INSIGHT
SURFACE BASE DESIGN

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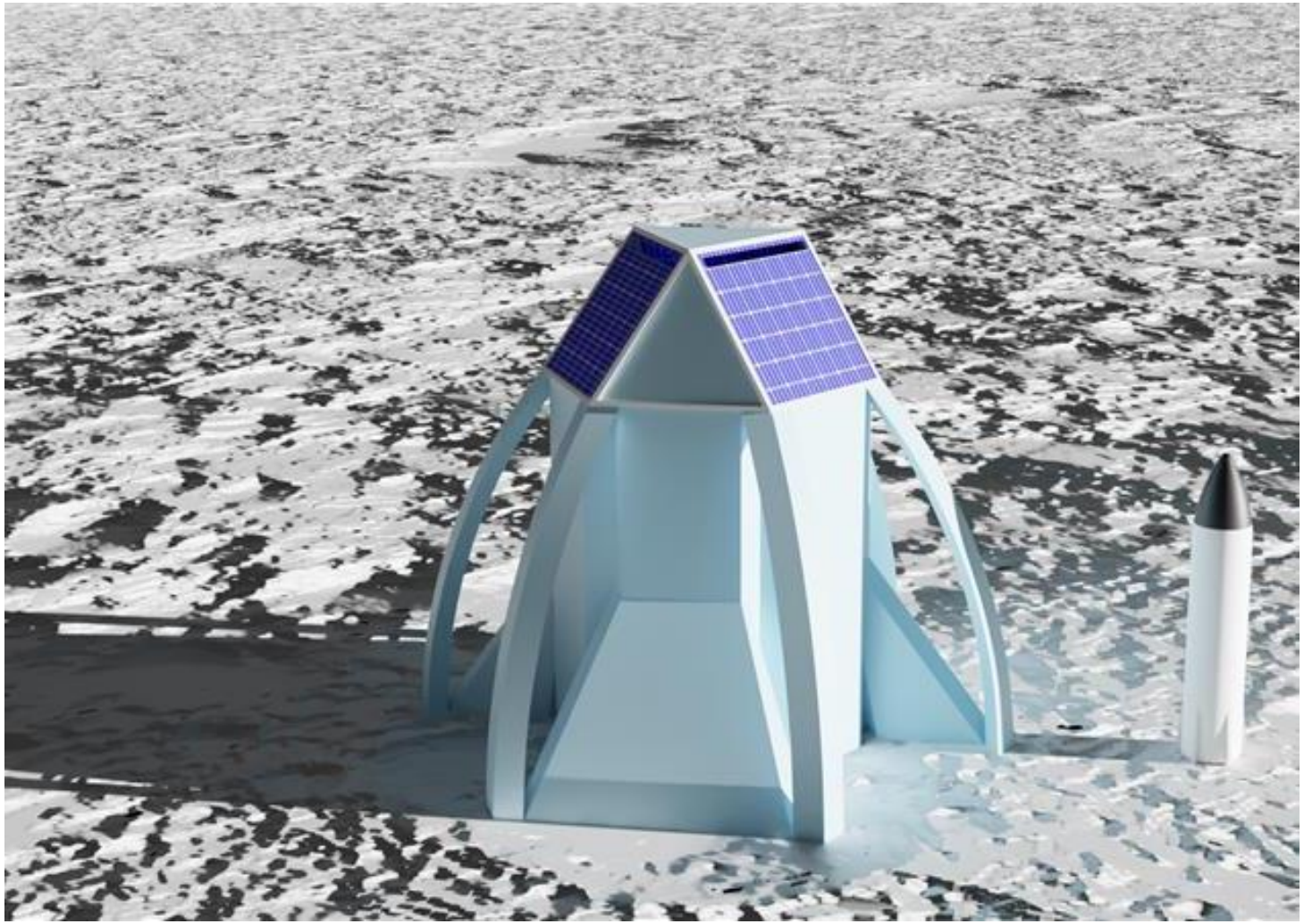
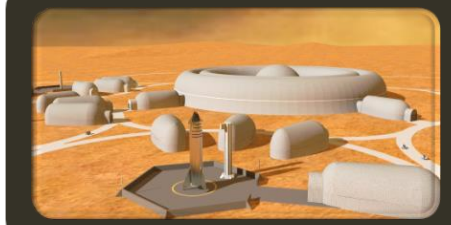


3D Illustration by Aarya Singh

GRAND CHALLENGES OF SPACE SETTLEMENT

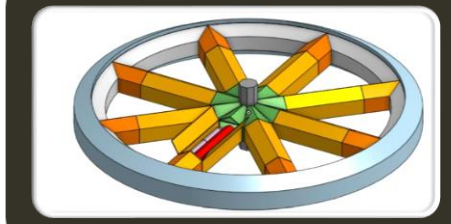
Launch/LEO	Deep Space	Moon/Mars	Settlement
Affordable Launch	Solar Flares	Moon Landing	Air/Water
Large Vehicle Launch	GCR: Cell Damage	Mars EDL	Power and Propellant
Orbital Refueling/ Mass Fraction beyond Earth Orbit	Medication/ Food Expiration	Spacesuit Lifespan	Base Construction
Space Junk	Life Support Closed Loop	Dust Issues	Food Growth
Microgravity (health issues)	Medical Entropy	Basic Power/ Propellant Production	Surface Mining and Extraction
	Psychology	Return Flight to Earth (speed, mass, etc.)	Hybrid Manufacturing
	Mechanical Entropy	Planetary Protection	Reproduction

BEGIN WITH THE END IN MIND



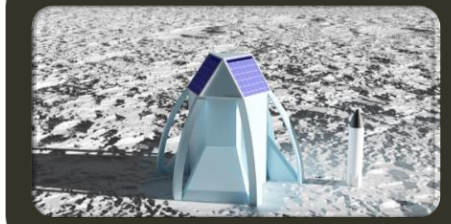
2045: Eureka (2019)

- 1000-person permanent surface design with artificial gravity
- Extensive use of native materials.



2032: Starport (2020)

- Centrifuge ring of Starship-derived “train cars” in GCR/Debris shield
- Modular standards introduced for Starship-rooted construction



2028: Insight (2021)

- Starship-derived Moon/Mars base with full food production for 30
- Same structure as ring, but vertical, and compatible with surface rings

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EXPLORATION REQUIRES SHIPS.

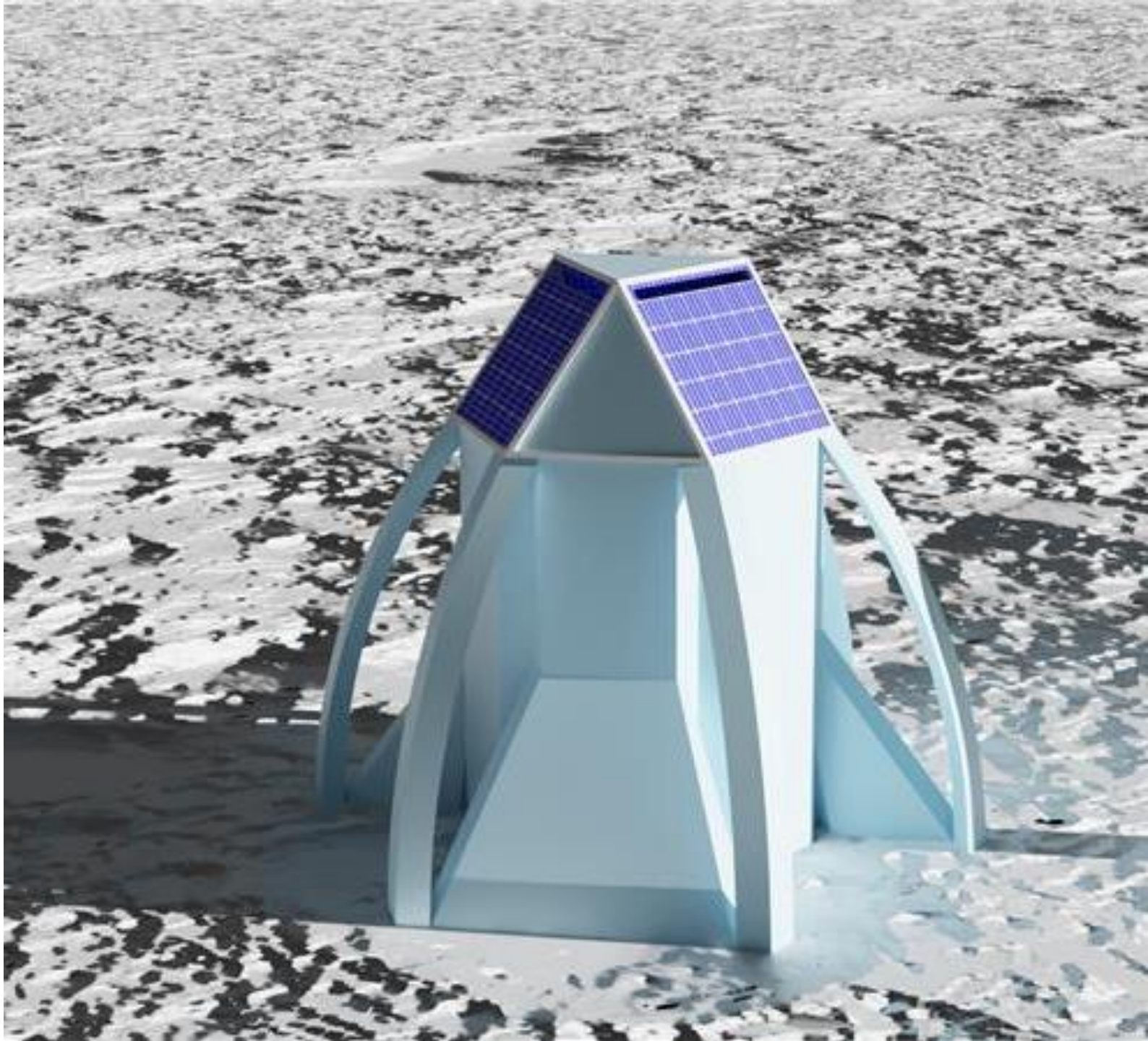
SETTLEMENT REQUIRES PORTS.

