



BECOMING A MULTIPLANET SPECIES

SPACEX



“You want to wake up in the morning and think the future is going to be great - and that's what being a spacefaring civilization is all about. It's about believing in the future and thinking that the future will be better than the past. And I can't think of anything more exciting than going out there and being among the stars.”

Elon Musk, CEO and Lead Designer, SpaceX

PROGRESS

DEEP CRYO LIQUID OXYGEN TANK TESTING

Pressure tested to 2.3 atmospheres

Carbon fiber matrix

Volume 1000m^3

Holds 1200 tons of liquid oxygen



ENGINE TESTING

Over 1200 seconds of firing across 42 main engine tests

Longest test 100 seconds; 40 seconds typical for Mars landing

Test engine operates at up to 200 atmospheres



PERFECTING PROPULSIVE LANDING

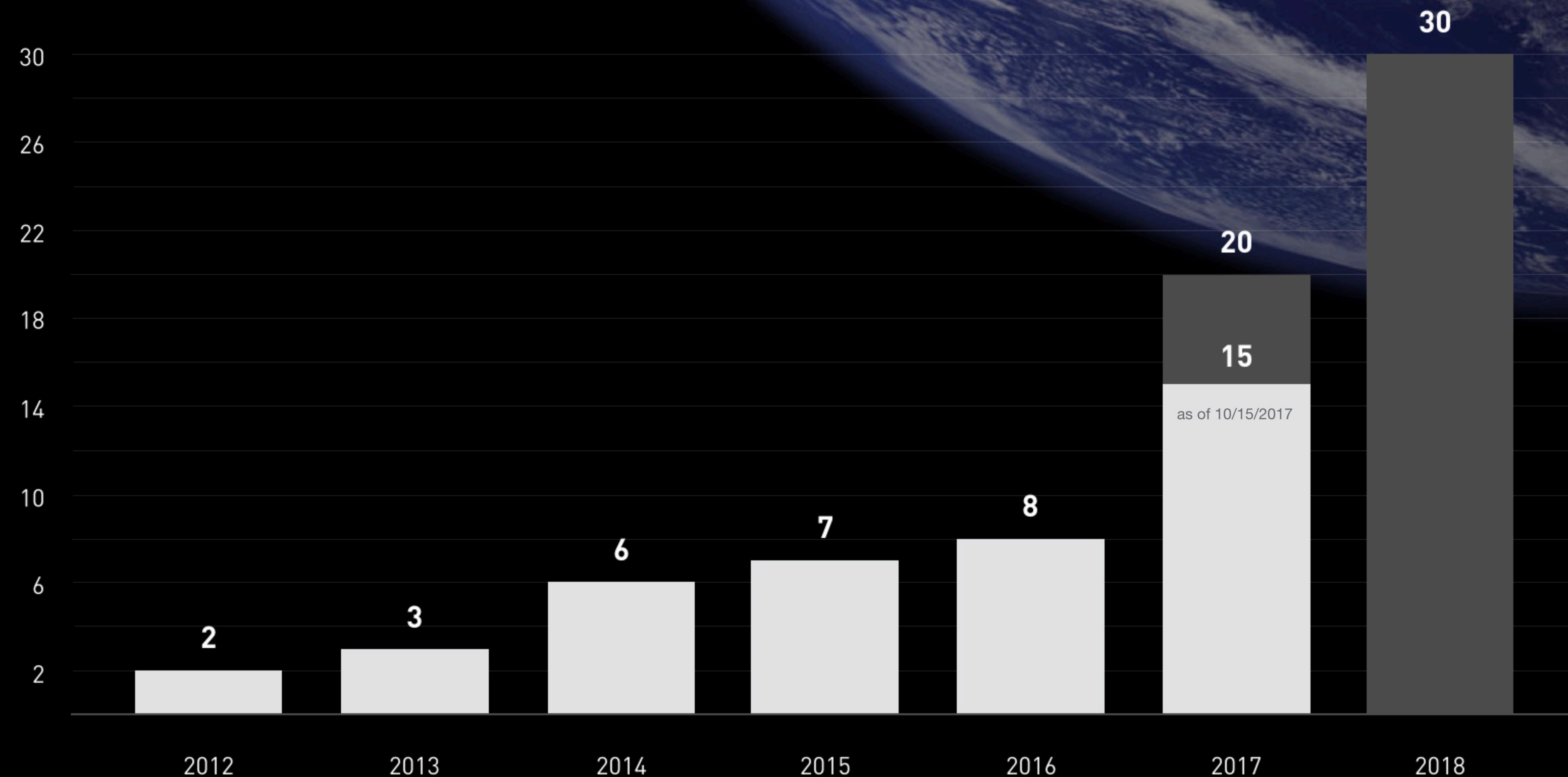
18 successful Falcon 9 landings as of
10/15/2017

Very high reliability demonstrated with
single engine landings

Precision landing will allow for return to
launch mount, no landing legs needed



LAUNCH RATE

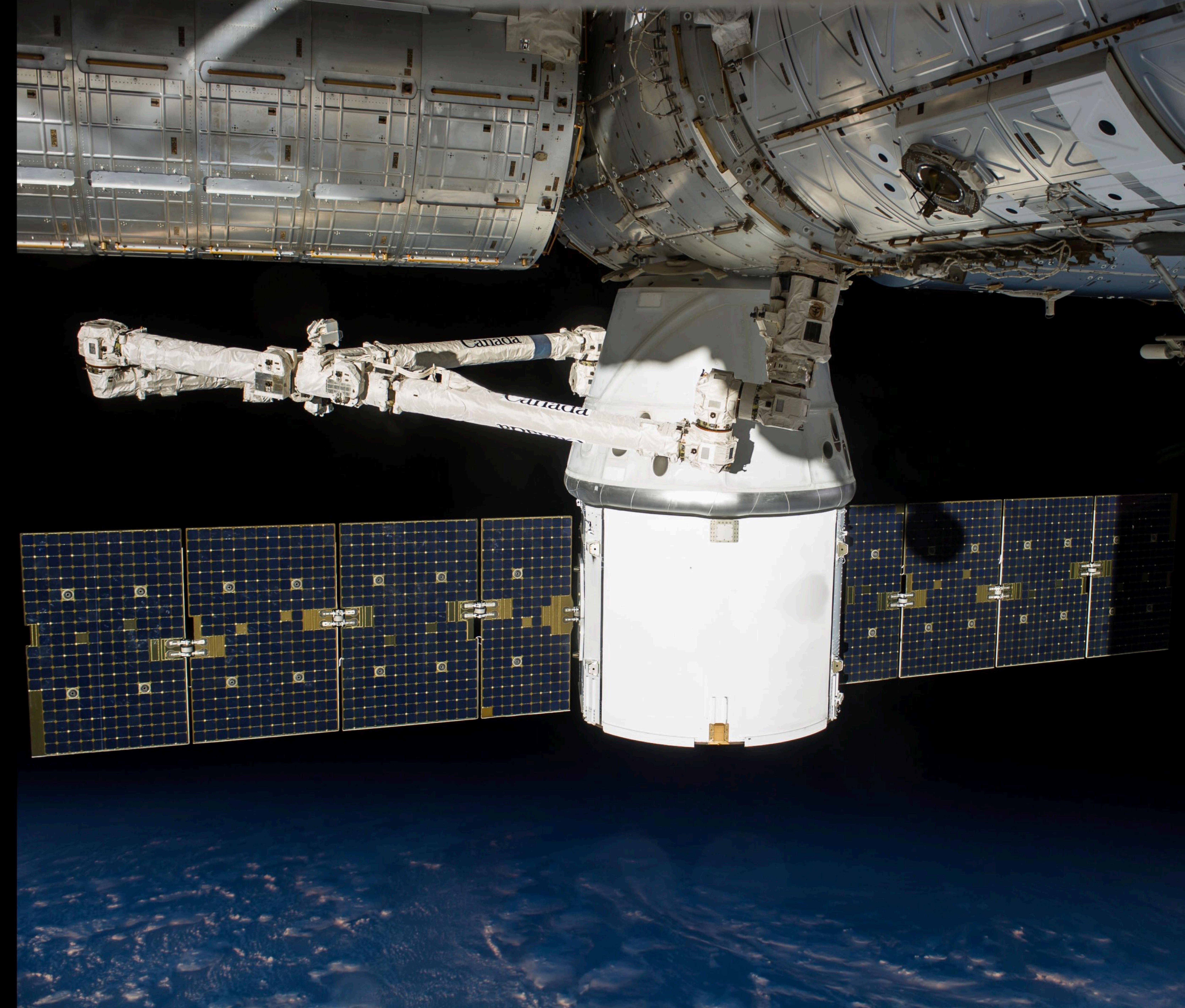


DRAGON UPDATES

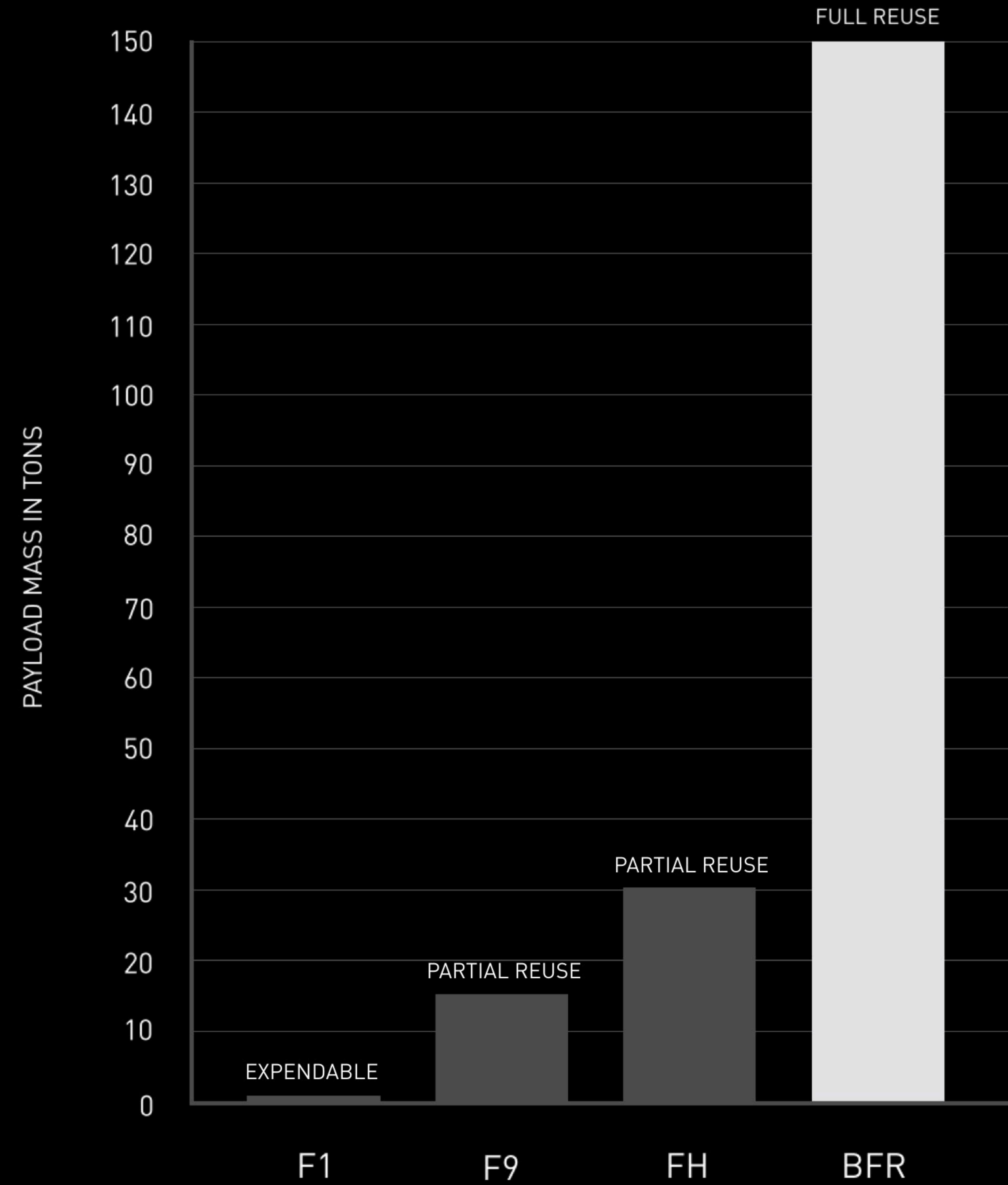
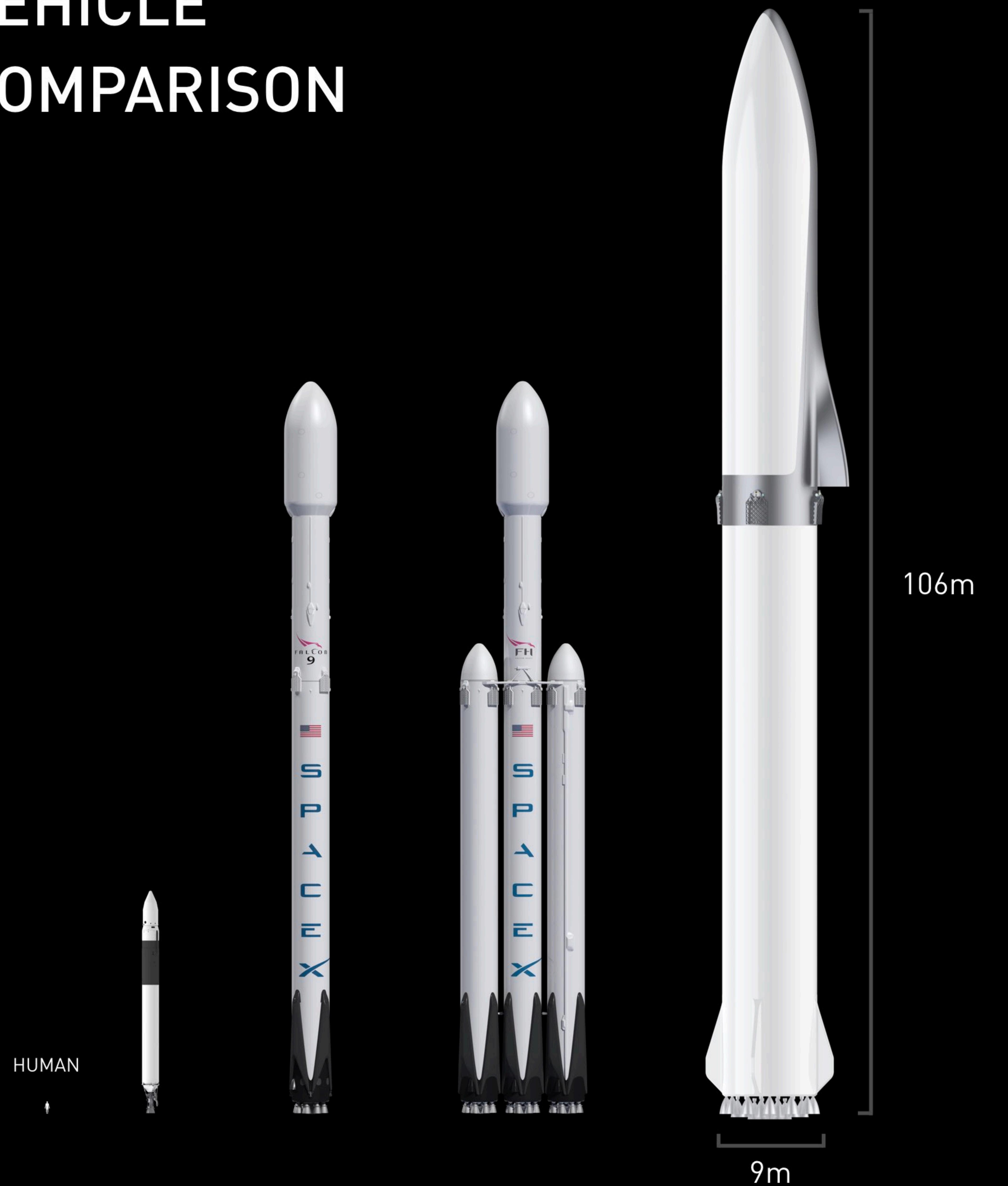
Demonstrated automated rendezvous and docking to space station with Dragon 1

