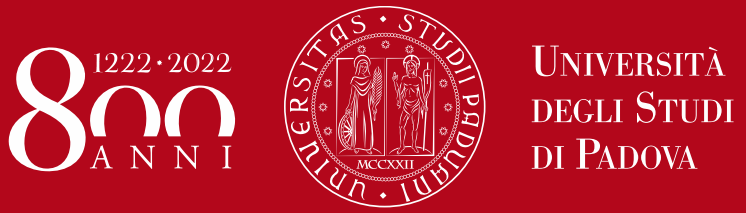


Development of a standard modular docking interface for On Orbit assembly and servicing

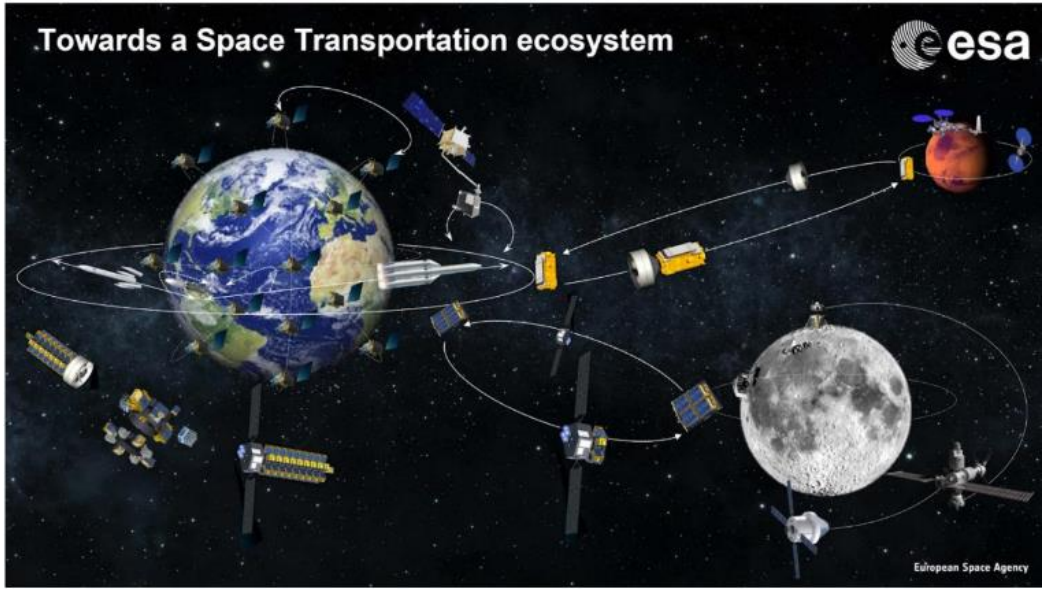
Giuseppe Ventura - 38th Cycle

Supervisor: Prof. Alessandro Francesconi

Admission to the second year - 13/11/2023

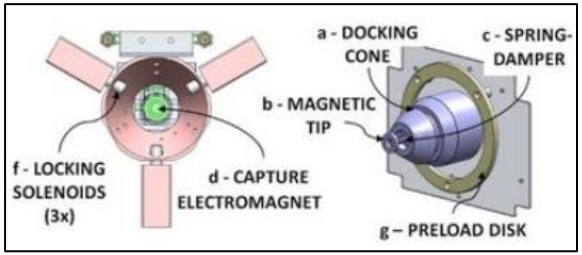
Space Logistic Ecosystem

- On orbit servicing
- In space manufacturing and assembly
- End of life management and active debris removal
- On orbit infrastructures for energy and/or data exchanges
- Return to Earth

