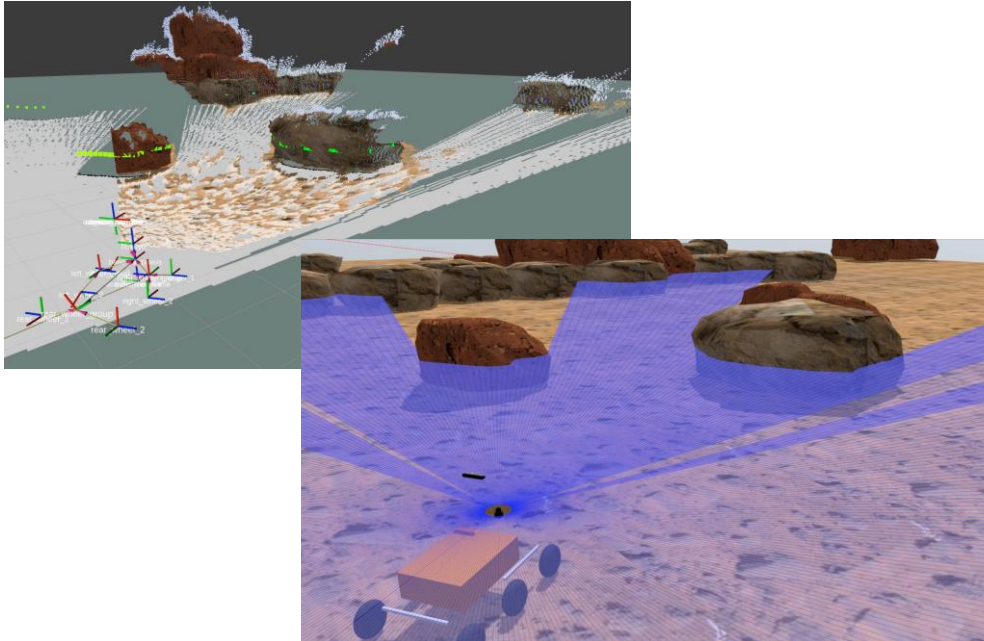


## I) Design and HW implementation of the lunar rover GNC system

- Use cases and requirements definition for the lunar rover
- Strategy definition for the control of the rover basis orientation
- Design of GNC architecture and hardware implementation



## II) Navigation SW and algorithms development



- Definition of navigation strategies
  - onboard rover global localization methods
  - autonomous navigation strategies
- Navigation SW and algorithms development

## III) SW/HW tests and navigation strategies validation

- Test campaign
- Test results analysis



*University and Thales ROXY  
(Rover eXploration facilitY)  
laboratories*



<b>PHD STUDENT</b>	Fortuna Simone	<b>DATE</b>	28/10/2022
<b>PHD THESIS</b>	Science and Technology for Space Exploration	<b>ADMISSION TO</b>	First year in the Sciences, Technologies and Measurements for Space PhD Course

WBS NUMBER	TASK TITLE	% OF TASK COMPLETE	FIRST YEAR				SECOND YEAR				THIRD YEAR							
			T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4				
			O N D	J F M	A M J	J A S	O N D	J F M	A M J	J A S	O N D	J F M	A M J	J A S				
<b>1</b>	<b>Literature Review</b>																	
1.1	Navigation sensors and strategies review	0%	█	█	█	█	█											
1.2	Rover GNC systems/architectures review	0%	█	█	█	█	█											
<b>2</b>	<b>GNC system design and prototyping</b>																	
2.1	Use cases and requirements definition for the lunar rover	0%		█	█	█	█											
2.2	Strategy definition for the control of the rover basis orientation	0%		█	█	█	█	█	█	█								
2.3	Design of GNC architecture and hardware implementation	0%		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
<b>3</b>	<b>Navigation SW and algorithms development</b>																	
3.1	Definition of navigation strategies	0%		█	█	█	█	█	█	█								
3.2	Navigation SW and algorithms development	0%		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
<b>4</b>	<b>SW/HW tests and navigation strategies validation</b>																	
4.1	Test campaign									█	█	█	█	█	█	█	█	█
4.2	Test results analysis									█	█	█	█	█	█	█	█	█
<b>5</b>	<b>Thesis writing and reports/articles redaction</b>																	
5.1	Writing reports	0%		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
5.2	Article redaction	0%		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
5.3	PhD Thesis	0%		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█



# Thanks for the attention

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