Dragon 2 will dock directly, not needing use of Canadarm

Perfected heat shield technology to withstand extremely high reentry temperatures



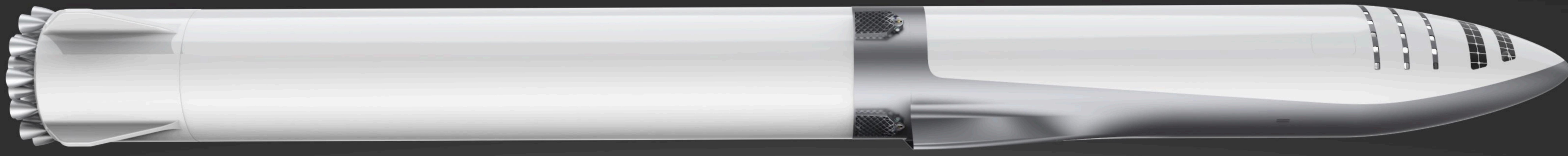
VEHICLE COMPARISON



BFR OVERVIEW

By creating a single system that can service a variety of needs, we can redirect resources from Falcon 9, Falcon Heavy and Dragon to this system—which is fundamental in making BFR affordable.

[WATCH ANIMATION](#)



Vehicle Length: 106 m

Booster Length: 58 m

Booster Thrust: 52,700 kN

BFR



Ship Length 48 m
Body Diameter 9 m

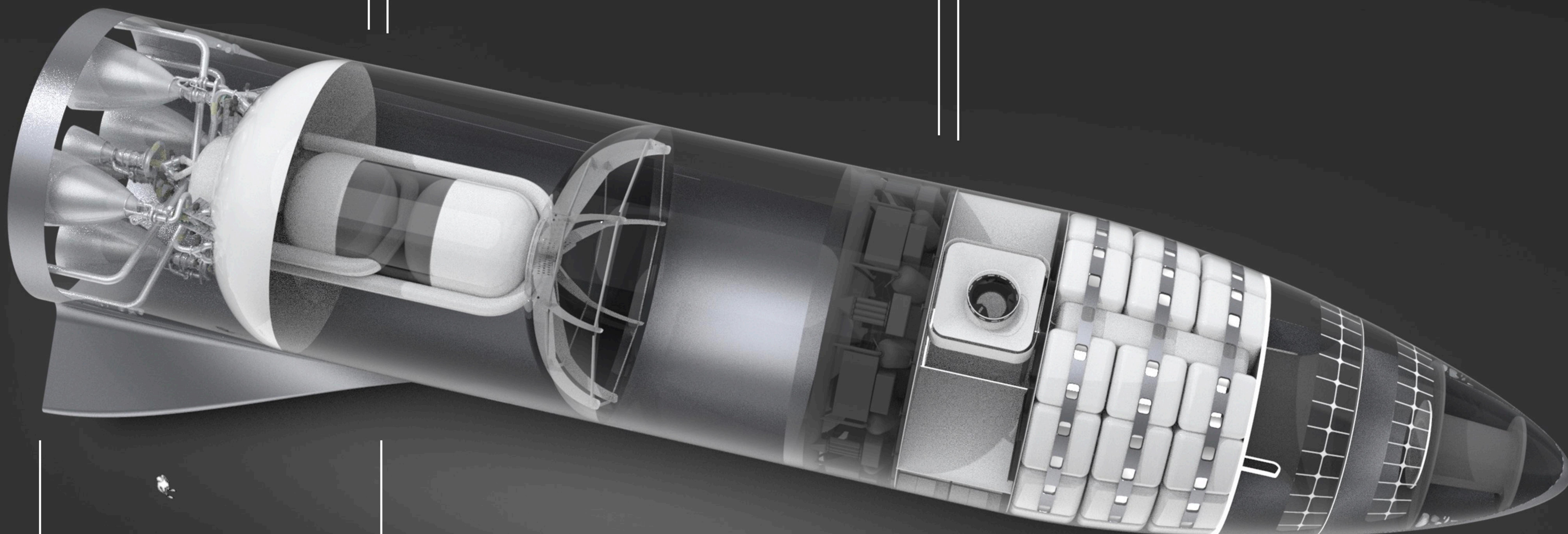
Ship Dry Mass 85 t
Propellant Mass 1,100 t