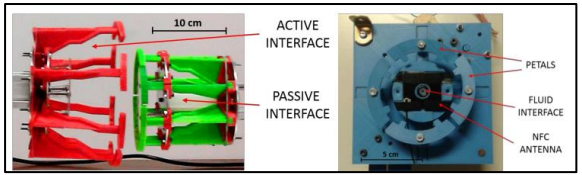


Docking interfaces analysis

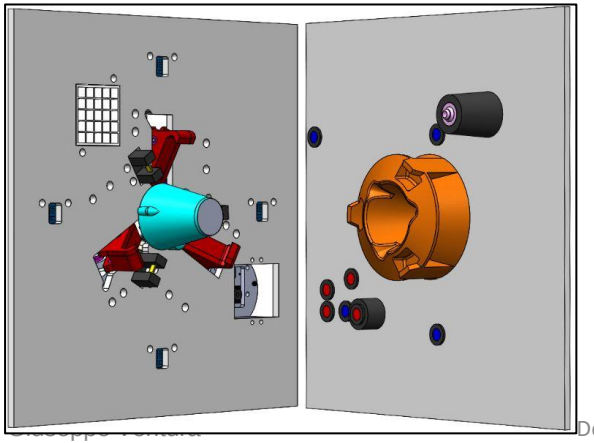
Arcade



Sam

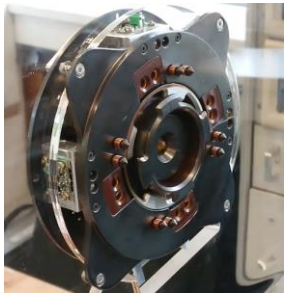


Docks

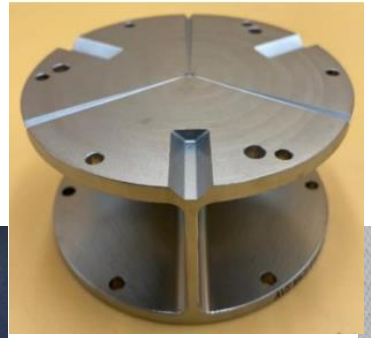


UDP

iBoss

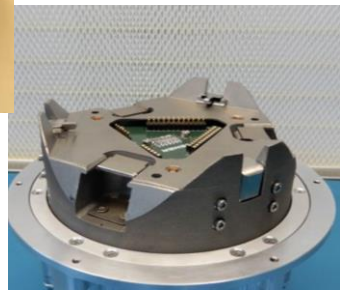


