# LIBRA'S RADIO ASTRONOMY MOON MISSION
A FUTURE MISSION CONCEPT

Science Goals	Science Objectives
Understand and probe the structure and evolution of the early universe	Determine the structure of neutral hydrogen. Determine when the first stars formed. Determine the physics of the epoch of reionization. Determine when the global transition between a neutral and ionized universe happen. Create a topographic map of the epoch of reionization. Detect and study early galaxy evolution. Explore the power spectrum of the 21-cm transitions.
Understand the sun and its effects of the solar system	Trace coronal mass ejections as they propagate towards earth. Improve space weather predictions
Observe interaction between the lunar regolith and high energy particles	Understand the origin and nature of ultra high energy cosmic rays. Detect ultra high energy cosmic rays.

Science Payload	
Lander	Lifetime: 5 years
	DALI: frequency range (40-150MHz), temperature sensitivity (10mK)
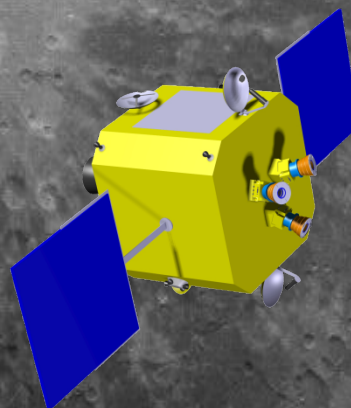
| Lander	
Mass	790.9 kg (w/o propellant)
Power	15 m² GaAs triple junction solar cells
	250 kg of batteries at 220W*hr/kg
Communication	Ka-Band
Propulsion	3 Aerojet MR-80B Main Thrusters
	12 MR-106L and 4 MR-120 ACS Thrusters
Functions	Collect data from LRA and relay data to orbiter.
	Three burn maneuvers
	Lifetime: 5 years