Max Ascent Payload 150t
Typical Return Payload 50 t

ENGINES

PROPELLANT TANKS

PAYLOAD



DELTA WING

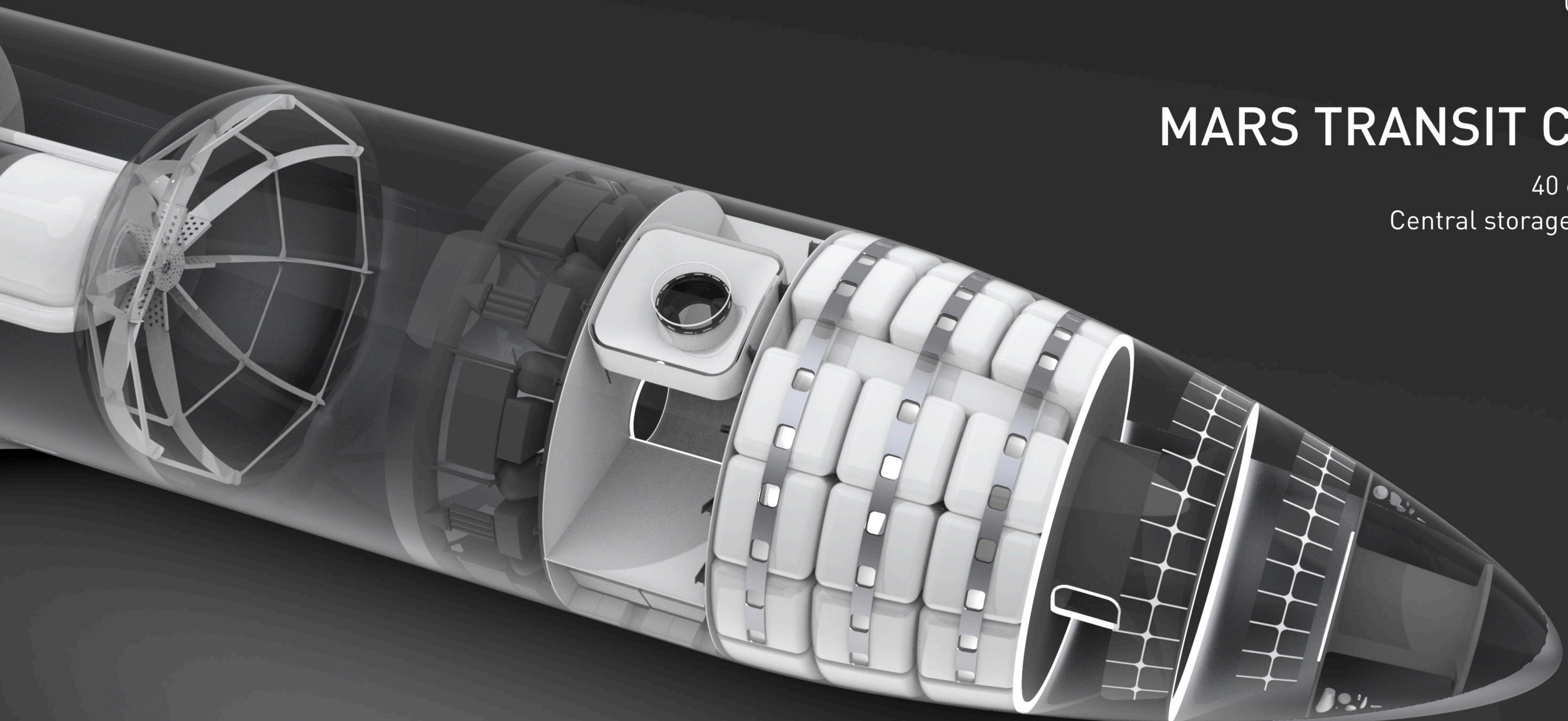
PRESSURIZED VOLUME 825 m³

Greater than an A380 main deck

MARS TRANSIT CONFIGURATION

40 cabins and large common areas

Central storage, galley and solar storm shelter

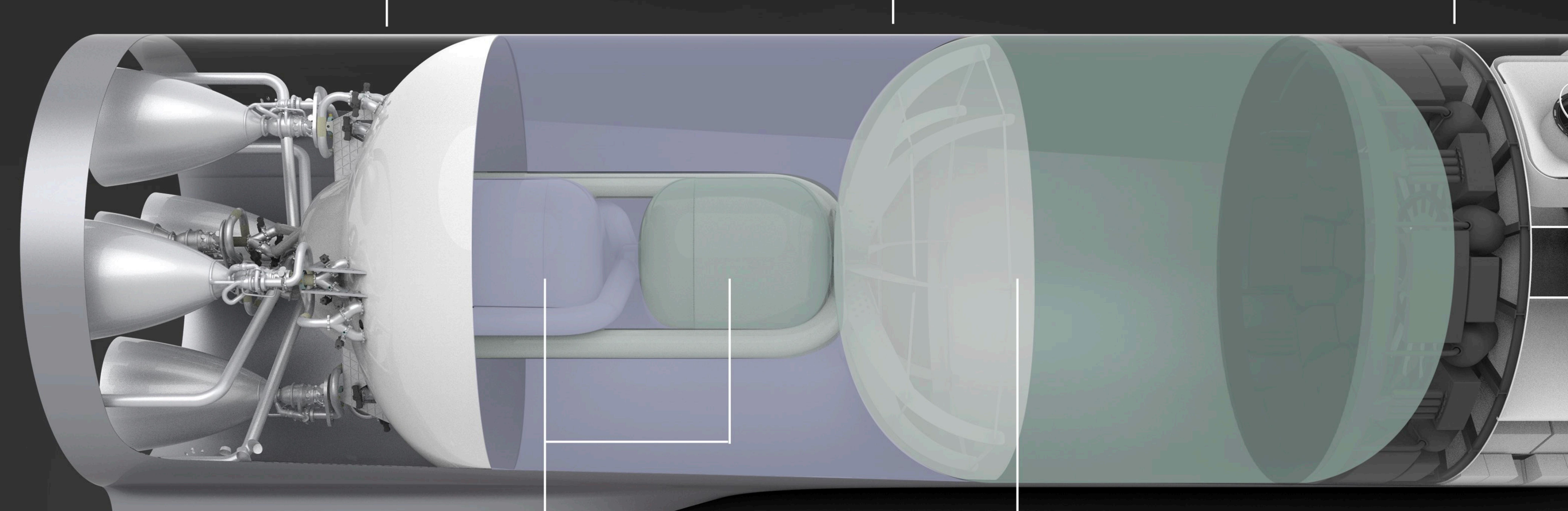


FUEL TANK

Holds 240 tons of CH₄

OXYGEN TANK

Holds 860 tons of liquid O₂



HEADER TANKS

Hold landing propellant during transit

COMMON DOME

Separates CH₄ and O₂

RAPTOR ENGINES

Chamber pressure 250 bar

Throttle 20% to 100% thrust

2 SEA-LEVEL ENGINES

Exit Diameter 1.3 m

Thrust (SL) 1,700 kN

Isp (SL) 330 s

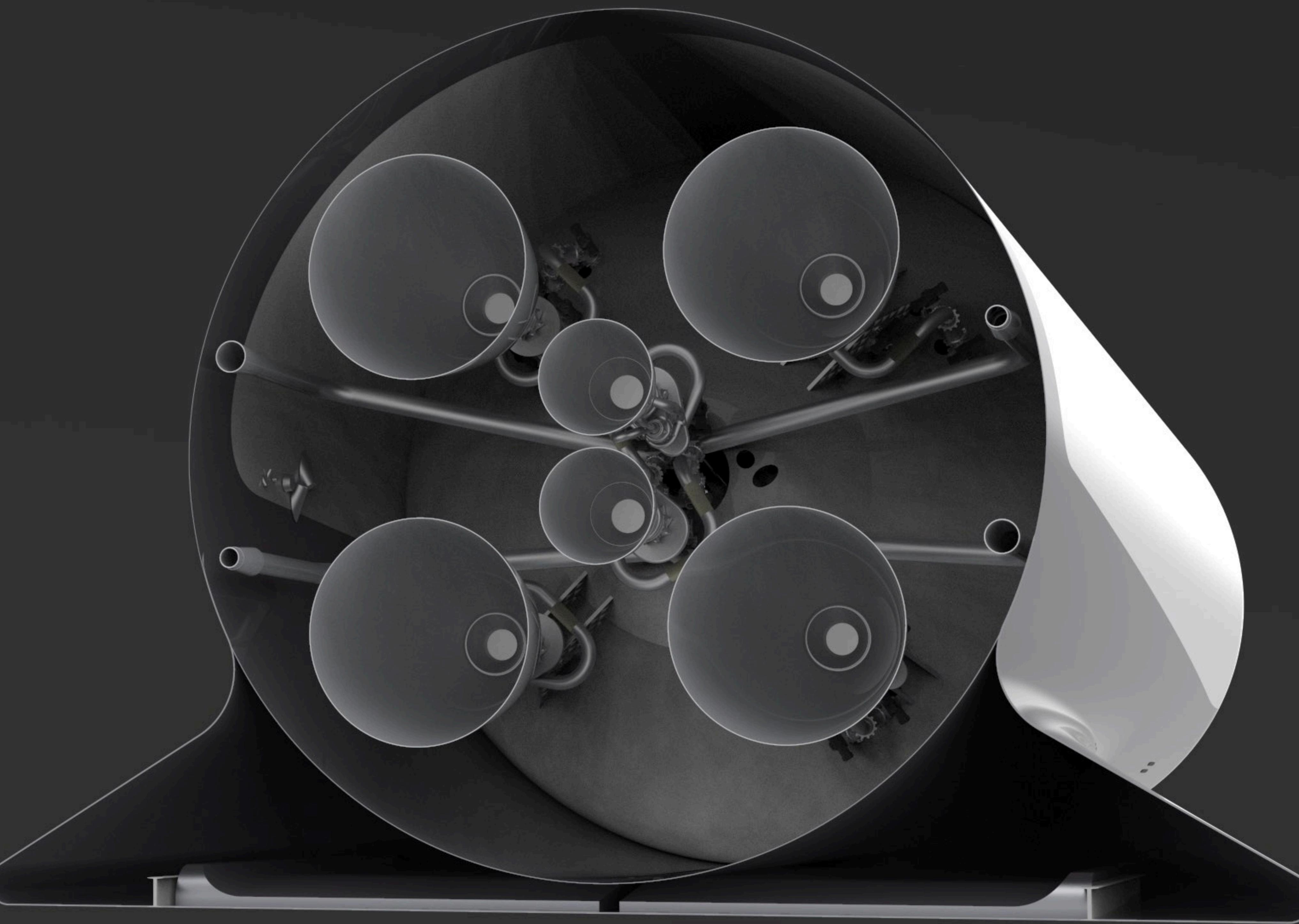
Isp (Vac) 356 s

4 VACUUM ENGINES

Exit Diameter 2.4 m

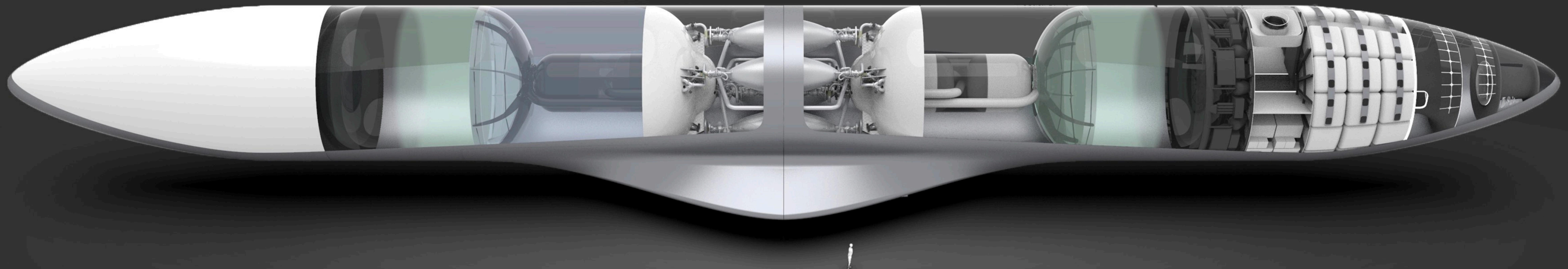
Thrust 1,900 kN

Isp 375 s



REFILLING

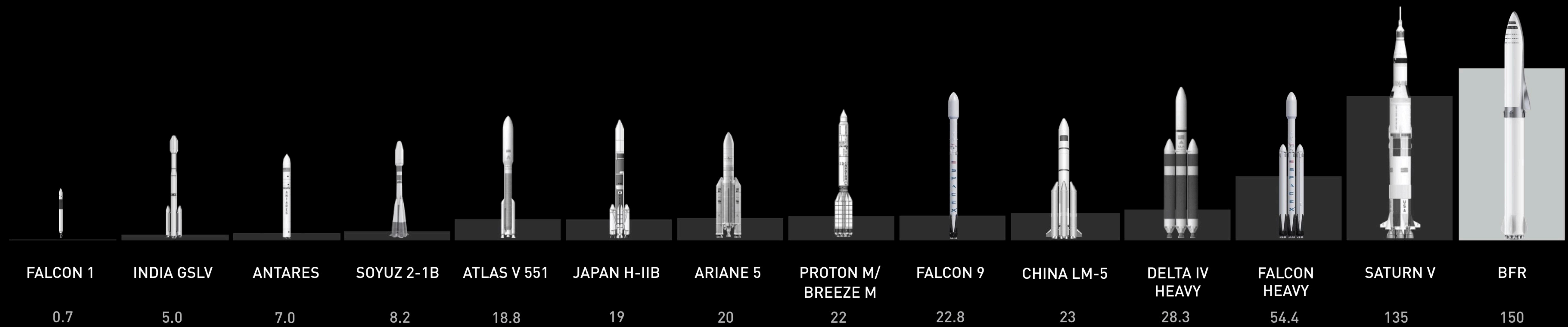
Propellant settled by milli-g acceleration using control thrusters



ROCKET CAPABILITY

PAYLOAD TO LOW EARTH ORBIT IN TONS

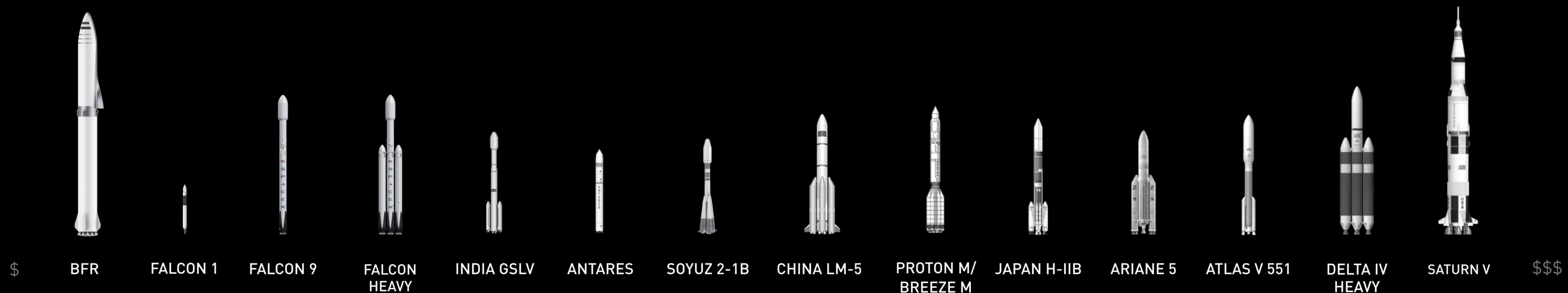
BFR has larger payload capacity than a Saturn V, while being fully reusable



LAUNCH COST

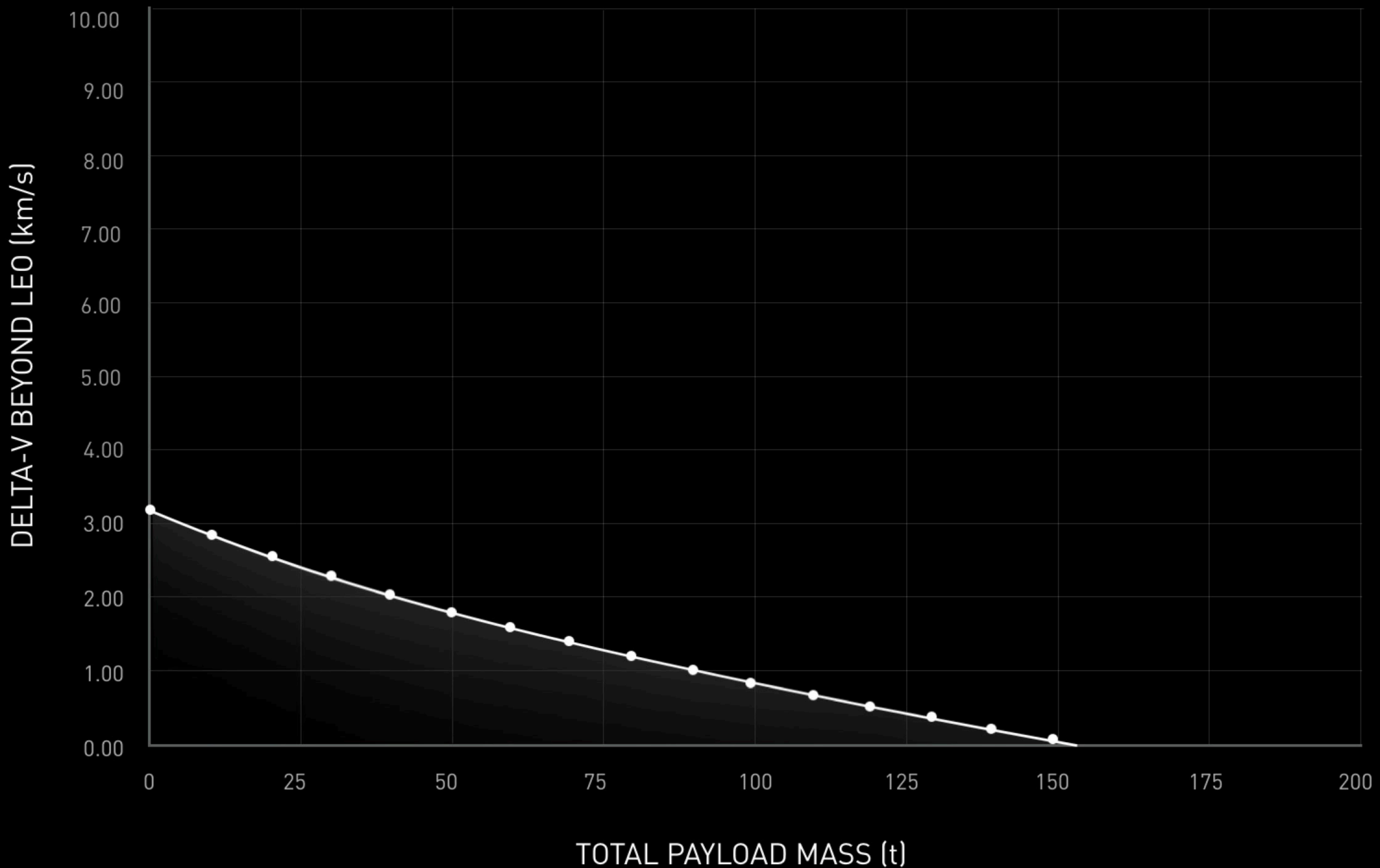
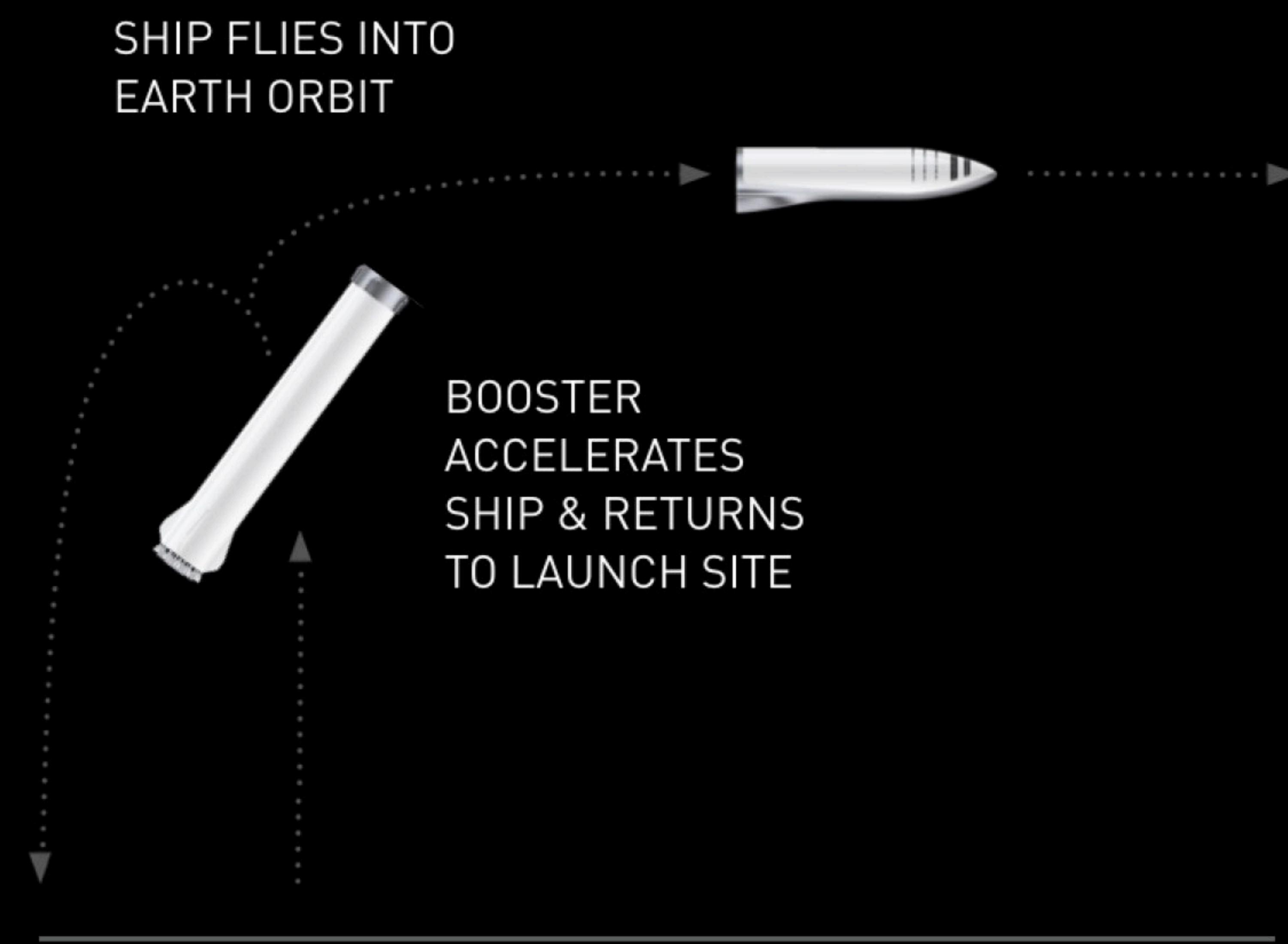
MARGINAL COST PER LAUNCH ACCOUNTING FOR REUSABILITY