MICE



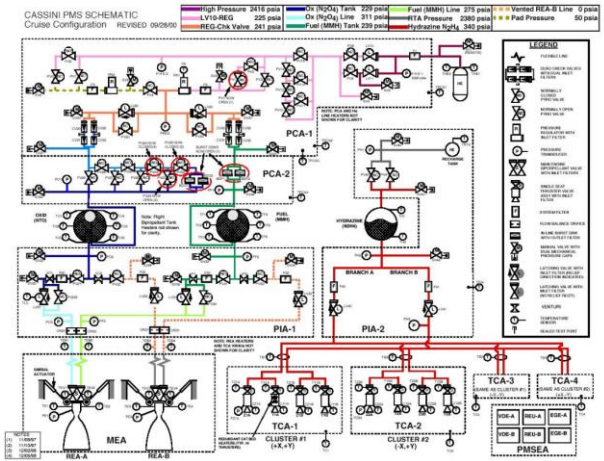
HotDock

Sirom



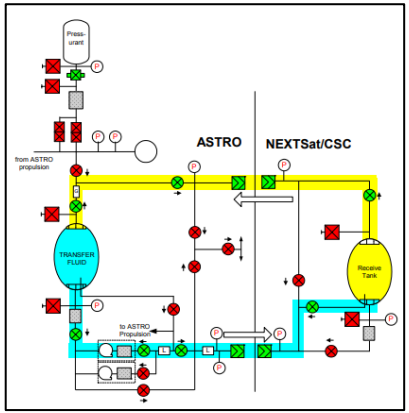
Refuelling analysis

Cassini

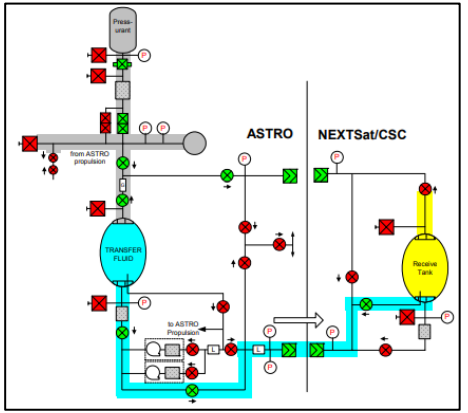


Orbital Express

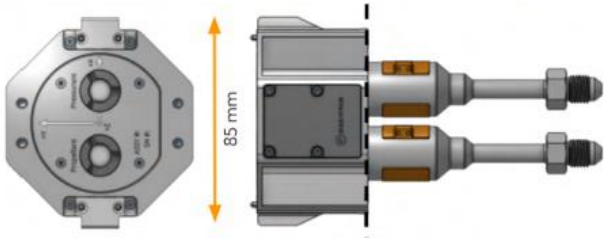
Fluid transfer pump



