



ROCKETS

Choose one of the rockets below. List your choice on your Mission Proposal.

Vehicle Name	First Flight	Latest Flight	Total # of launches (incl. failures)	Cost per launch	Payload Capacity (to LEO**)
Ariane 5	1996	2022	113	\$186 million	28000 kg
Atlas V	2002	2021	40	\$153 million	15000 kg
Falcon Heavy	2015	2022	147	\$100 million	25000 kg
SLS*	Nov 2022		0	\$2 billion	120000 kg
Vega	2012	2020	15	\$37 million	7500 kg

*Space Launch System

**Low earth orbit

Based on your rocket choice, choose a launch site. List your choice on your Mission Proposal.

Location	Rockets
Cape Canaveral, Florida, USA	Atlas V, Falcon Heavy
Kennedy Space Center, Florida, USA	Falcon Heavy, SLS
Guiana Space Centre, Kourou, French Guiana	Ariane 5, Vega



PROJECT DEADLINE

Select a project deadline from the given choices below. Earlier dates are more cost effective but riskier, with less time for testing. Later dates will add more cost to your mission but have more chance for success. List your choice on your Mission Proposal.

Project Deadline	Additional Labor Cost
November 7, 2023	\$935 million
March 15, 2024	\$1.275 billion
May 12, 2024	\$1.445 billion
July 20, 2024	\$1.615 billion
October 18, 2024	\$1.870 billion
December 8, 2024	\$2.04 billion
February 16, 2025	\$2.21 billion



SATELLITE PARTS SHOP

Choose one of each of the parts. List your choices on your Mission Proposal.

Sunshield

Option	Material(s)	Weight	Cost
1	<u>Mylar</u> Lightest, most expensive	800 kg	\$850 million
2	<u>Kapton</u> Lightweight; expensive	2000 kg	\$750 million
3	<u>Kevlar</u> Cheap and durable; heavy	4000 kg	\$500 million

Mirrors*

Option	Material(s)	Weight	Cost
1	<u>Titanium Beryllide</u> Most durable; rare resource	2000 kg	\$650 million
2	<u>Beryllium</u> Lightweight; expensive	1500 kg	\$750 million
3	<u>Borosilicate Glass</u> Low cost; heavy	2500 kg	\$500 million

*A special gold coating is applied to all materials to ensure maximum reflectiveness



SATELLITE PARTS SHOP CONT.

Choose one of each of the parts. List your choices on your Mission Proposal.

Solar Array

Option	Material(s)	Weight	Cost
1	<u>Perovskite</u> Lightest and highest efficiency rating; fragile	400 kg	\$600 million
2	<u>Silicon</u> Abundant and low cost; heaviest material	550 kg	\$450 million
3	<u>Quantum Dots</u> Lightweight and cheap; not as efficient	450 kg	\$200 million

Integrated Science Instrument Module (ISIM) - Cryocooler

Option	Material(s)	Weight	Cost
1	<u>Joule-Thomson Cooler</u> Newest technology; expensive	2500 kg	\$850 million
2	<u>Turbo-Brayton</u> Reliable; fragile, needs more routine maintenance	2000 kg	\$700 million
3	<u>Single-stage Stirling</u> Oldest technology and cheapest; heavy	3000 kg	\$350 million



SATELLITE PARTS SHOP CONT.

Choose a company to construct the below parts. List your choices on your Mission Proposal.

Integrated Science Instrument Module (ISIM) - Star Trackers

Option	Contract Company	Weight	Cost
1	<u>Leonardo</u> Longest tenure with space programs; heaviest	650 kg	\$250 million
2	<u>Raytheon Technologies</u> Long tenure with space programs; most expensive	600 kg	\$300 million
3	<u>Vecornav</u> Least expensive; least experience	600 kg	\$200 million

Spacecraft Bus

Option	Contract Company	Weight	Cost
1	<u>Lockheed Martin Space System</u> Lowest weight; most expensive	300 kg	\$350 million
2	<u>Northrop Grumman</u> Reliable; expensive	350 kg	\$300 million
3	<u>Airbus</u> Least expensive; heavy	500 kg	\$250 million