Due to full reusability, BFR provides lowest marginal cost per launch, despite vastly higher capacity than existing vehicles



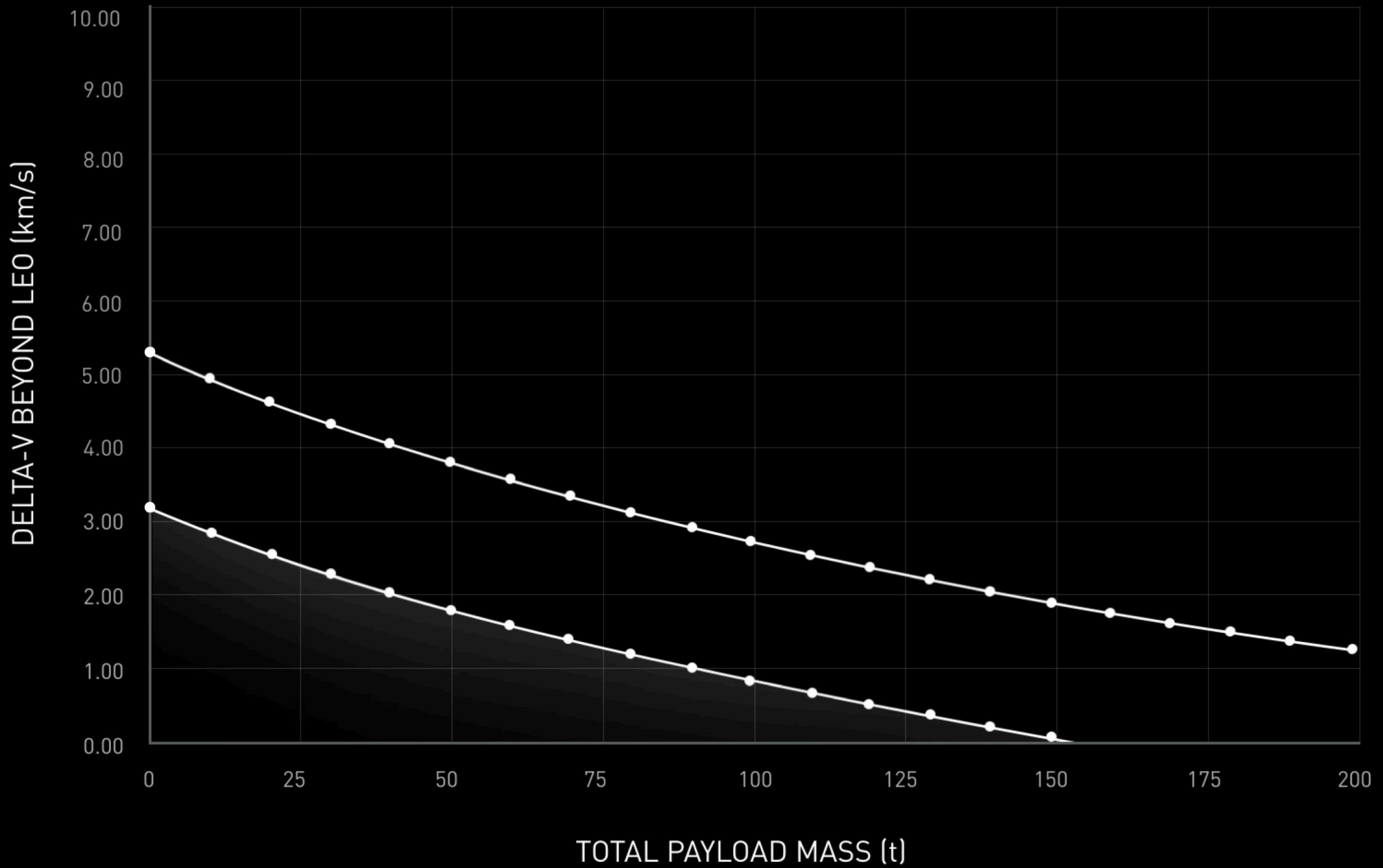
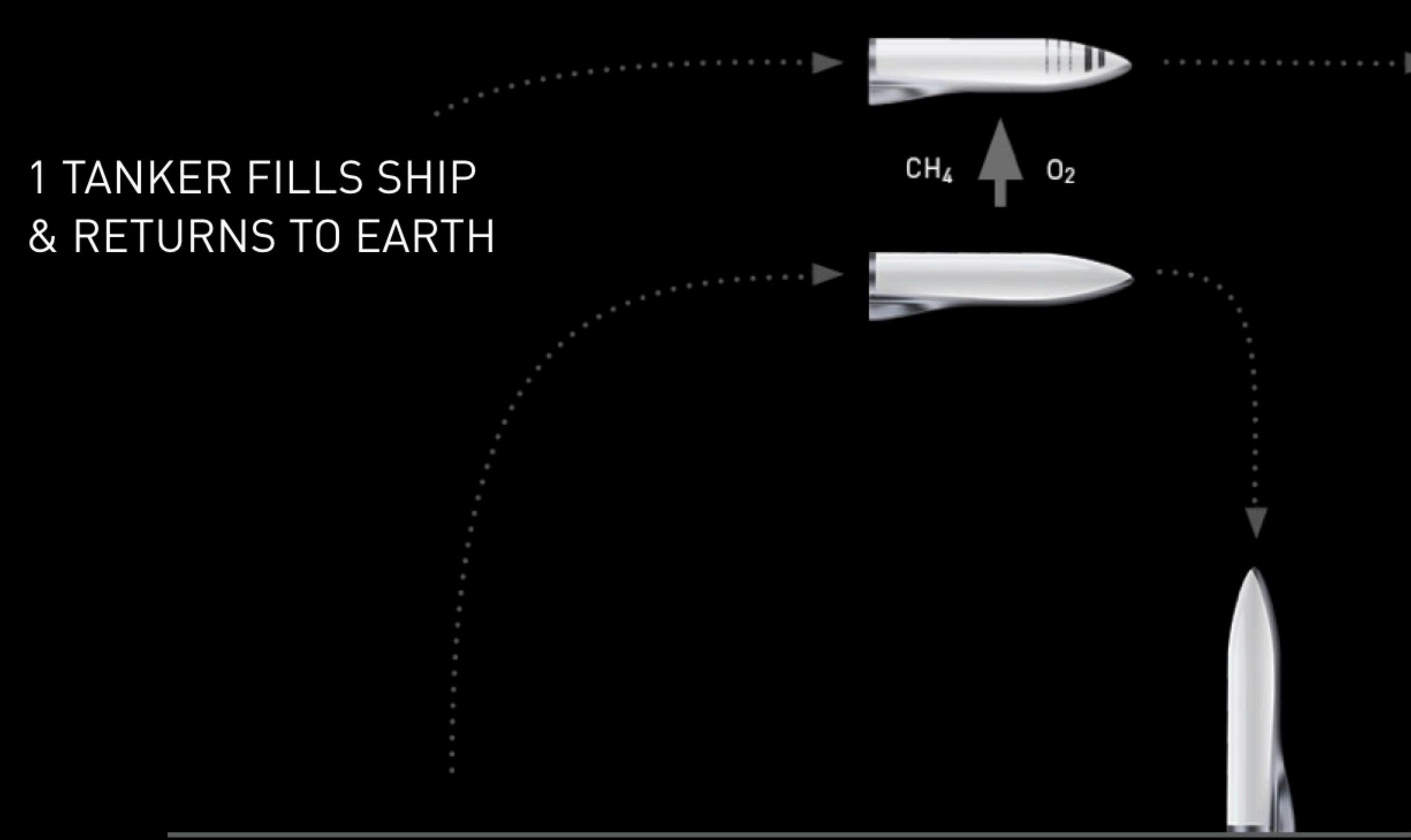
VALUE OF REFILLING