Orbiter	
Mass	127 kg (w/o propellant)
Power	1.28 m² QIOPTIQ Solar Relectors
	20 VES-180 Batteries
Communication	Ka-Band
Functions	Relay data from lander on lunar surface to earth.
	Two burn maneuvers
	Lifetime: 5 years
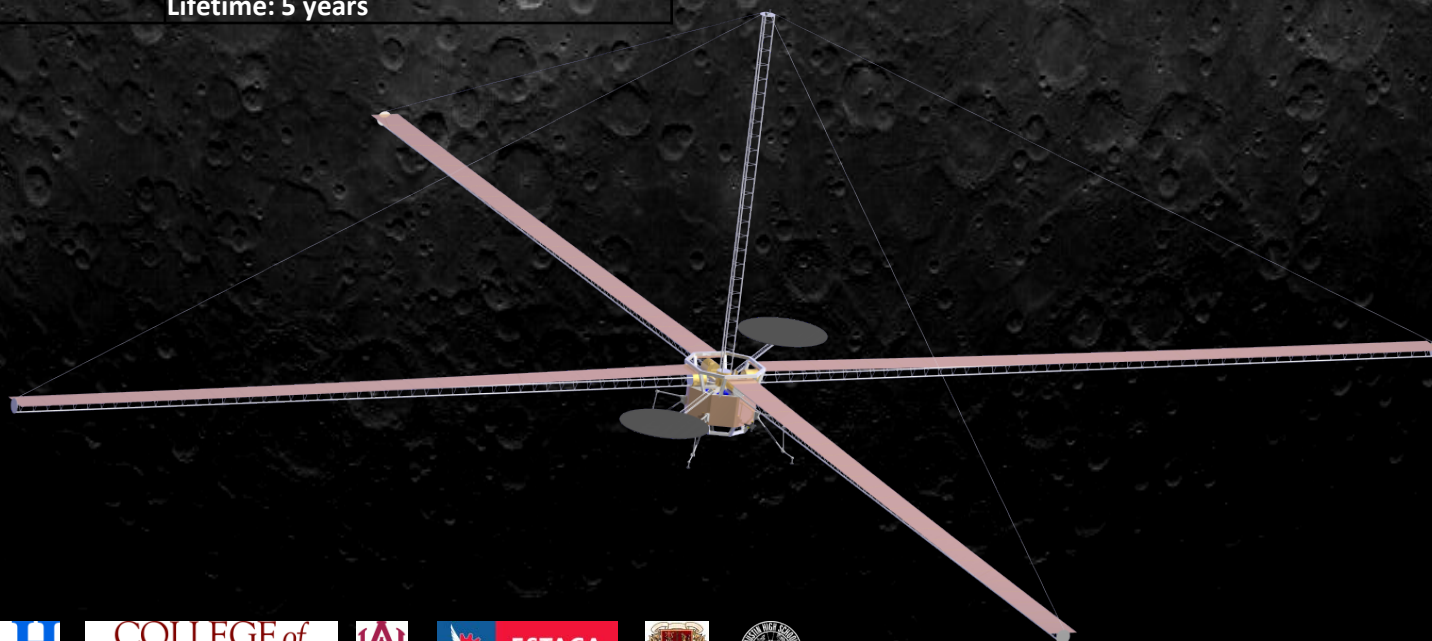
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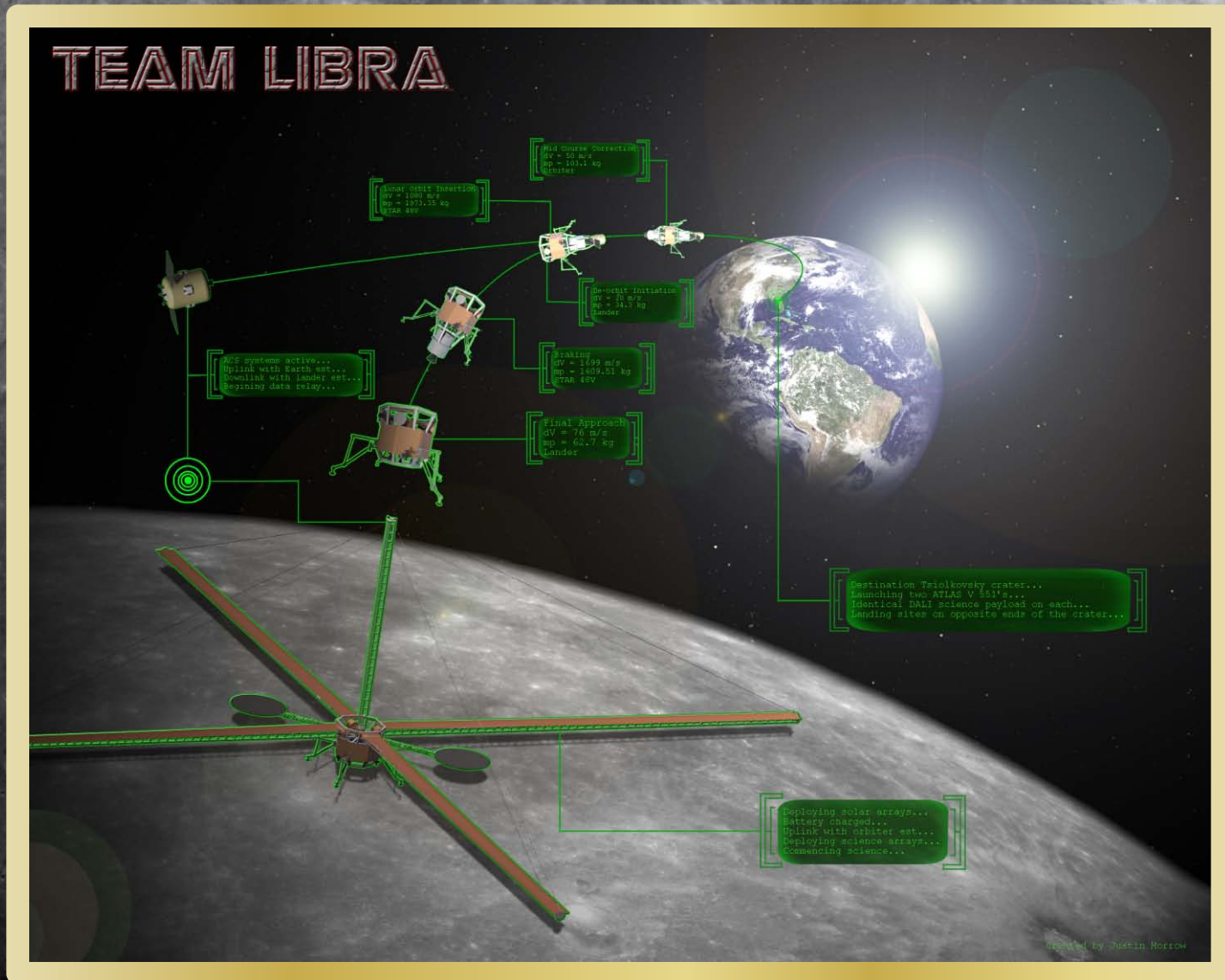
Maneuver	Purpose	Performed By	ΔV (m/s)	Isp (s)	m_p (kg)
1	Correct trajectory after centaur jettison	Orbiter	50	312	105.7
2	Slow payload to allow entry into lunar orbit	Solid Rocket Motor	1080	294.2	1973.35
3	Correct any solid rocket motor thrust vector misaligment	Orbiter	30	312	39.9
4	Push lander out of lunar orbit	Lander	20	231-200	34.3
5	Slow lander to allow for reasonable approach speed	Solid Rocket Motor	1699	294.2	1609.51
6	Slow lander enough for minimum 9g landing	Lander	76	231-200	62.8
7	Divert to a suitable landing spot determined by ALHAT	Lander	19	231-200	15.1