MOVING FROM EXPLORATION TO OUTPOSTS

Motive/Need	Exploration	Outpost
Access Vehicle	• Expendable and Minimalist	• Large, Reusable and Serviceable
Consumables	• Imported	• Local Sourcing and Refining
Basic Shelter	• Short Term, Small, and Fragile	• Long term, large, durable, and expandable
Storm Shelter	• OK for basic flares, but not large ones • Exposure comparable to ISS	• Full shielding of crew and electronics from flares, 10-100 times that of ISS for GCR.
Construction	• All materials soft-landed. • Short operational life of mission	• Local bulk materials with imported frameworks and tooling. • Process in place to adopt native feedstock and simplified construction methods.

INSIGHT: OUTPOST HABITAT

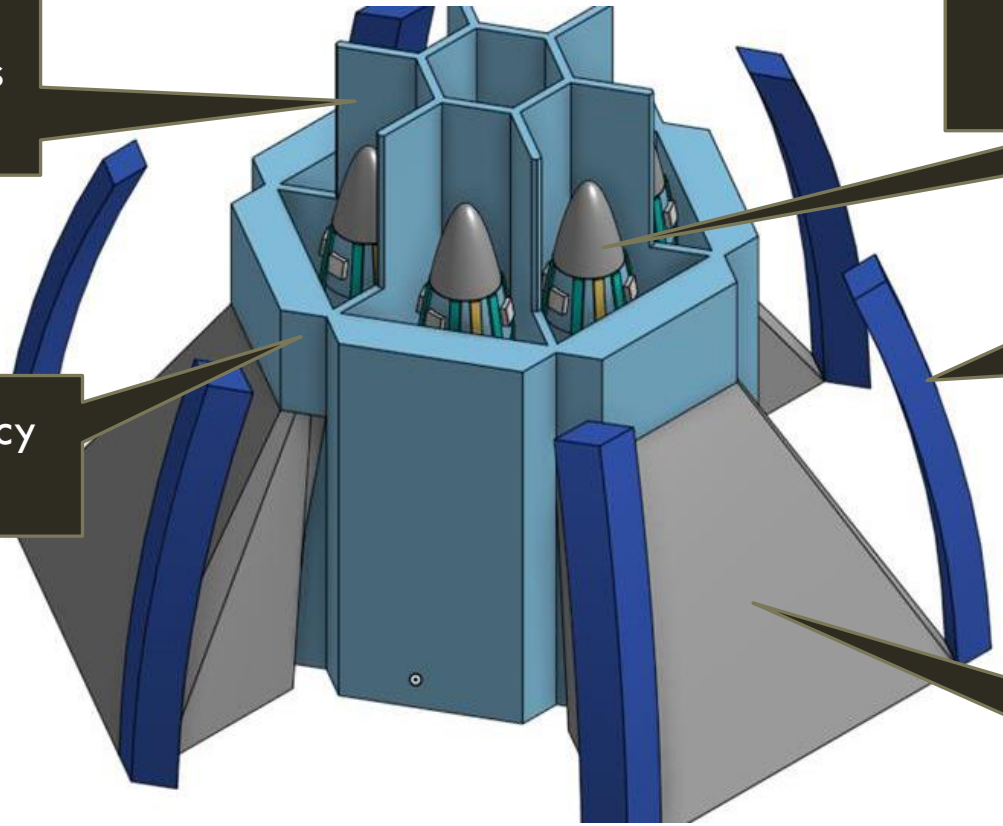
3D Illustration by Aarya Singh



OUTPOST INTERIOR

Expansion space for local semi-pressurized and pressurized spaces using modular designs.

Four Lunar Starships enclosed, with capacity for seven depending on base design.