SINGLE LAUNCH CAPABILITY FROM EARTH ORBIT



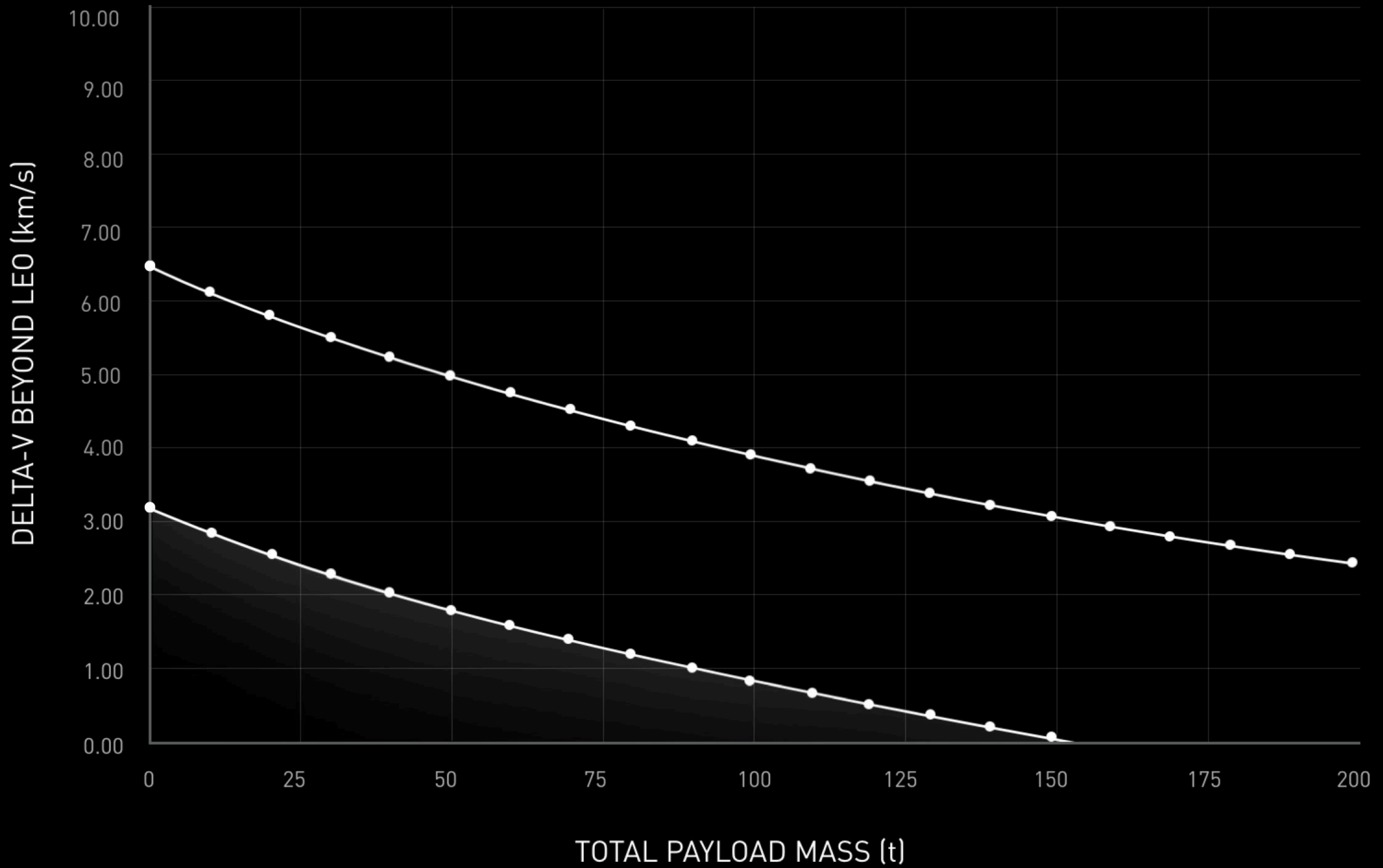
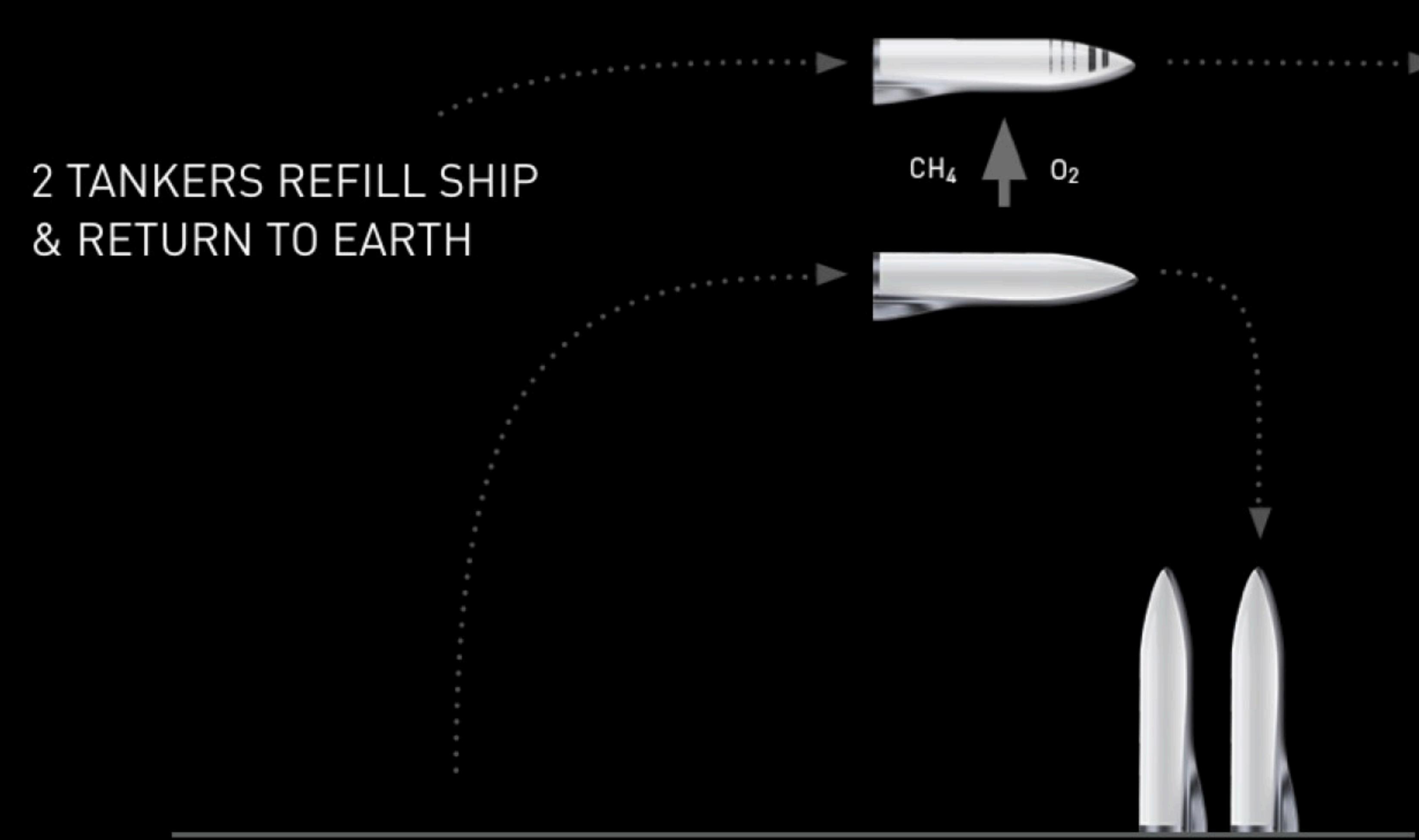
VALUE OF REFILLING

ONE TANKER



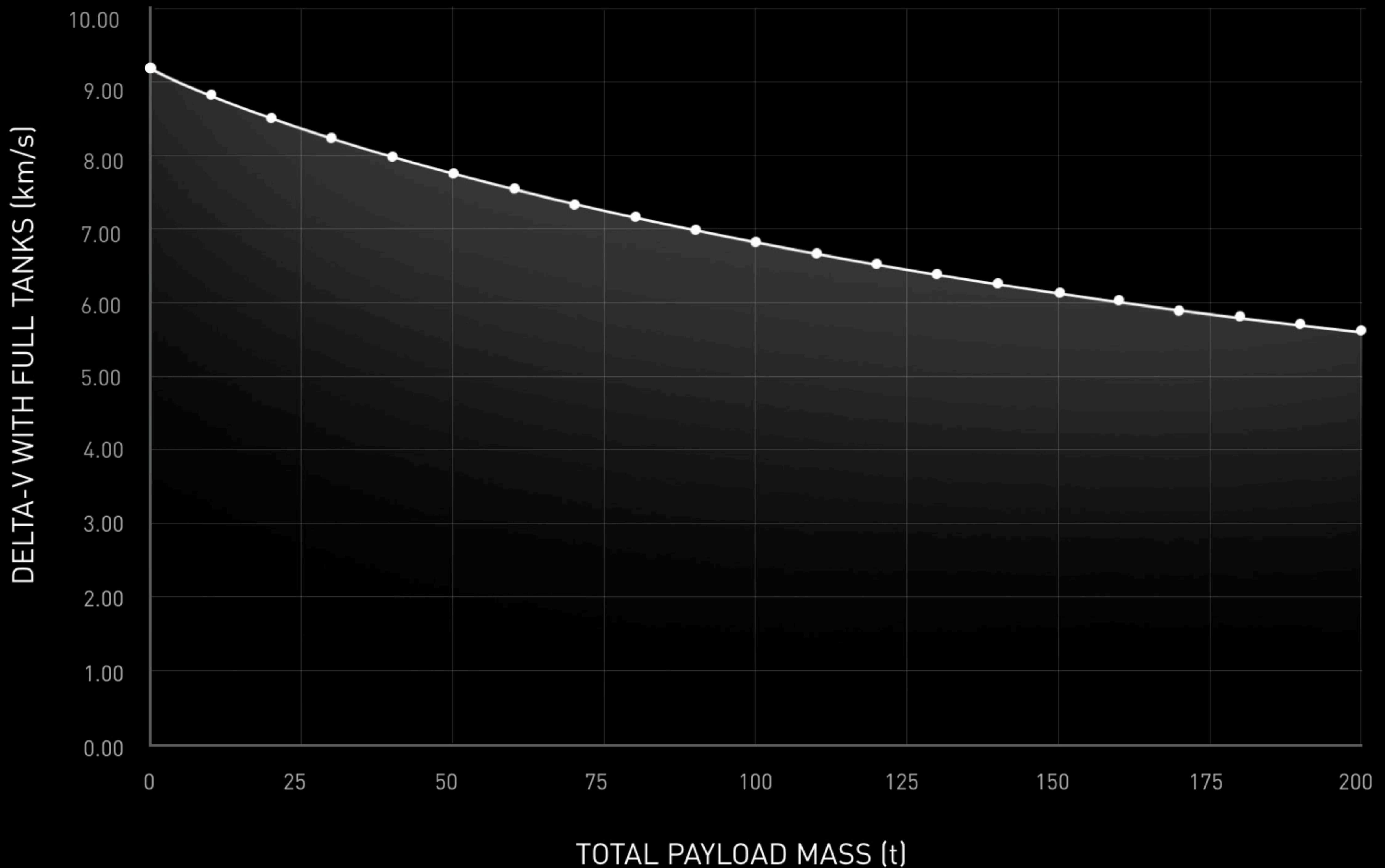
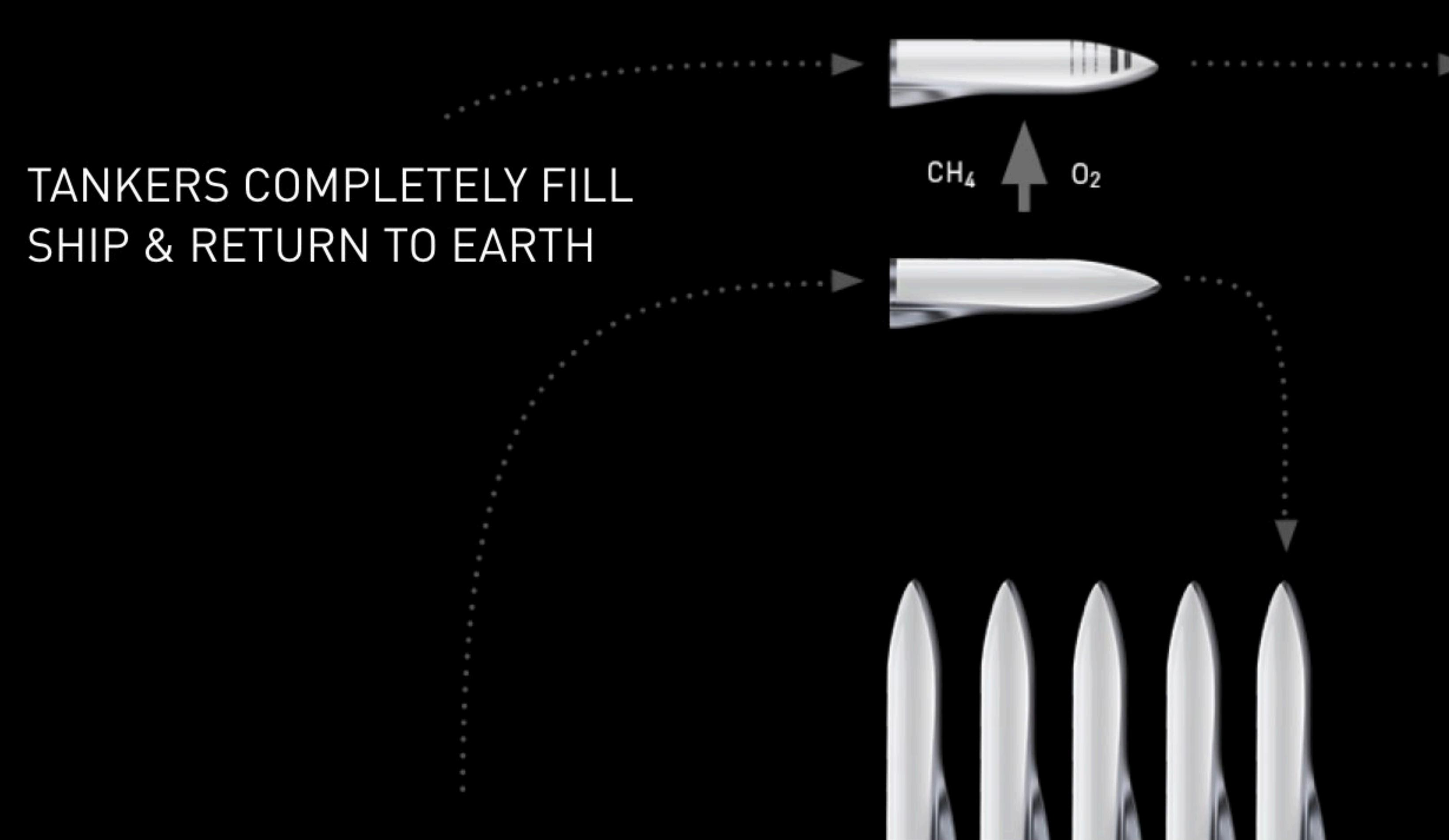
VALUE OF REFILLING