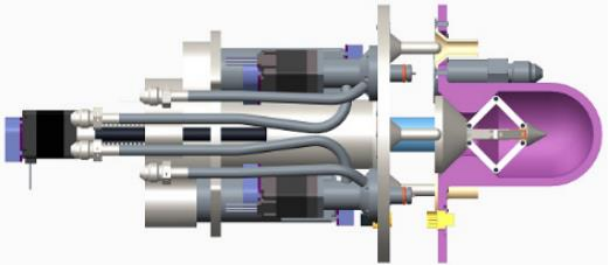
Ullage recompression



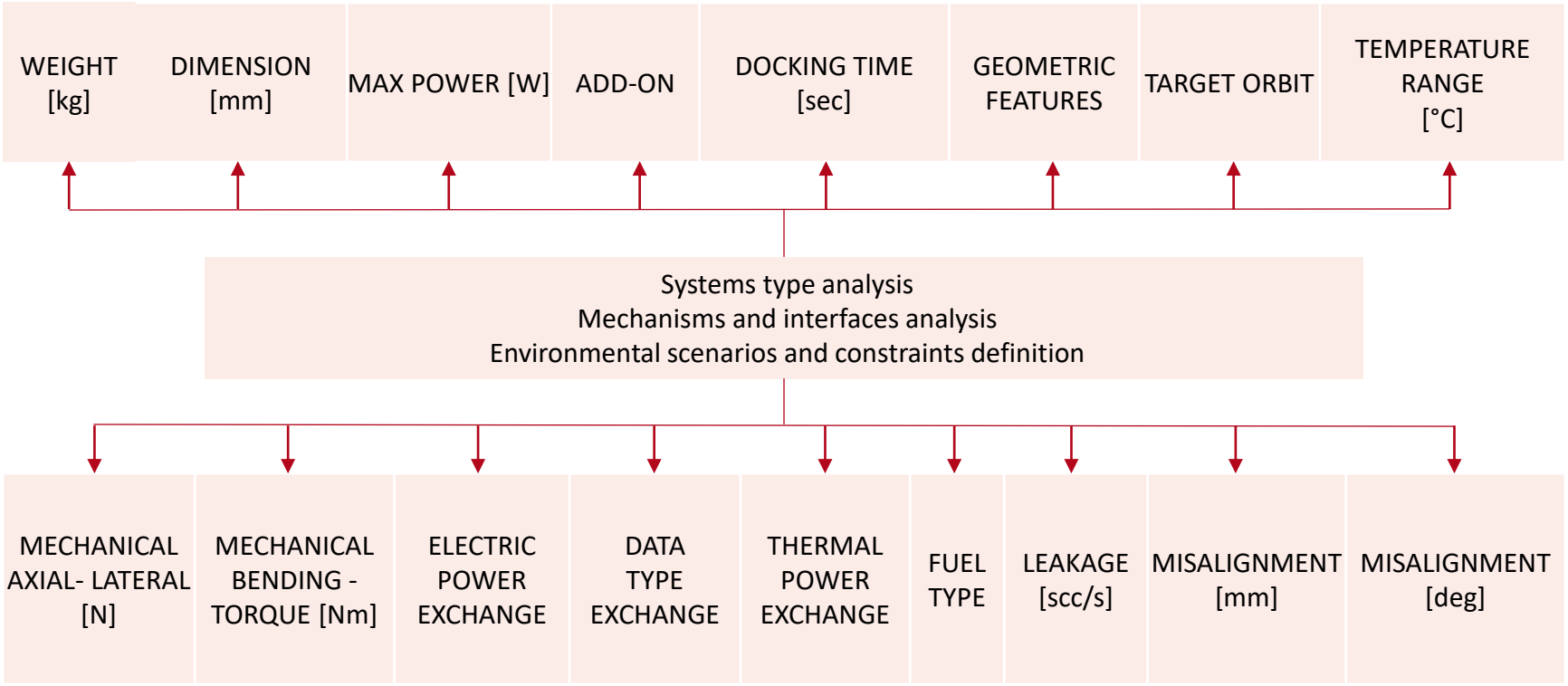
Rafti



ASSIST

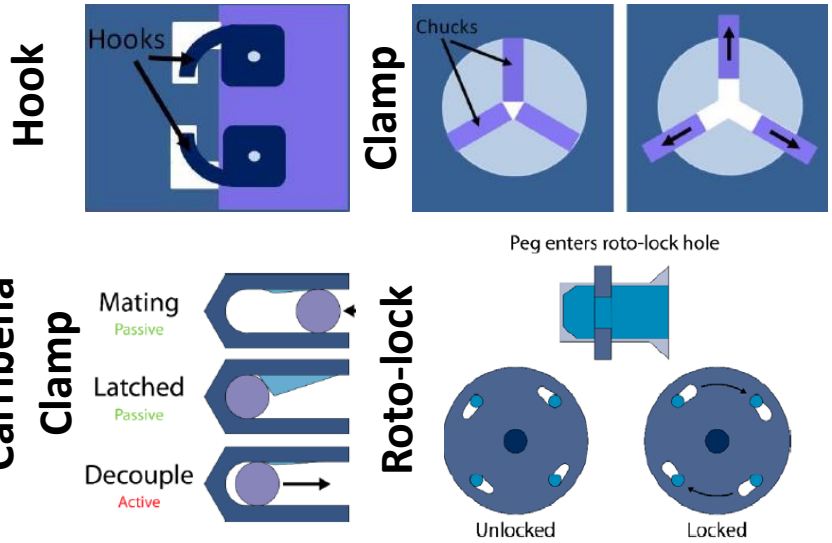


Functional requirements definition

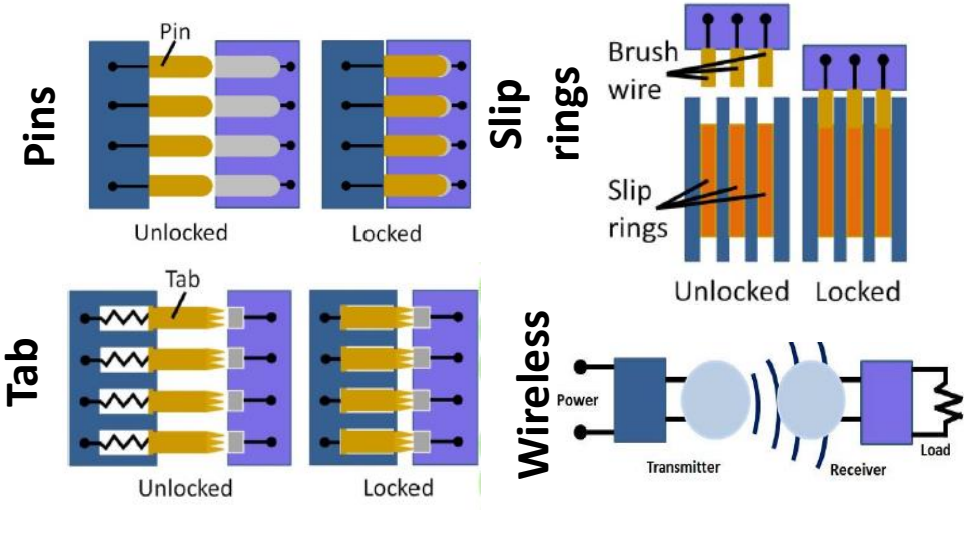


Technologies analysis

Mechanical docking mechanism