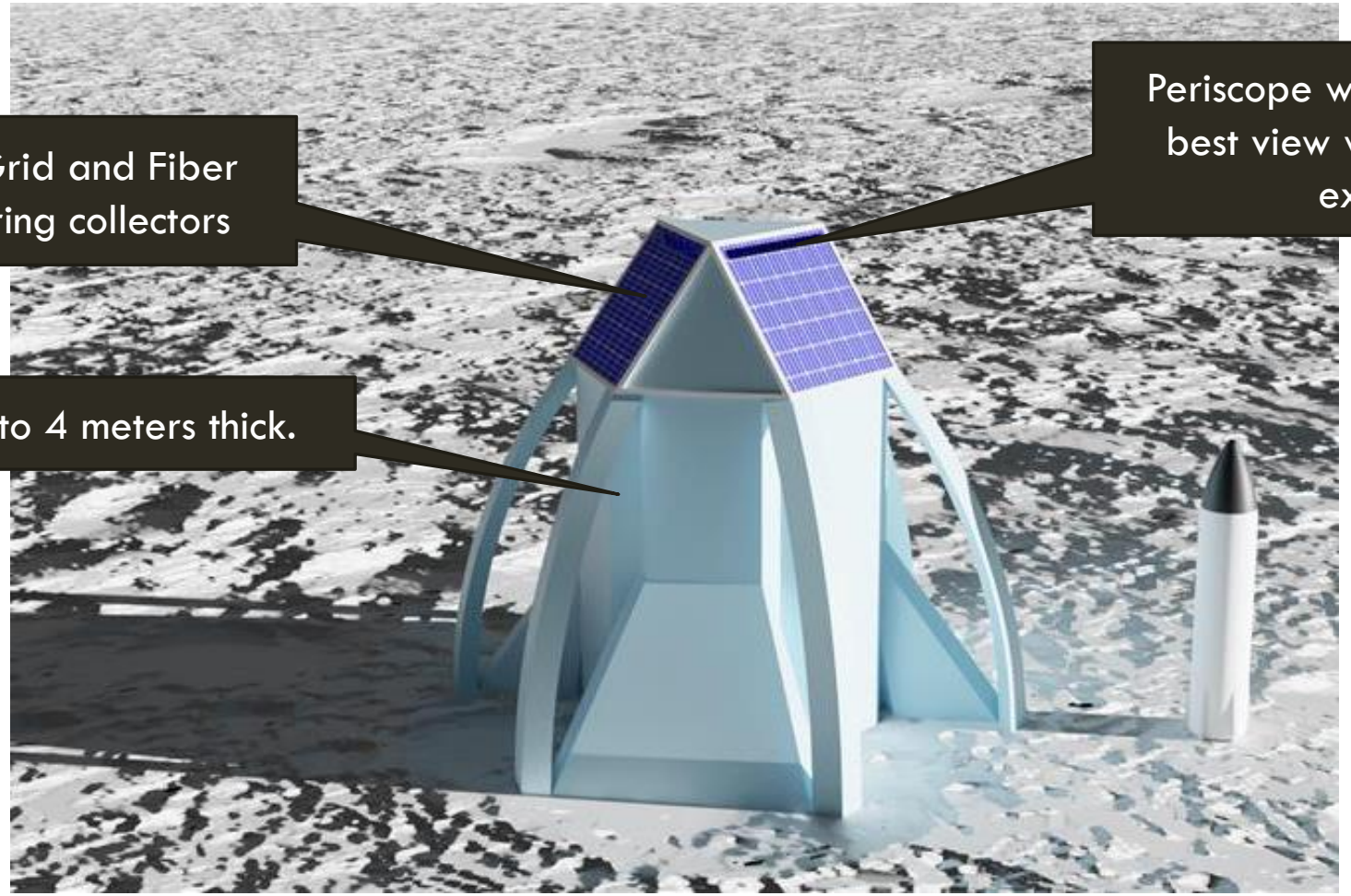


Gaps for windows and emergency airlocks

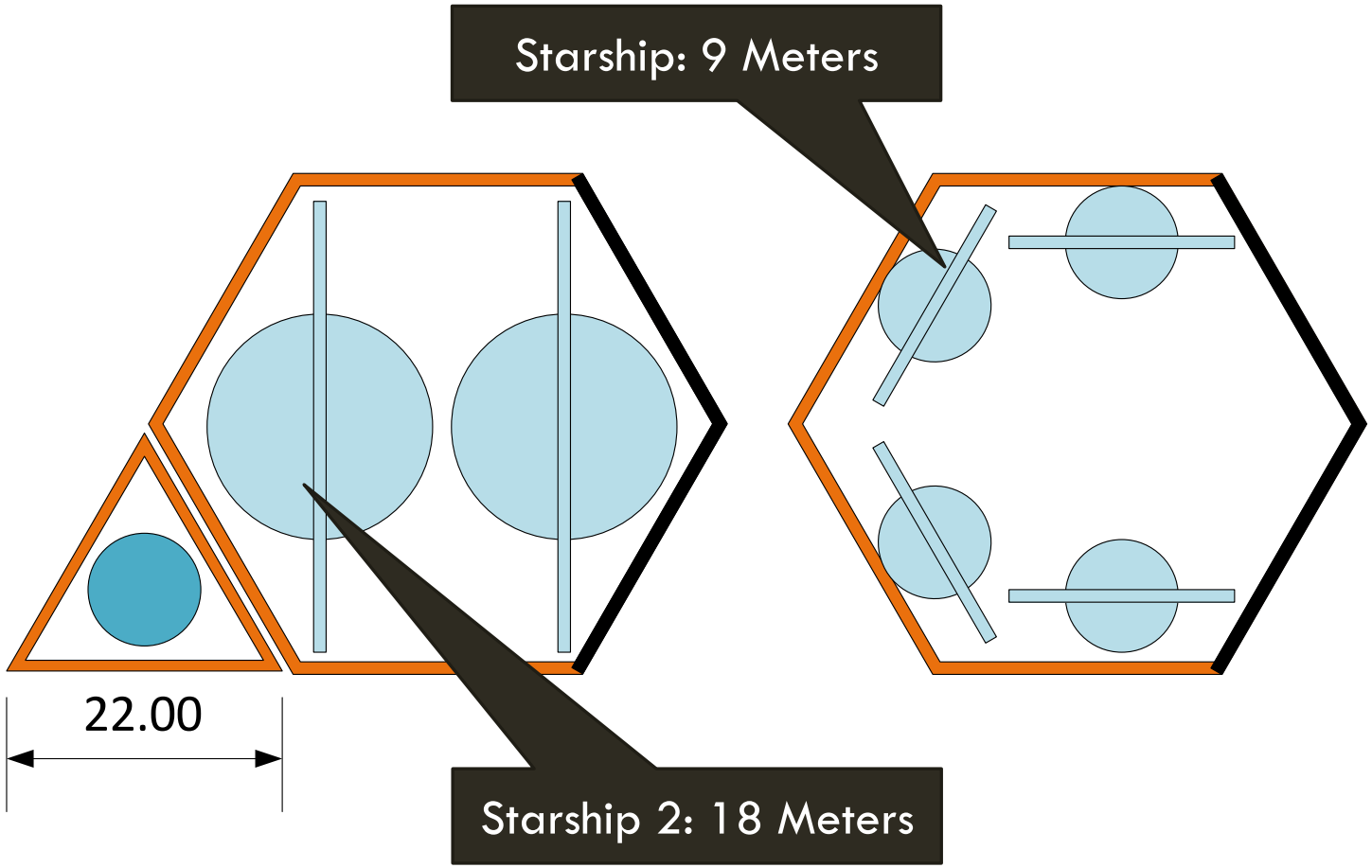
Support Buttress for shield walls also block radiation from exposed windows.

Garage spaces for surface vehicles under support walls

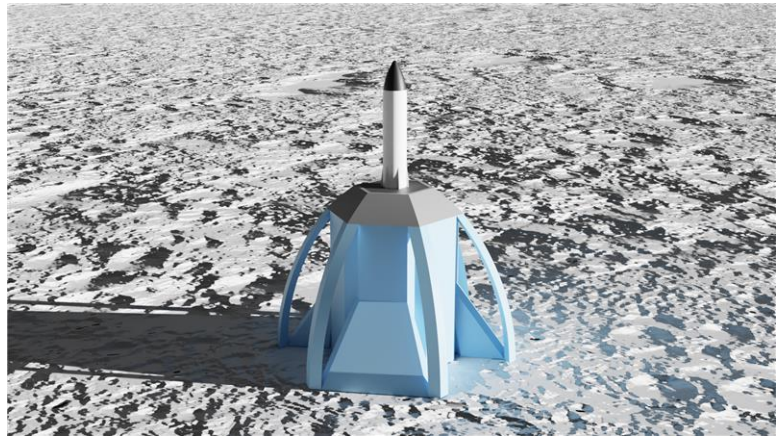
OUTPOST EXTERIOR

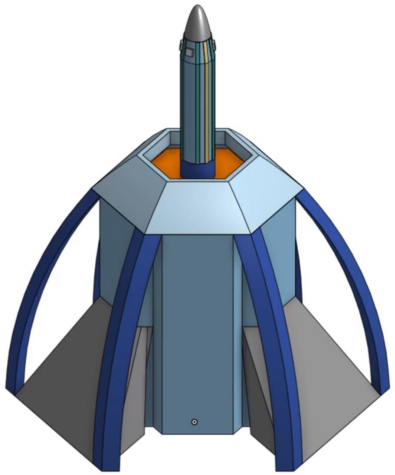


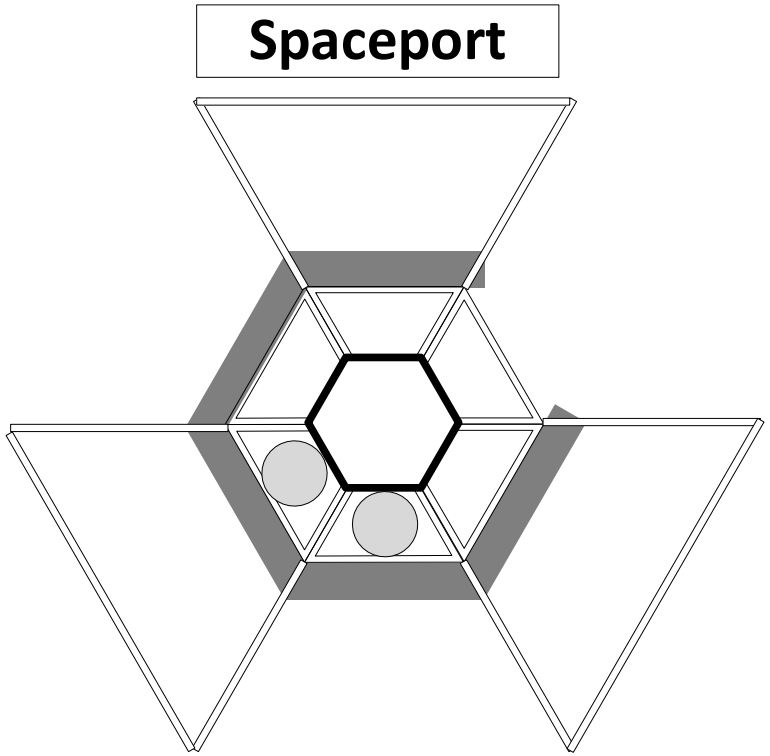
22 METER BASELINE FOR "FUTURE PROOF" GEOMETRY