TWO TANKERS



VALUE OF REFILLING

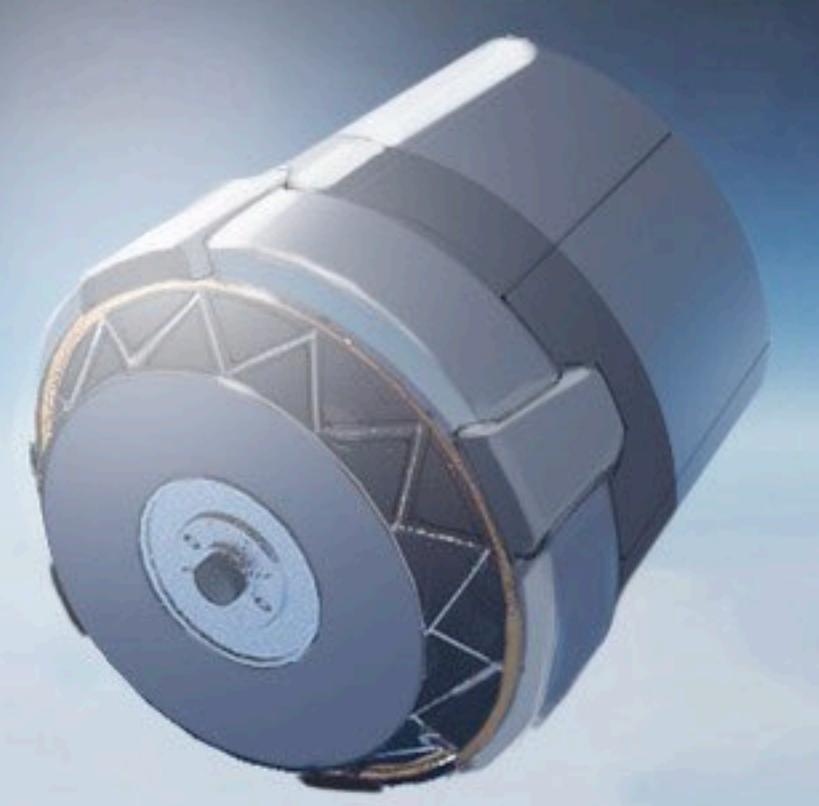
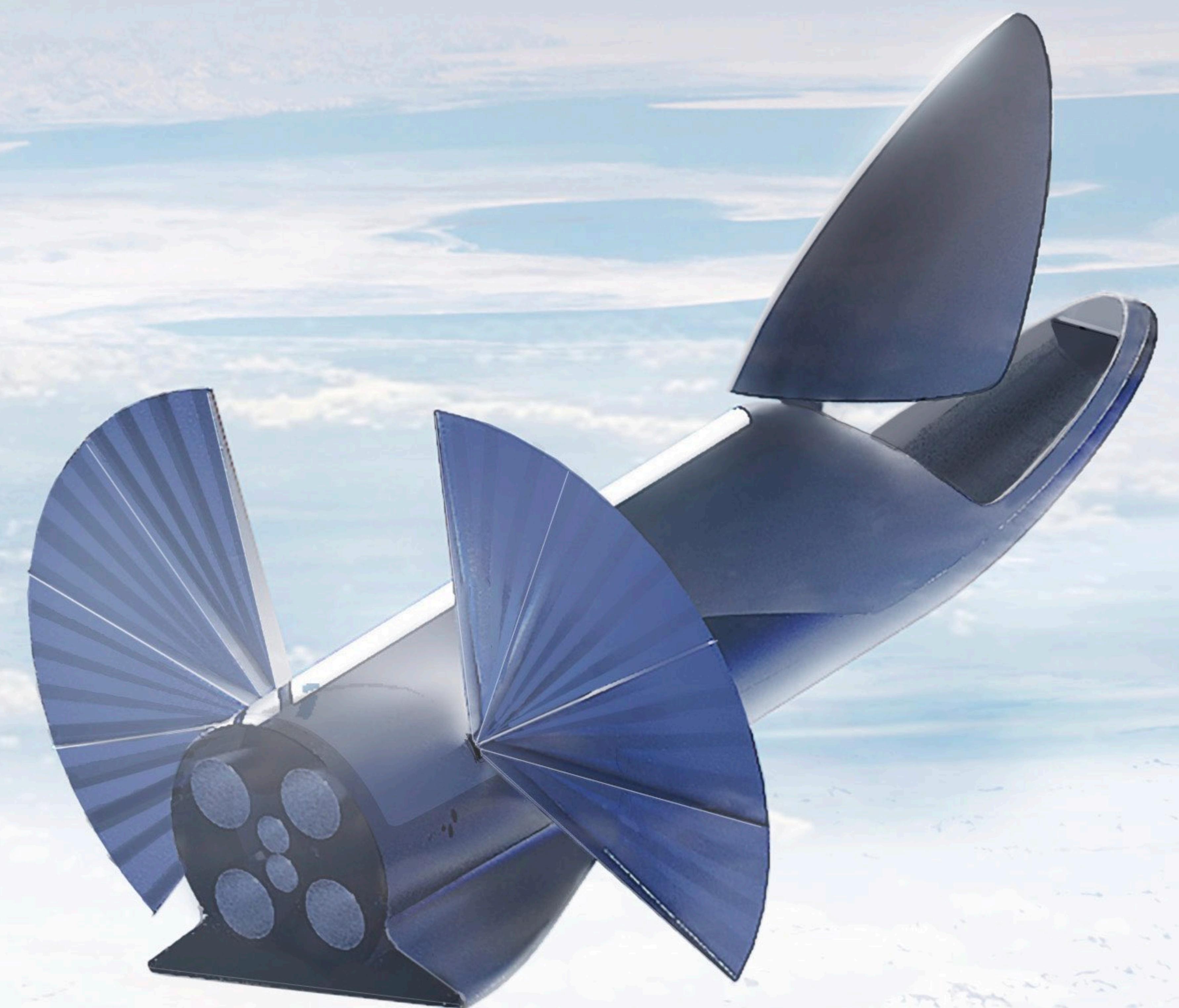
FULL TANKS



A dramatic view of Earth from space, showing clouds and continents against a dark background.