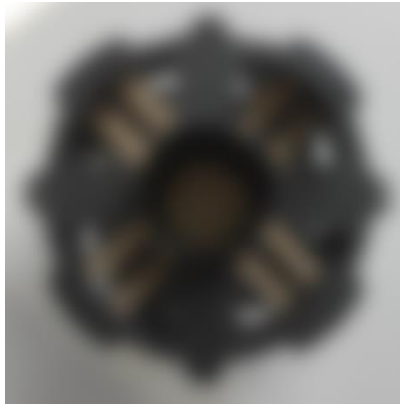


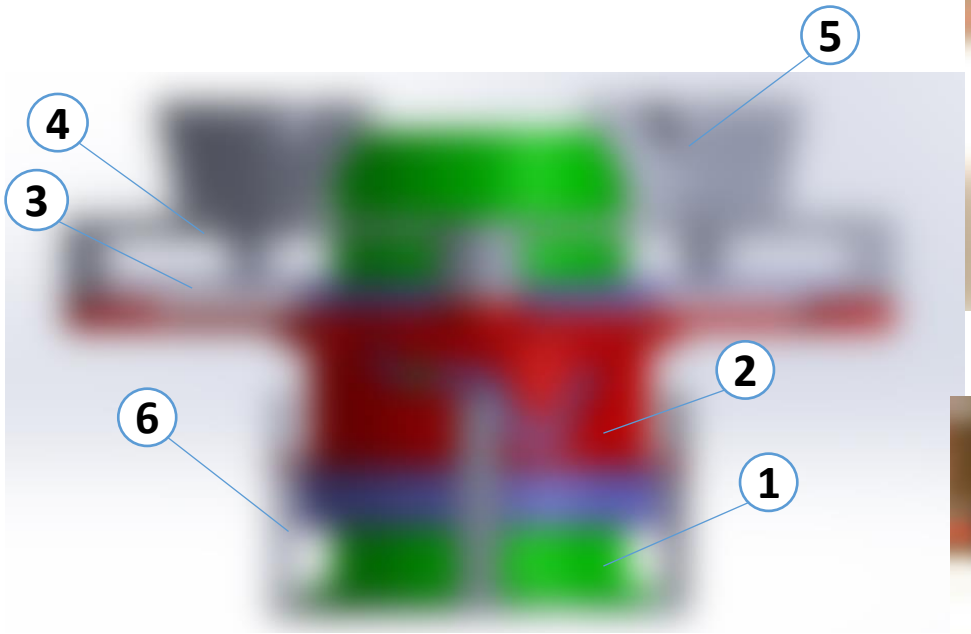
Electrical connections

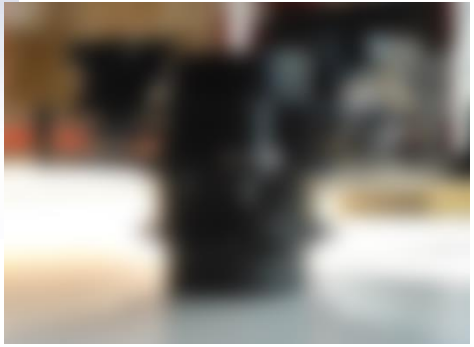


Data transfer	Milbus	SpaceWire	CANbus	Firewire
Thermal transfer	Heat Pipes	Water Sublimators	Fluid Loops	Pulsating Heat Pipes