SPACEPORT



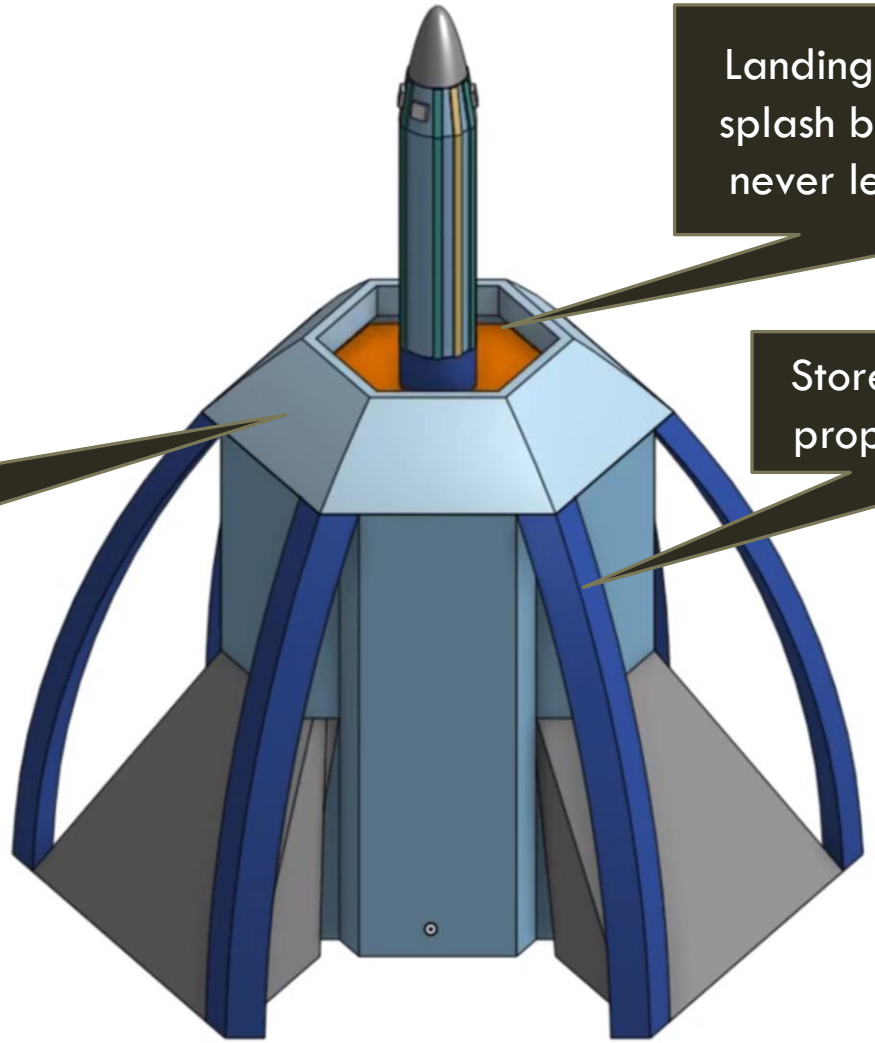




SPACEPORT ENGINEERING

Landing pad is 60 meters above surface and 16 meters across.

Angled sides have open “Tesla valve” texture to redirect plume away from surface



Landing pad elevated to minimize splash blast on surface. Thrust lines never less than 100 m to regolith.

Stored Starships can cache propellant, be maintained.

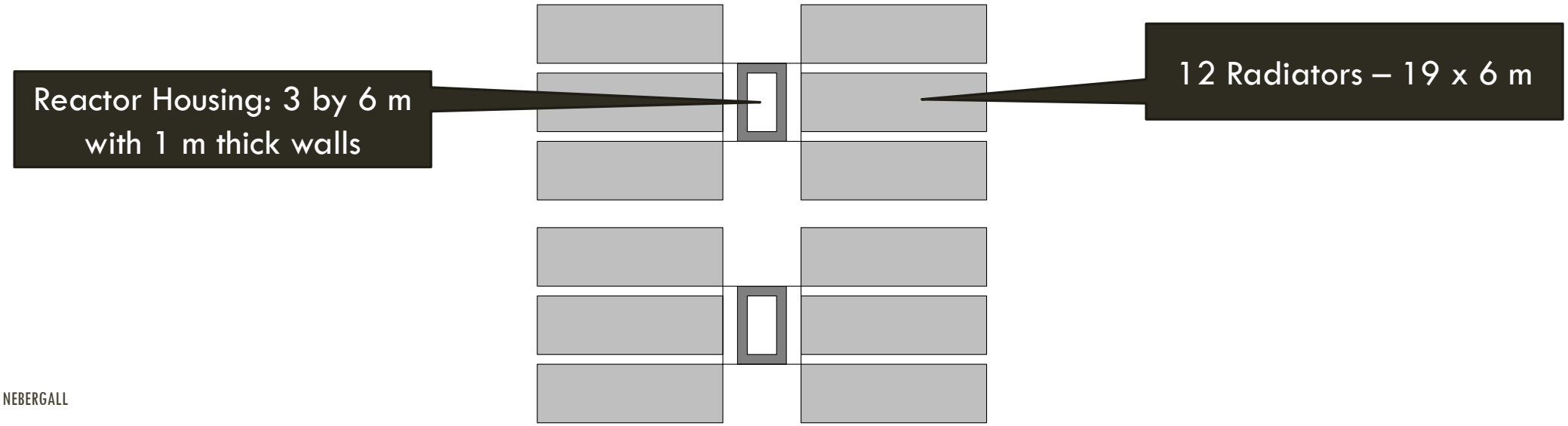
POWER SUPPLY AND DEMAND

		watt/ M^3	% of day	Watts/ M^3	% of day	Load	Total kWe
Habitat	Crew Space	40	75%	20	25%	35	140
	LED Garden	250	75%	1	25%	188	751
	Total						891
Industrial	Single Reactor	1200 kWe			Industrial Power Allowance:		400
	Dual Reactor	2400 kWe		Reserves for rovers, heavy construction, sintering, and early industrial prototype work.			1600

POWER PLANT

Low-Enriched Uranium (Megapower) reactor – Box Truck sized

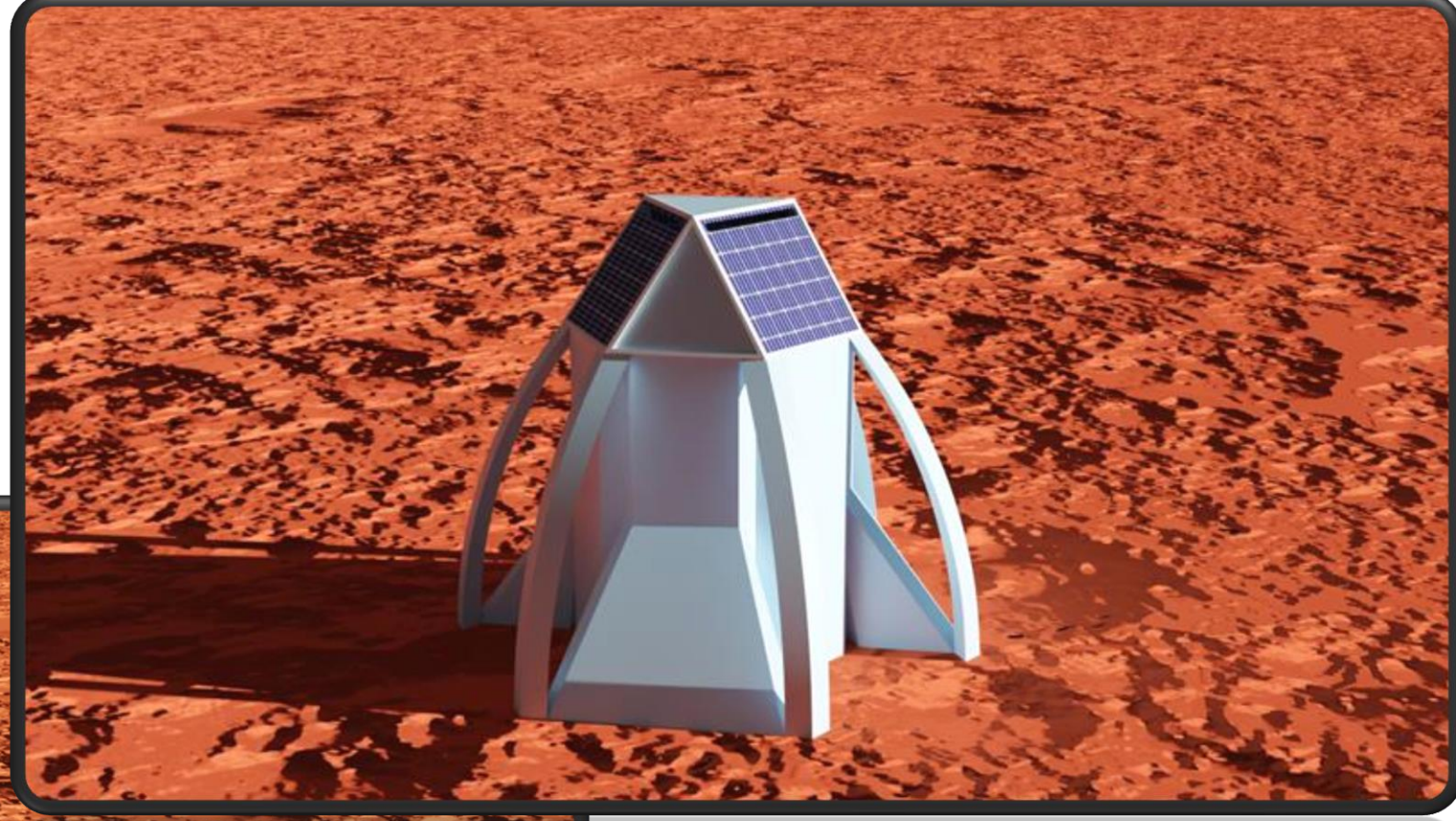
Sunshade/solar panels over radiators to provide additional power during full sun, when radiators from reactor least efficient.