BFR CAPABILITIES

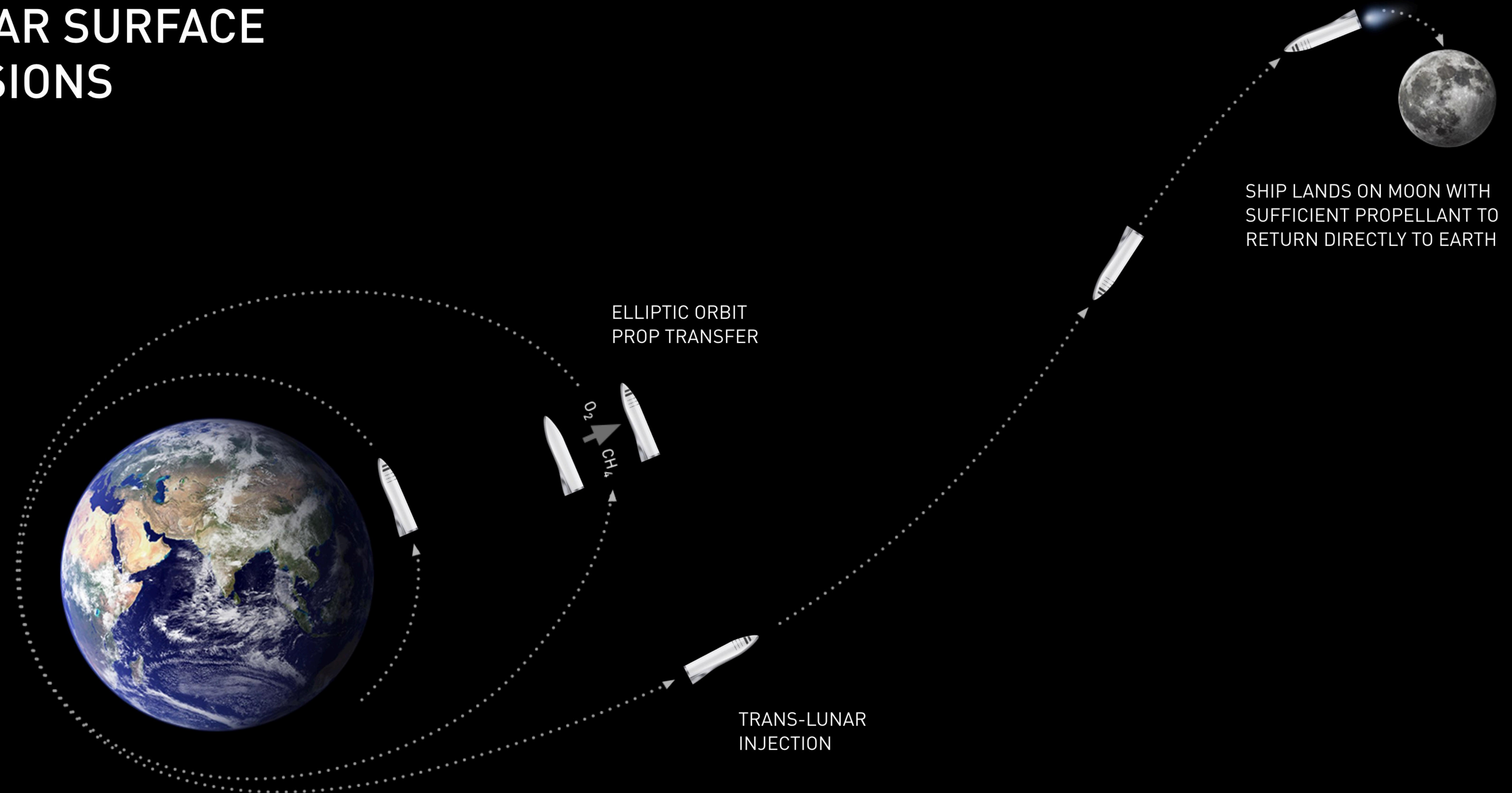
SATELLITES



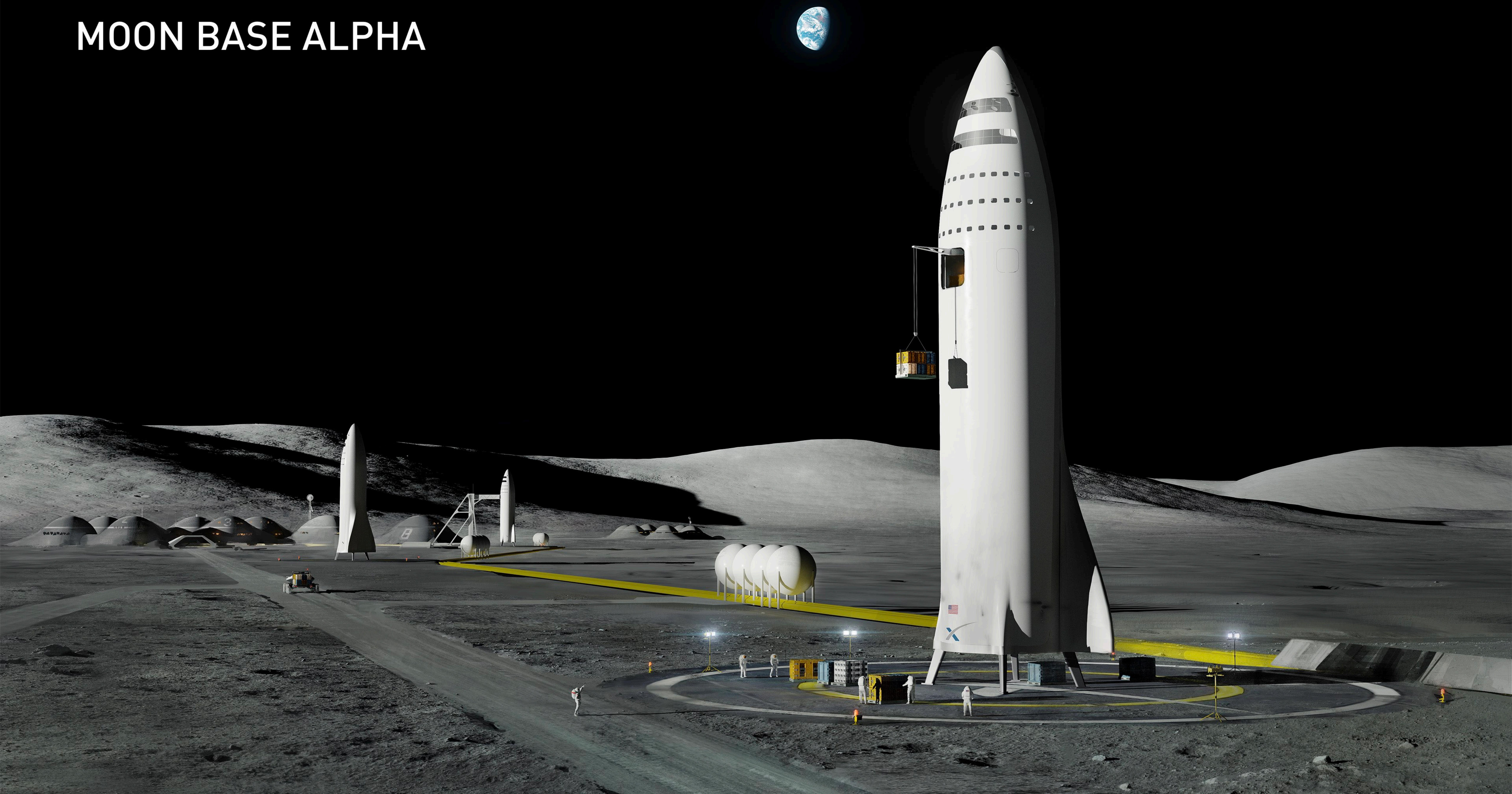
INTERNATIONAL SPACE STATION



LUNAR SURFACE MISSIONS

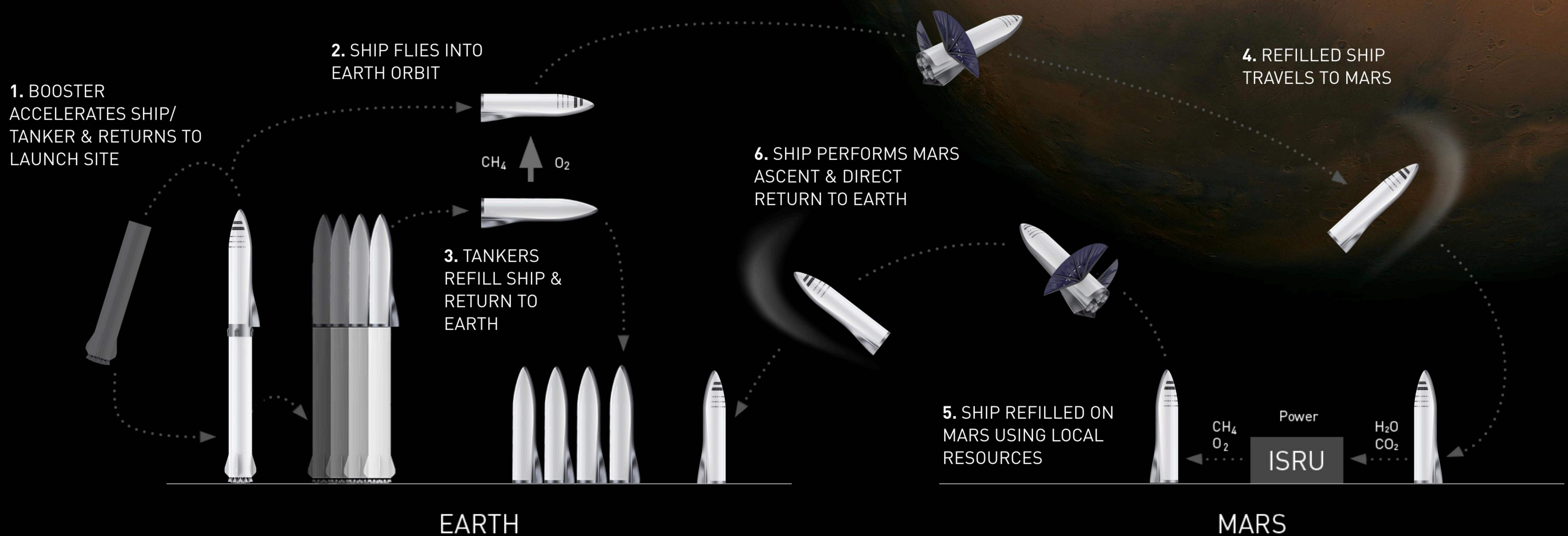


MOON BASE ALPHA



MISSIONS TO MARS

MARS TRANSPORTATION ARCHITECTURE



MARS ENTRY AND LANDING

Hyperbolic entry at up to 7.5 km/s

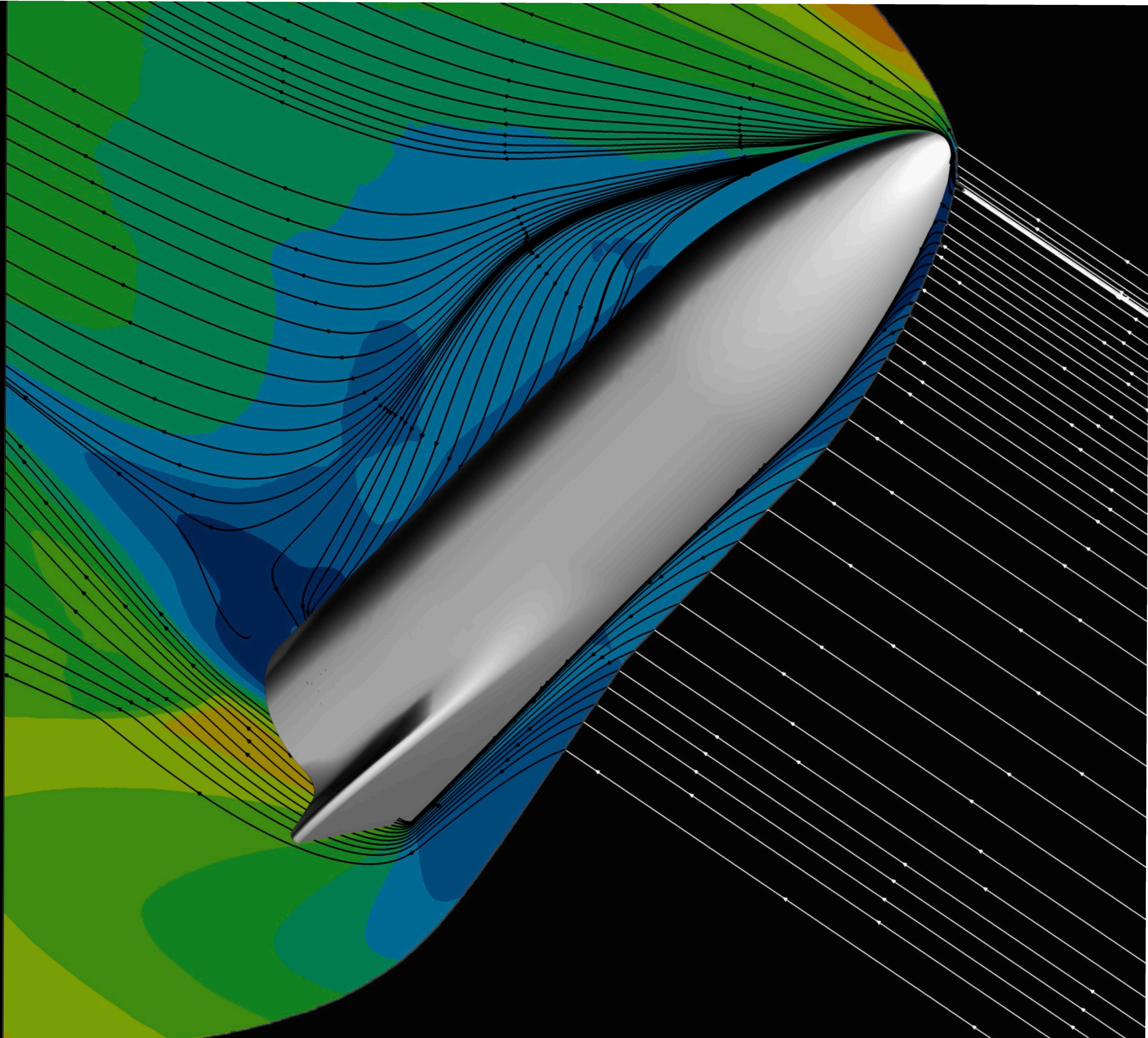
Leverages ablative heat shield materials developed for Dragon vehicles

Peak acceleration of 5 g's (Earth referenced)

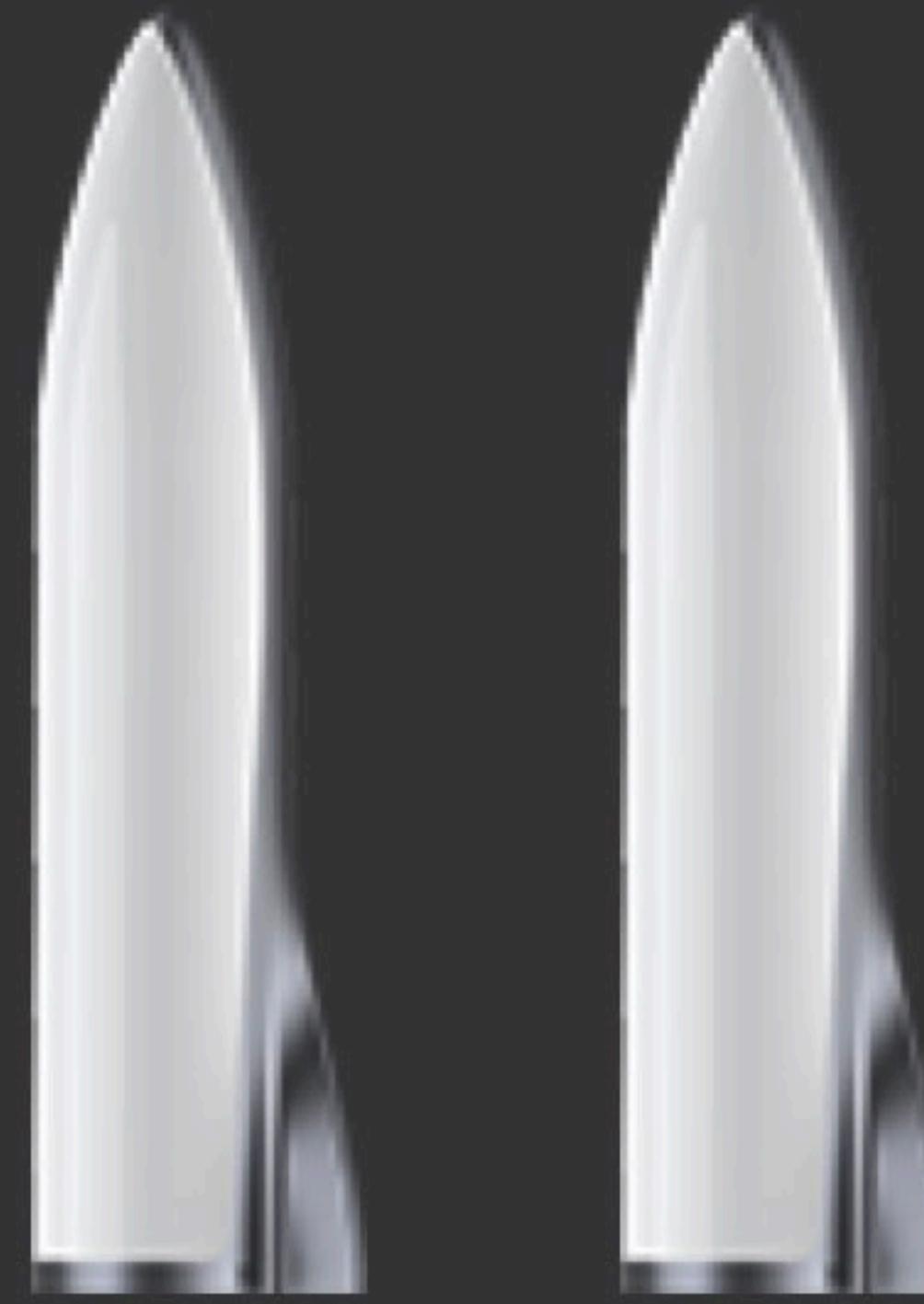
Over 99% of energy removed aerodynamically

Supersonic retropropulsion for landing burn

[WATCH ANIMATION](#)



INITIAL MARS MISSION GOALS



2022: CARGO MISSIONS

Land at least 2 cargo ships on Mars

Confirm water resources and identify hazards

Place power, mining and life support infrastructure for future flights



2024: CARGO & CREW MISSIONS

2 crew ships take first people to Mars

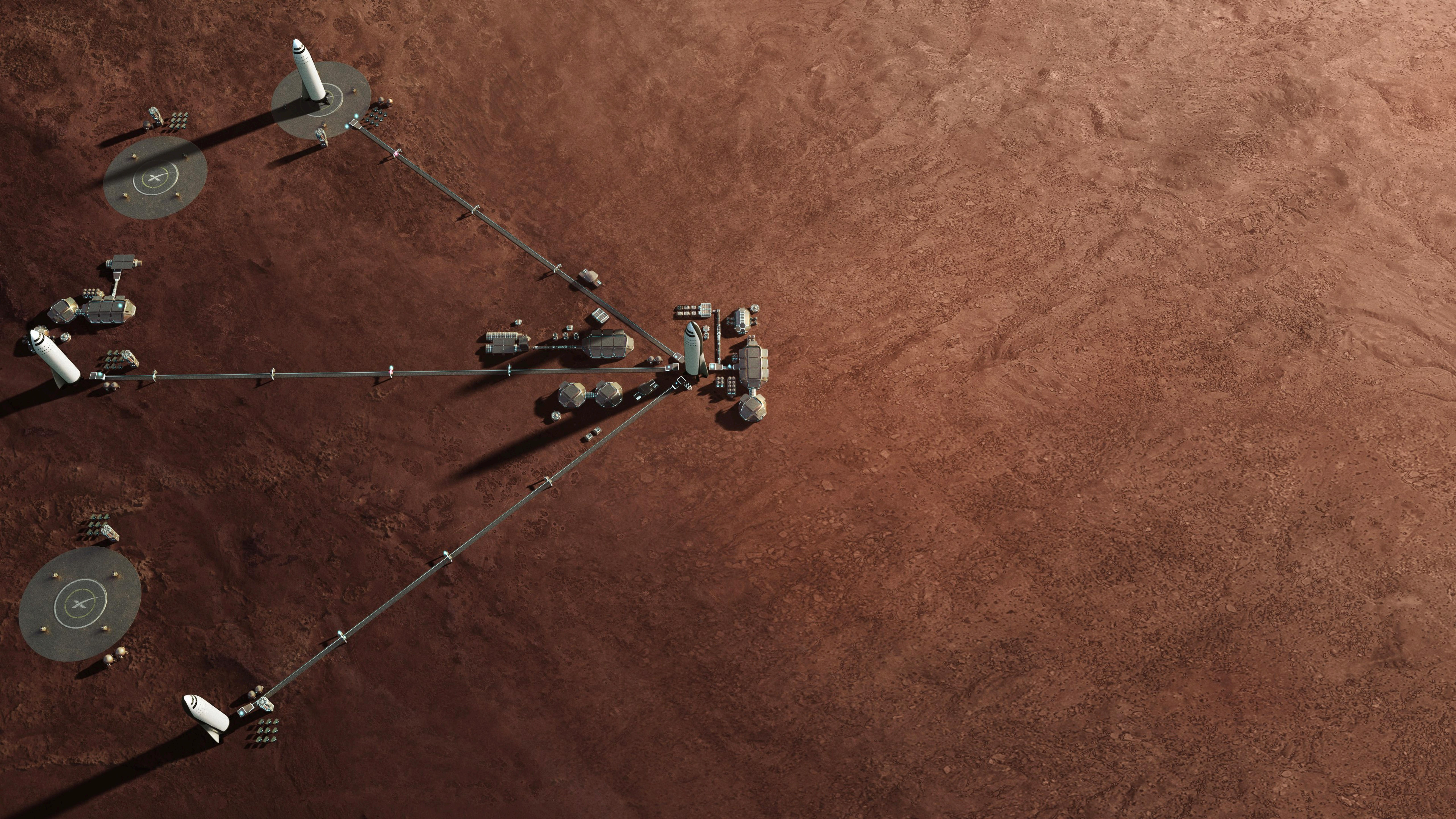
2 cargo ships bring more equipment and supplies