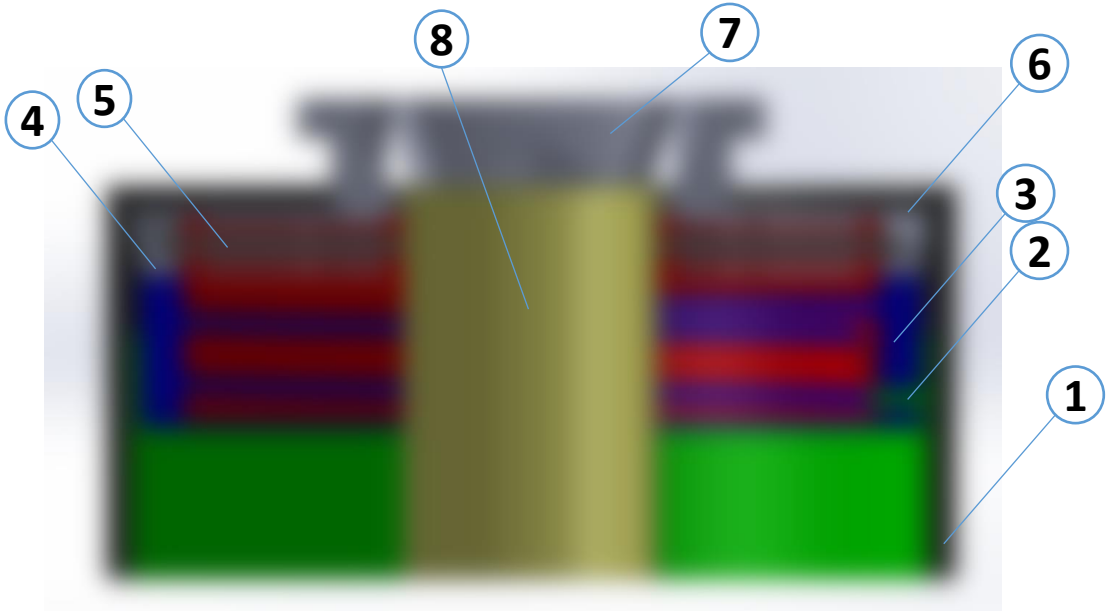
Interfaces design and prototyping 1/3



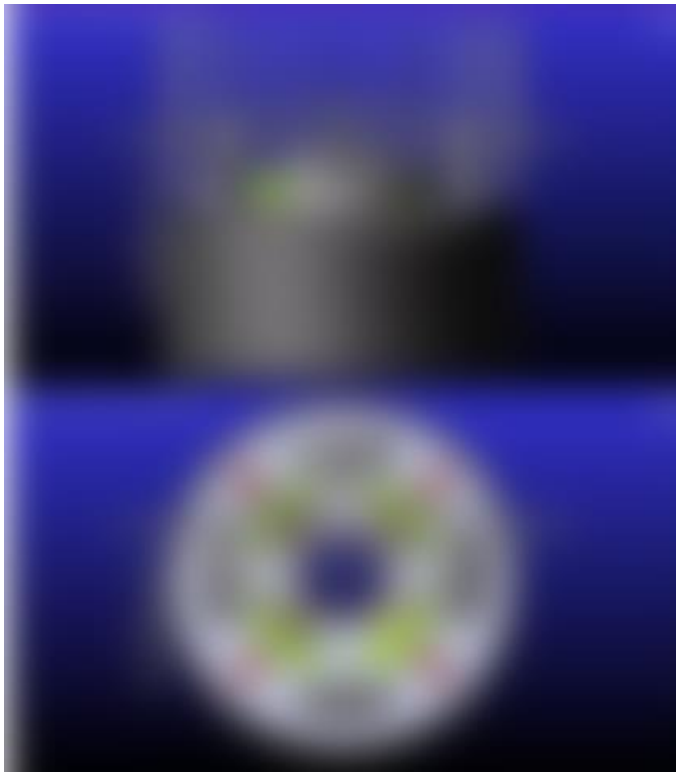




Interfaces design and prototyping 2/3

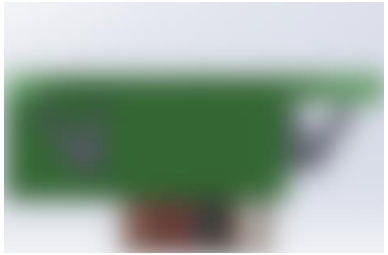


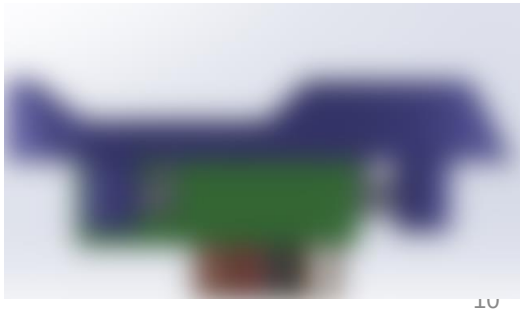
ADAMS docking simulation



Interfaces design and prototyping 3/3

Docking interface **+ Refuelling module** **+ Alignment module**

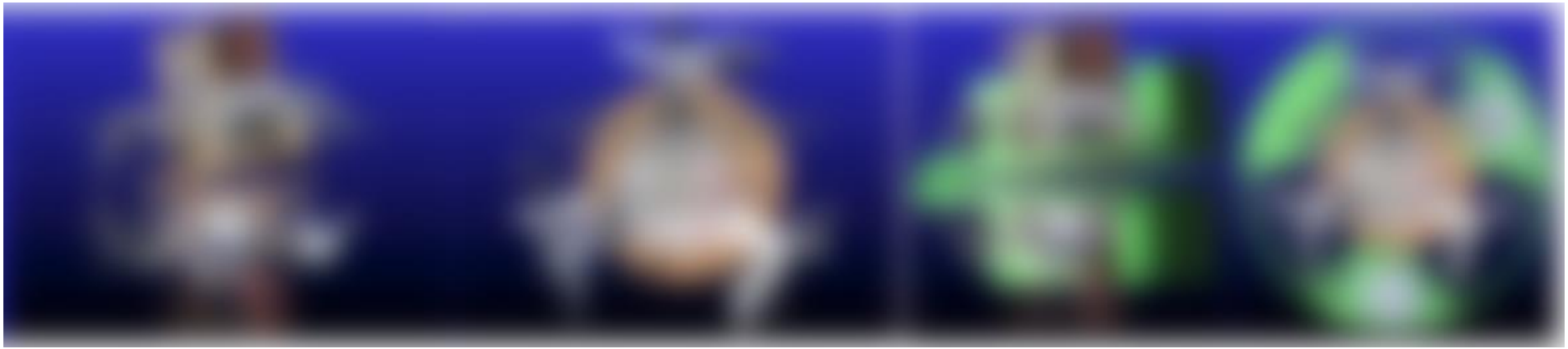




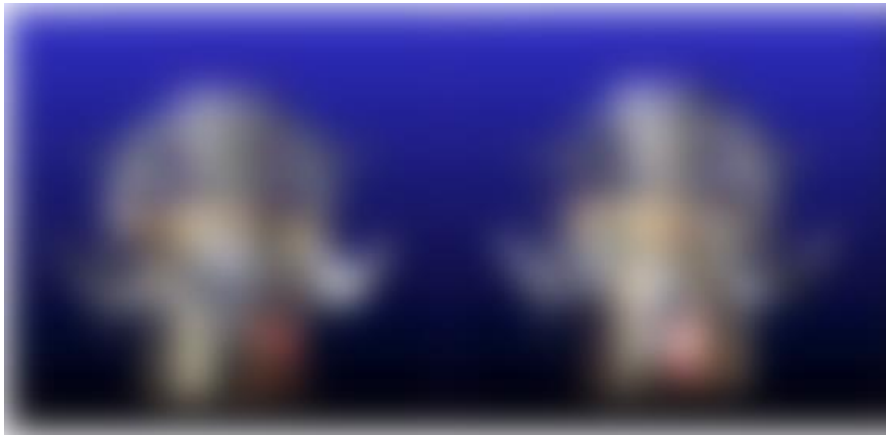
ADAMS simulations

Mechanical part docking

Mechanical and refuelling parts docking



Release



Next steps

Mechanisms and interfaces design

- Actuators and critical mechanical parts sizing
- Sensors analysis

Refuelling subsystem design

Experimental campaign

- Breadboarding phase
- Test phase

Timing

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
1	State of art definition																																					
1.1	Systems type analyses	100%																																				
1.2	Environmental scenarios and constraints definition	100%																																				
1.3	Mechanisms and interfaces analysis	100%																																				
2	Conceptual design																																					
2.1	Functional requirements definition	100%																																				
2.2	Mechanisms and interfaces design	50%																																				
2.3	Virtual prototyping and simulations	30%																																				
3	Physical design																																					
3.1	Detailed design, manufacturing and assembly	10%																																				
3.2	Experimental campaign	0%																																				
4	Writing PhD thesis and reports																																					
4.1	Writing reports	30%																																				
4.2	Article redaction	10%																																				
4.3	Writing PhD thesis	30%																																				

Site scheduling | University of Padua | Abroad period | Thales Alenia Space

PNRR

ThalesAlenia Space
a Thales / Leonardo company

Thanks for the attention