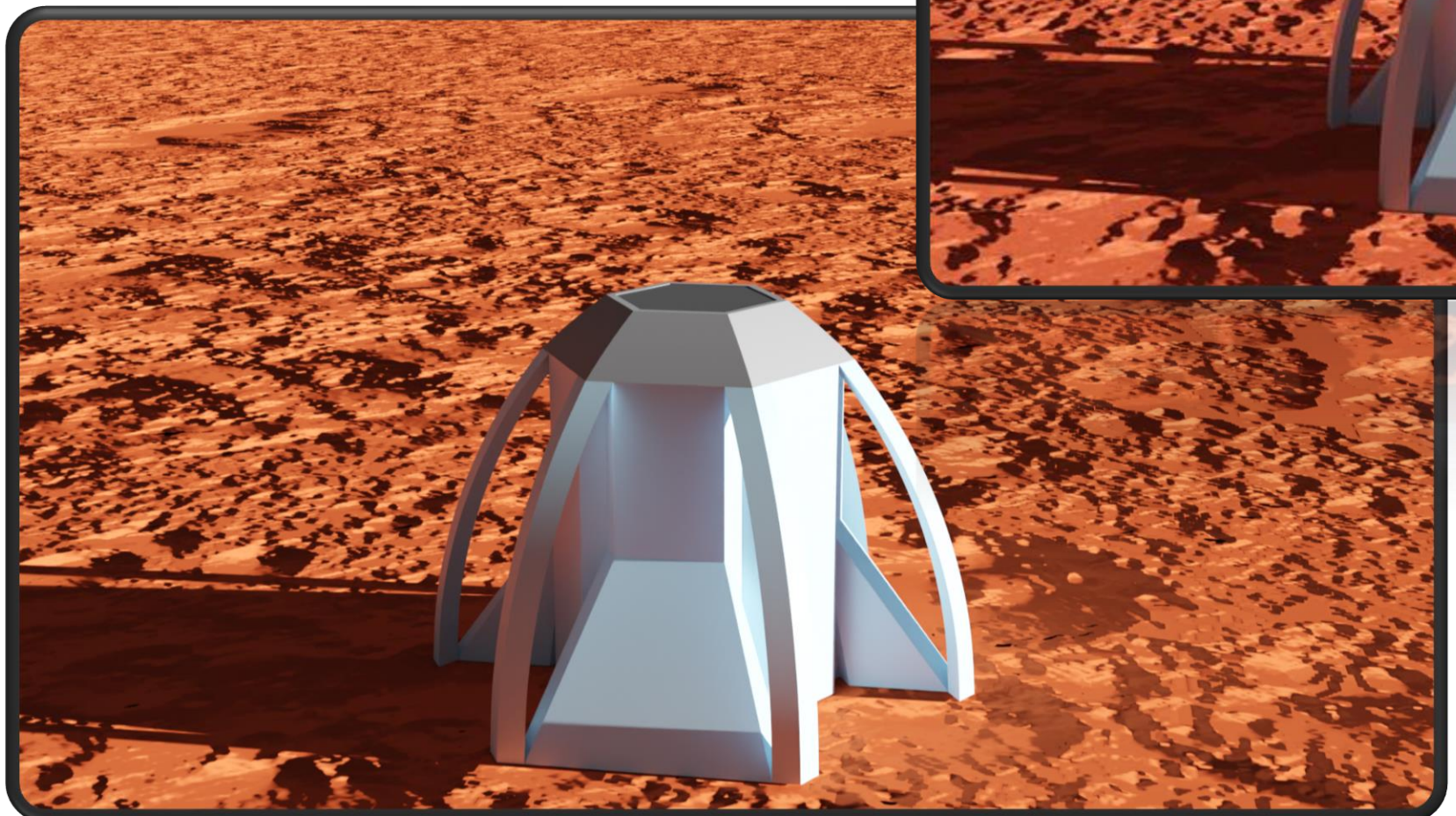


POWER SUPPLY

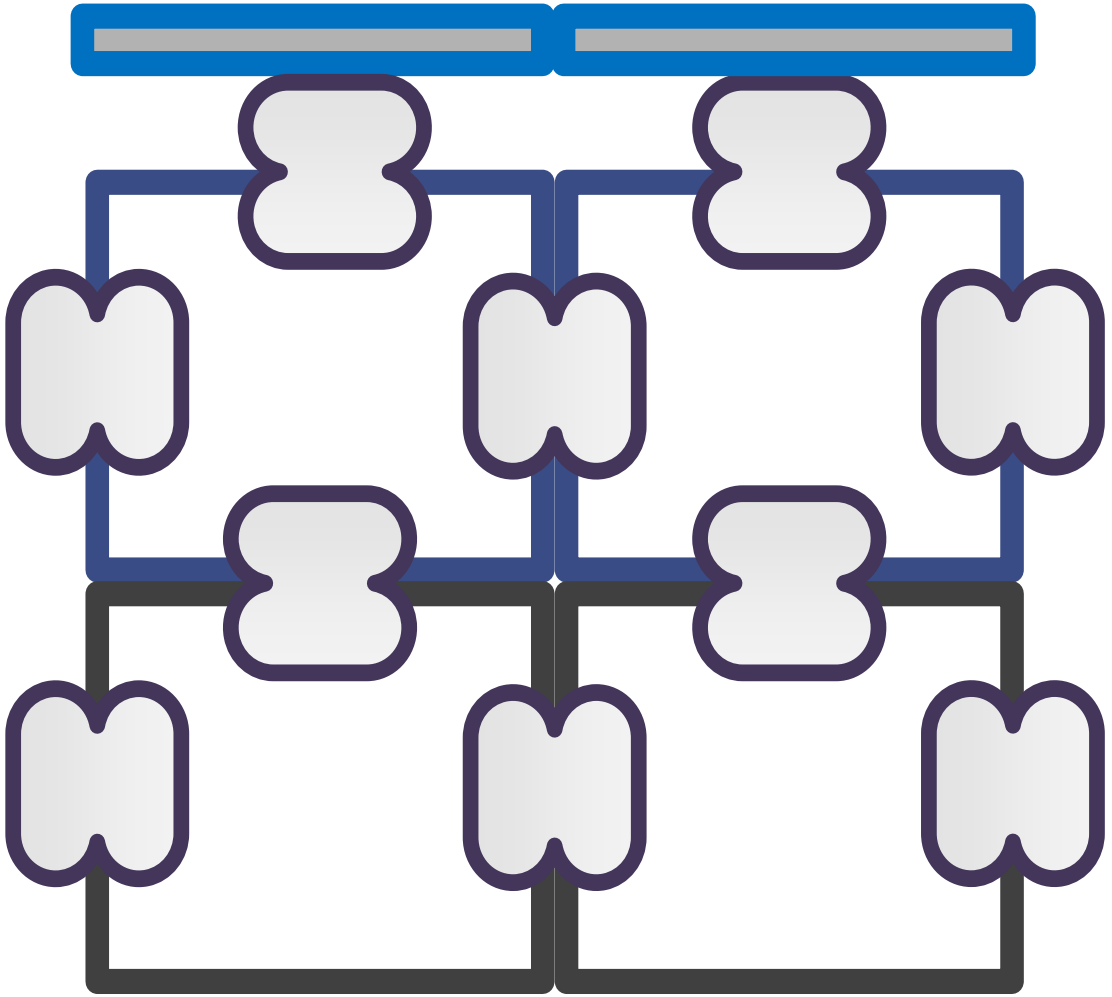
Component	Watts	Surface Area	Size
Reactor Housing	12 MWe		• 3 H x 3 W x 6 H meters • Add 1 meter to all walls for shielding
Radiators	120 MWt	600 sq. meters	• 19 x 6 meters per radiator. Six panels.
Photovoltaic Array	128 KW-e Max	600 sq. meters	• 19 x 6 meters per radiator. Six panels. • Offsets 6 percent efficiency loss from daytime heating of radiators.
Dual Reactors	24 MWe		• Can shut down one reactor and still cover full habitat base load. • Secondary reactor for industrial load and backup power to habitats