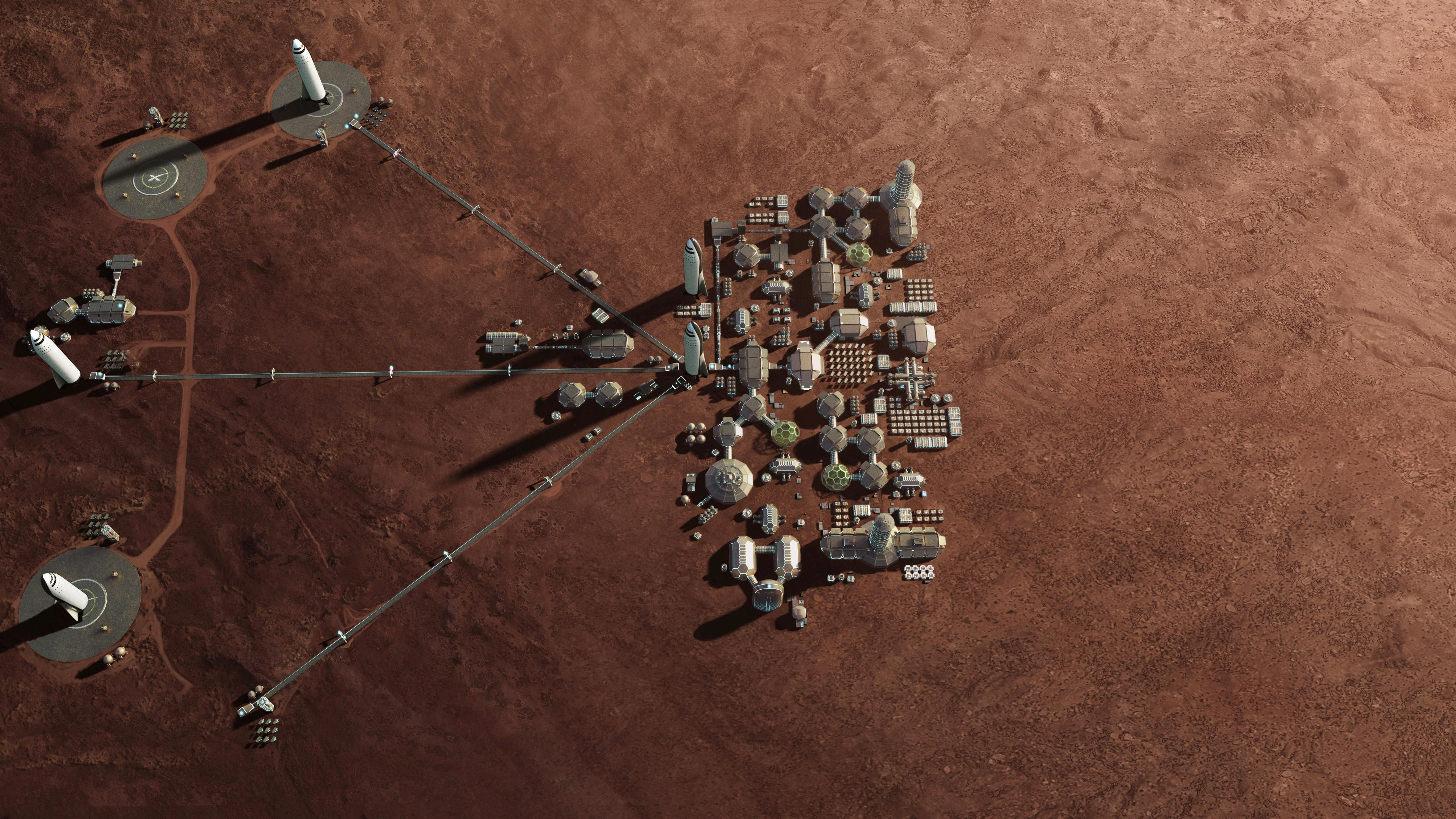
Set up propellant production plant

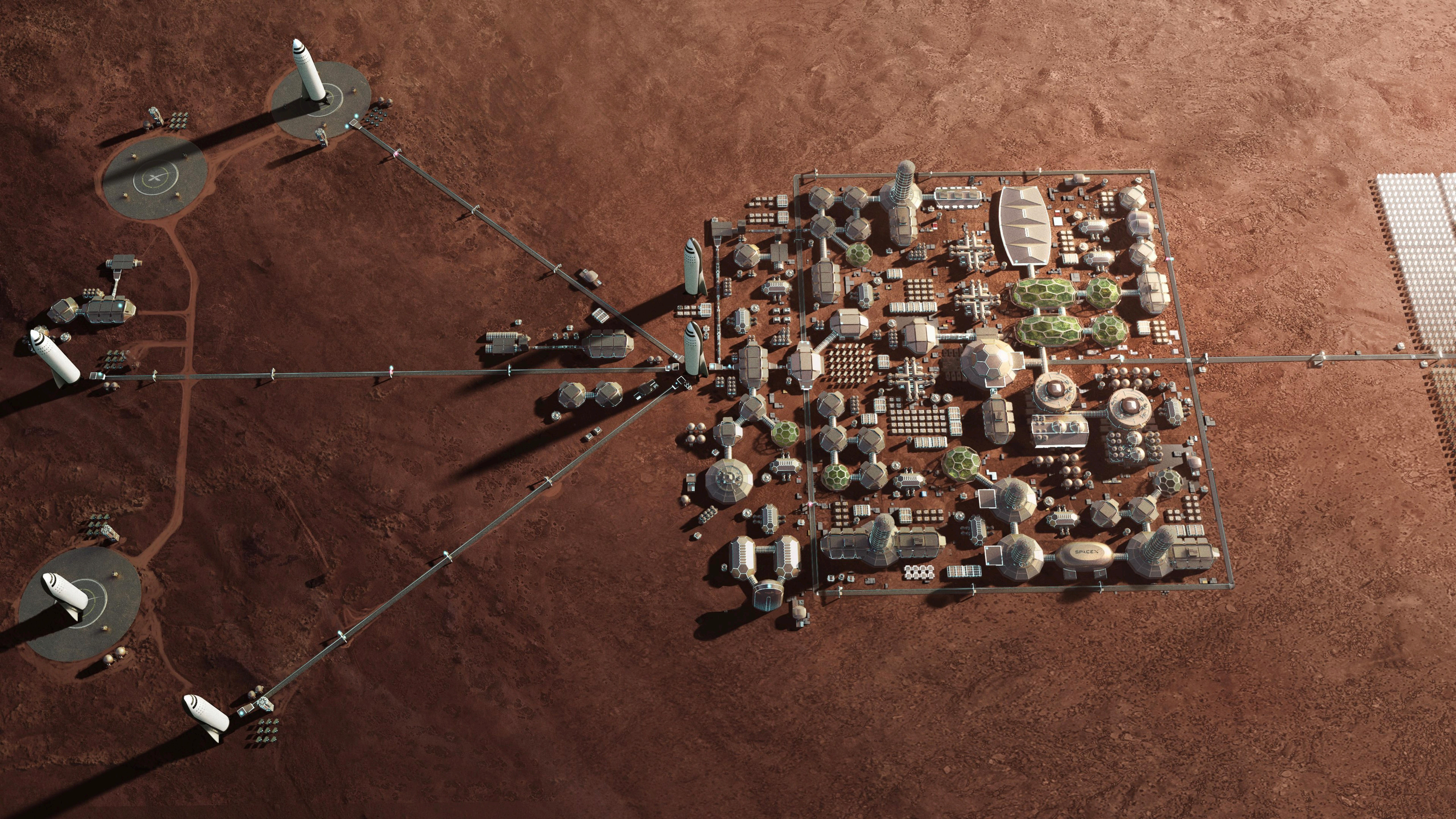
Build up base to prepare for expansion

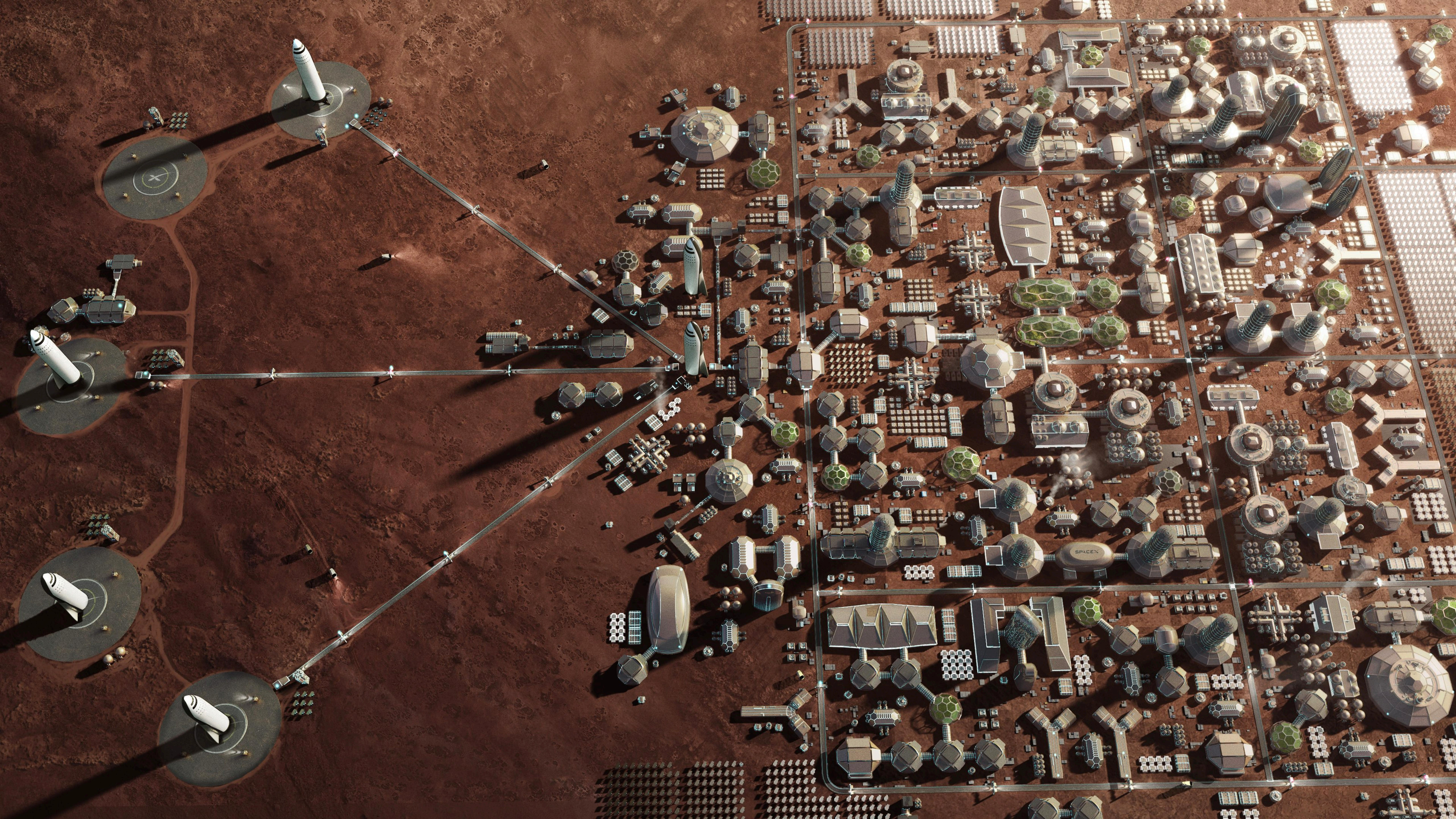


BASE BUILDUP







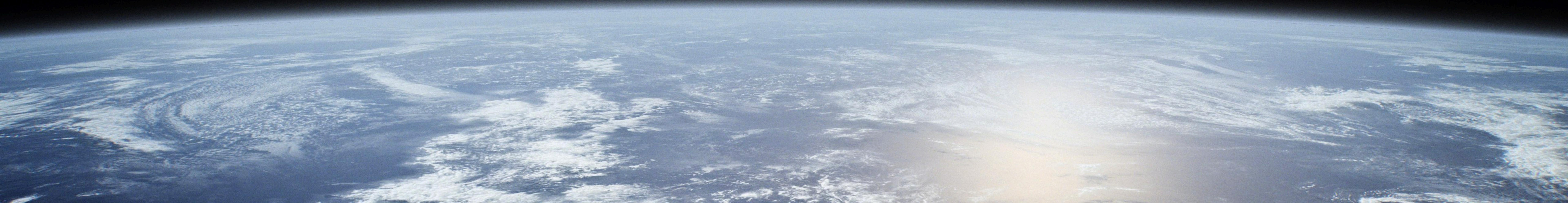




EARTH TO EARTH TRANSPORTATION

BFR has the ability to support Earth to Earth transport, with most of what people consider to be long distance trips being completed in less than half an hour.

Consider how much time we currently spend traveling from one place to another. Now imagine most journeys taking less than 30 minutes, with access to anywhere in the world in an hour or less.



A Boeing 747 aircraft is shown from a low angle, flying towards the viewer. The aircraft is white with blue and grey accents. It is set against a background of a colorful, pixelated landscape with various shades of green, blue, and red. The sky is clear and blue.

WATCH EARTH TO EARTH FILM