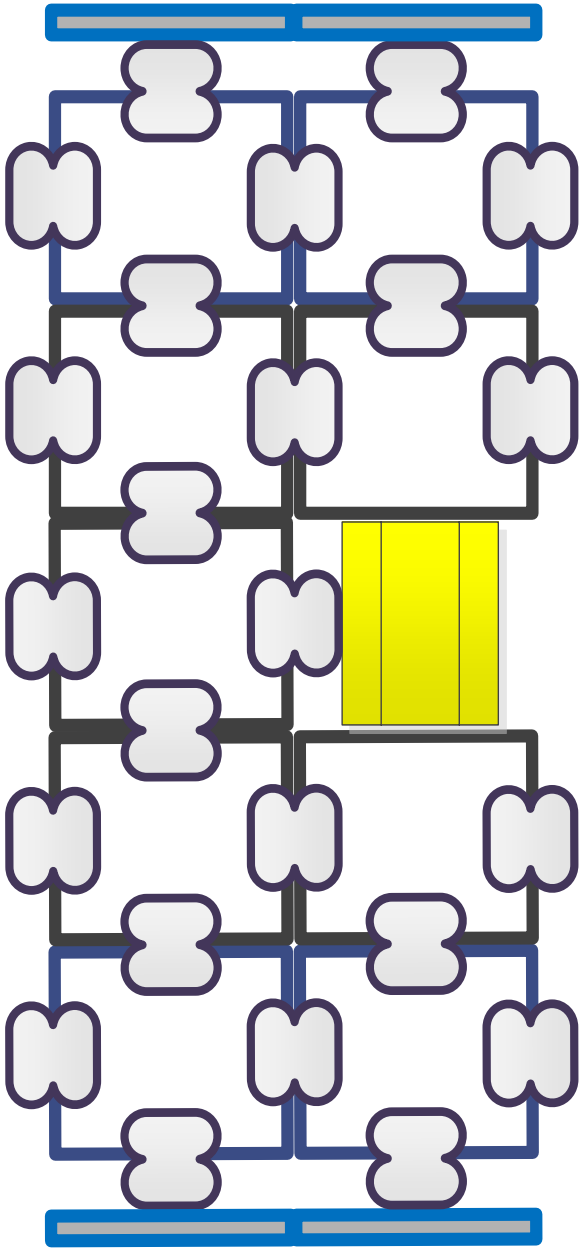
MARS VERSIONS



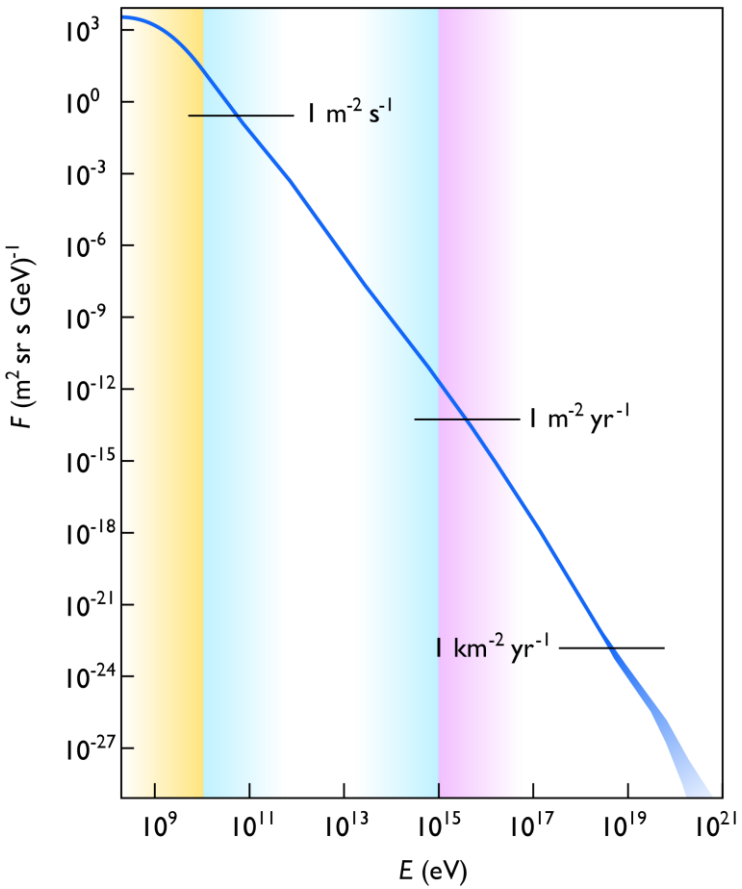


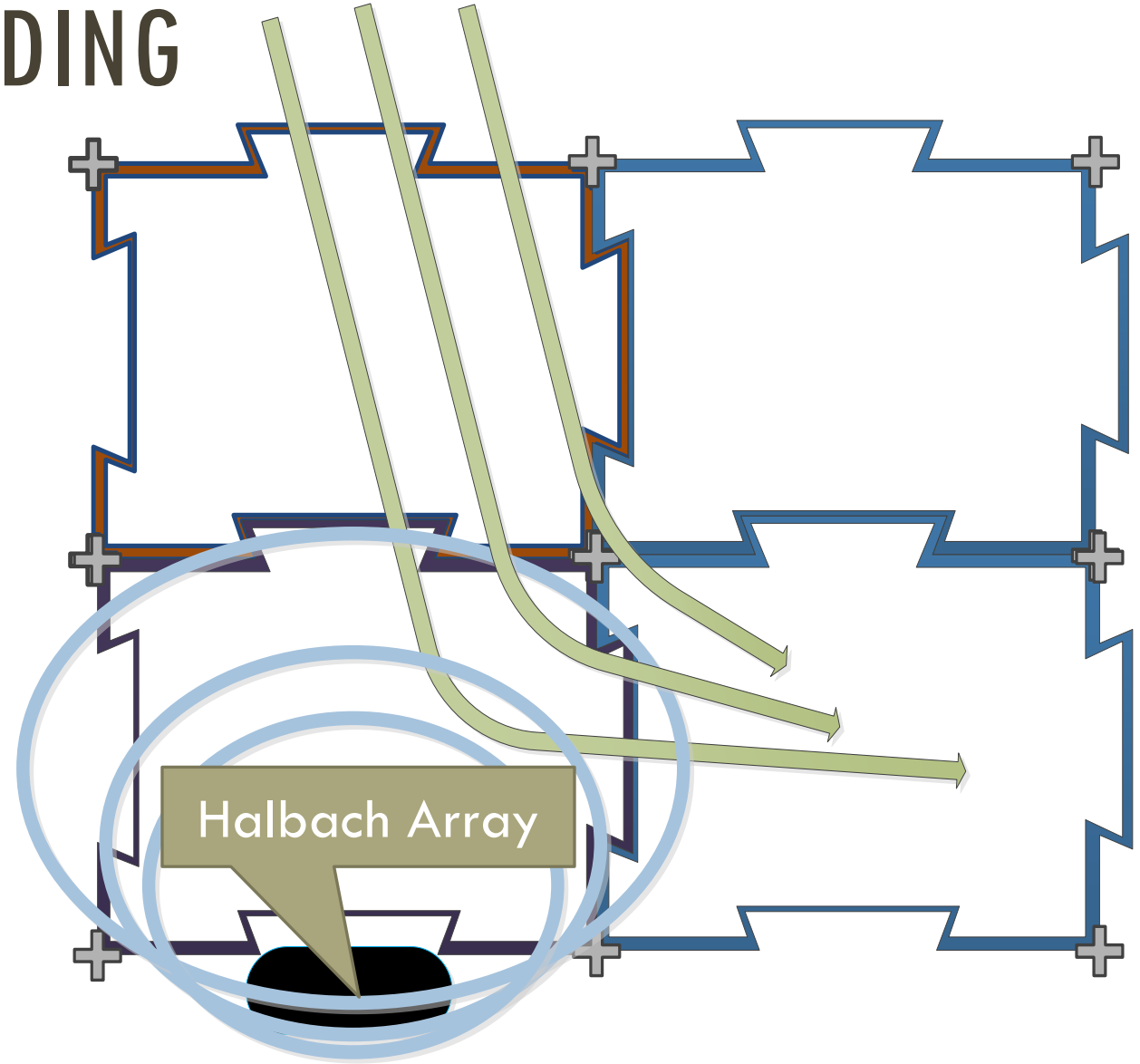
MODULAR PYKRETE CONSTRUCTION



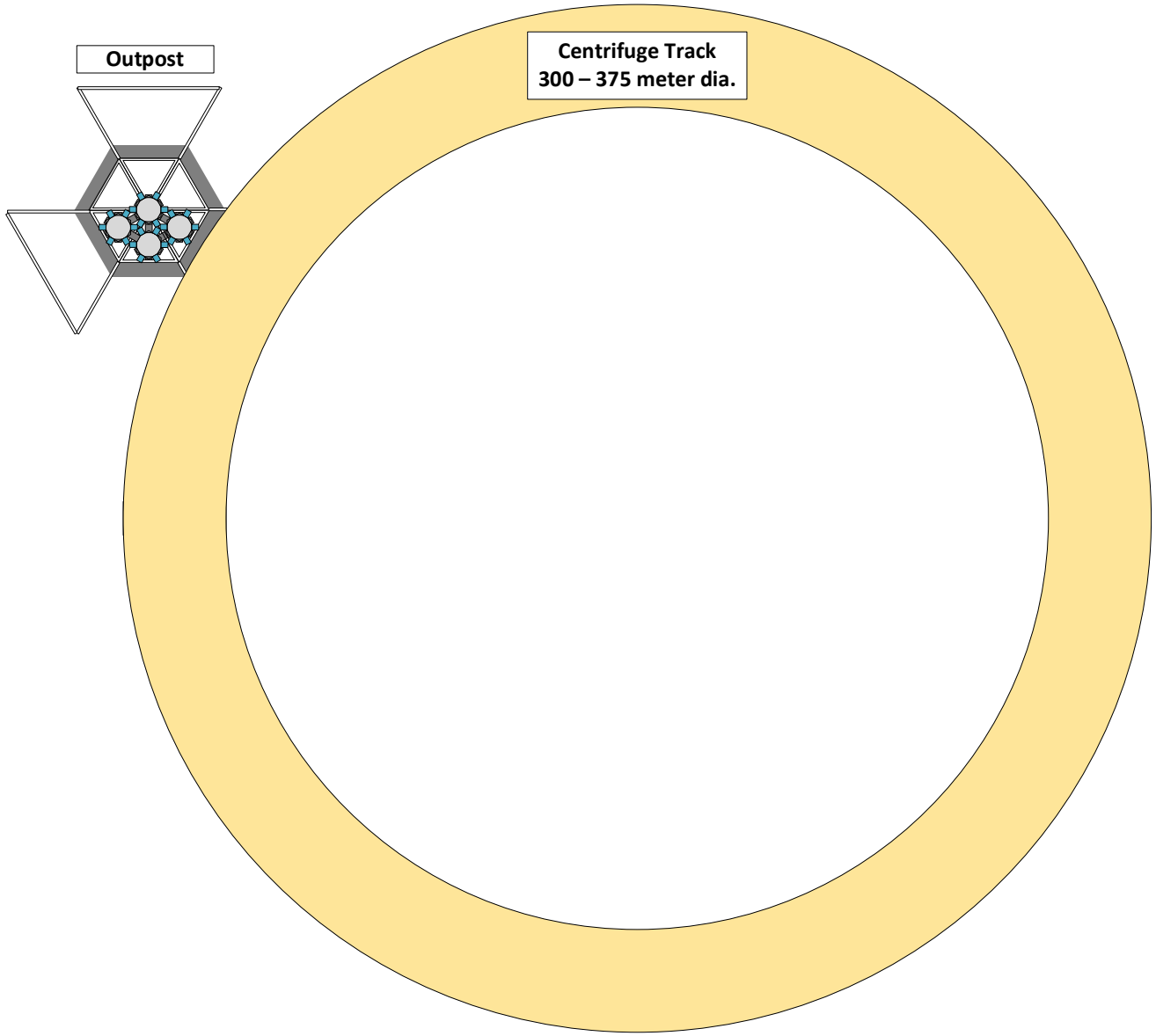


COSMIC RAY SHIELDING





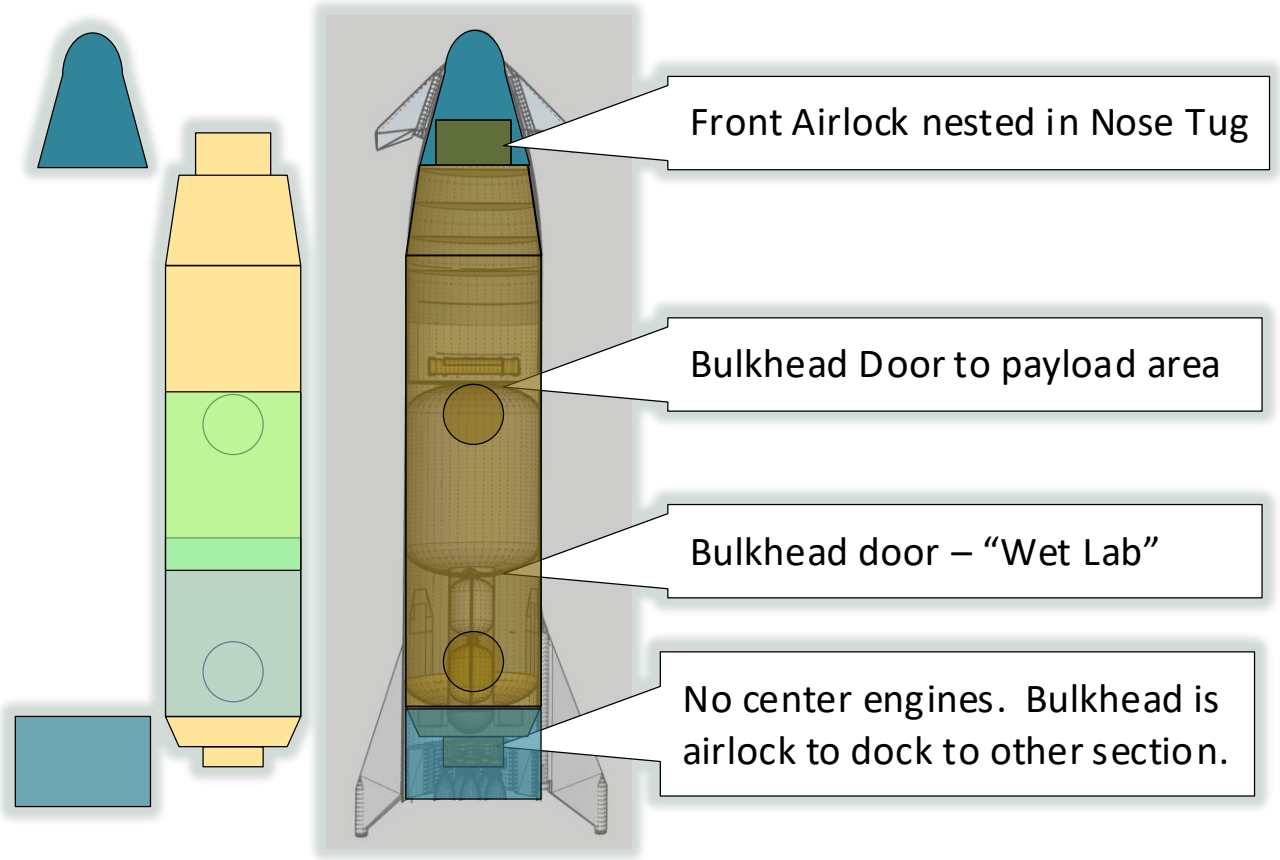
EXPANSION PHASE: CENTRIFUGE HABITAT



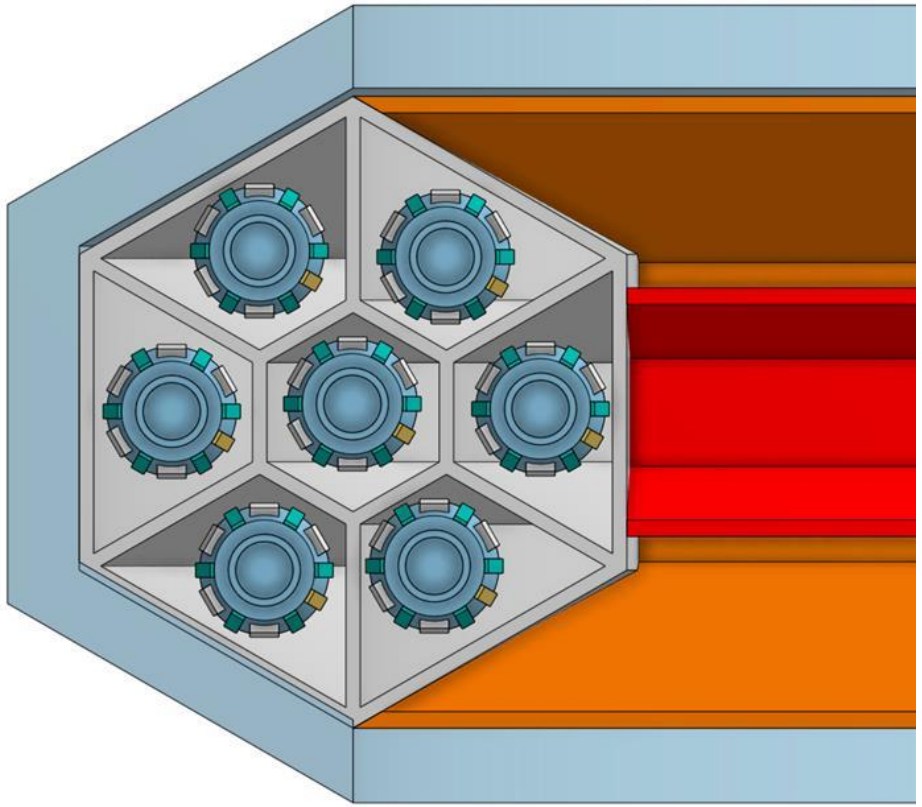
Front RCS/Tug Fairing
7.3 m base, 9 m tall, wraps around airlock.
RCS on sides, Tanks at top. Fairing

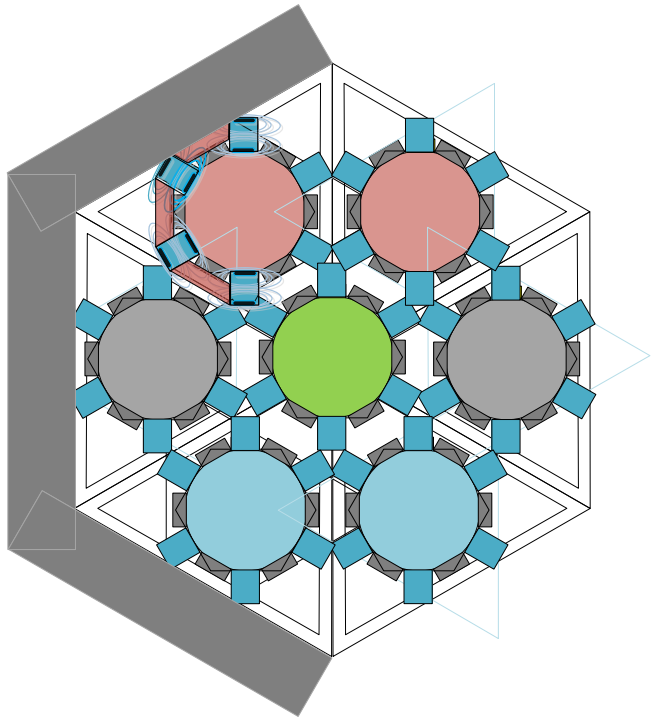
Starcar
Length: 42.69 meters
Pressurized Volume: 2000 cu. meters
Airlock Diameter: 4 meters
Airlock Angle Range: 17.4 to 19 deg.
Airlock Length Range: 1 to 27 cm

Rear Engine Block
6 m tall ring, 9 m dia.
Vac Raptor Engines, RCS, Plumbing.



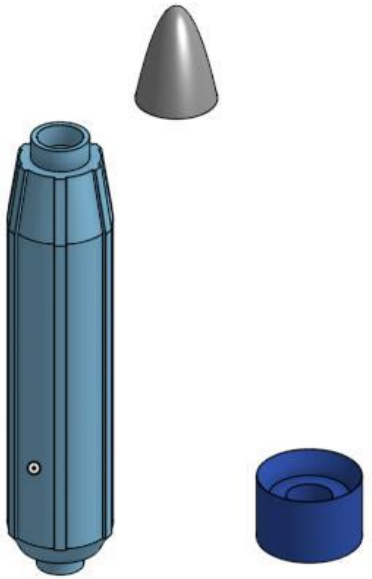
STARCAR: MODULAR "WET LAB" HABITAT

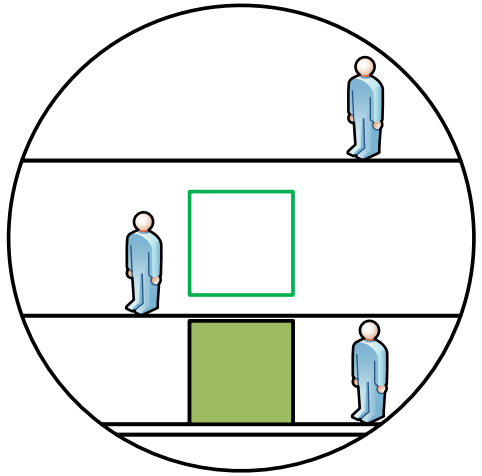


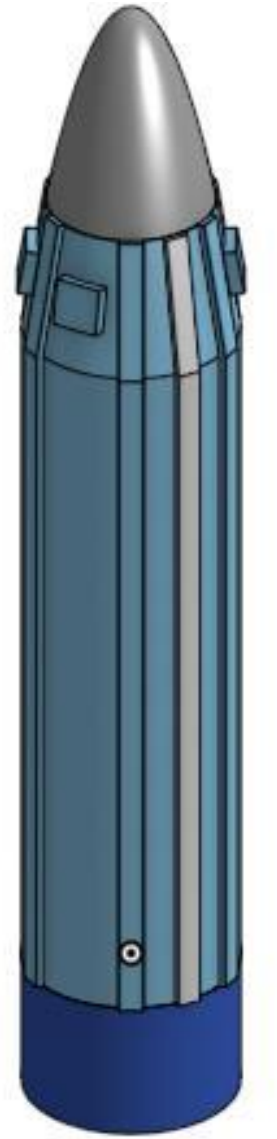


STAR-CAR RING HABITATS

STARCAR: DETAILS

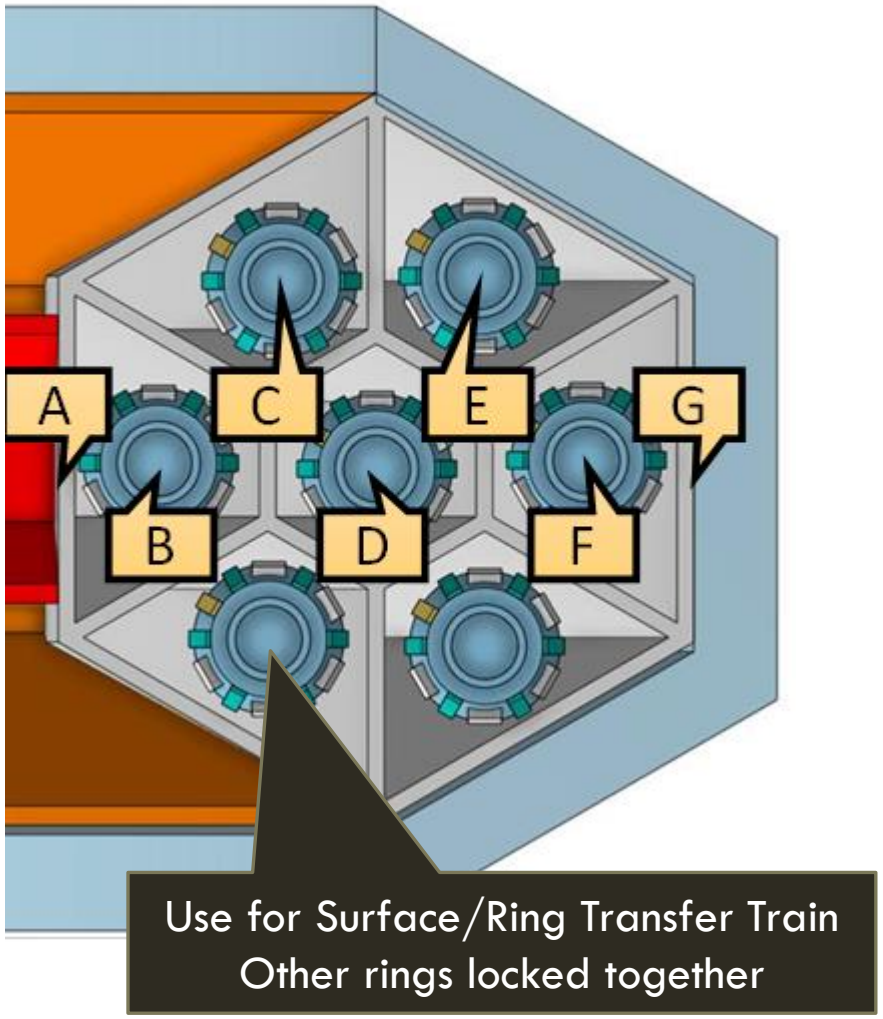






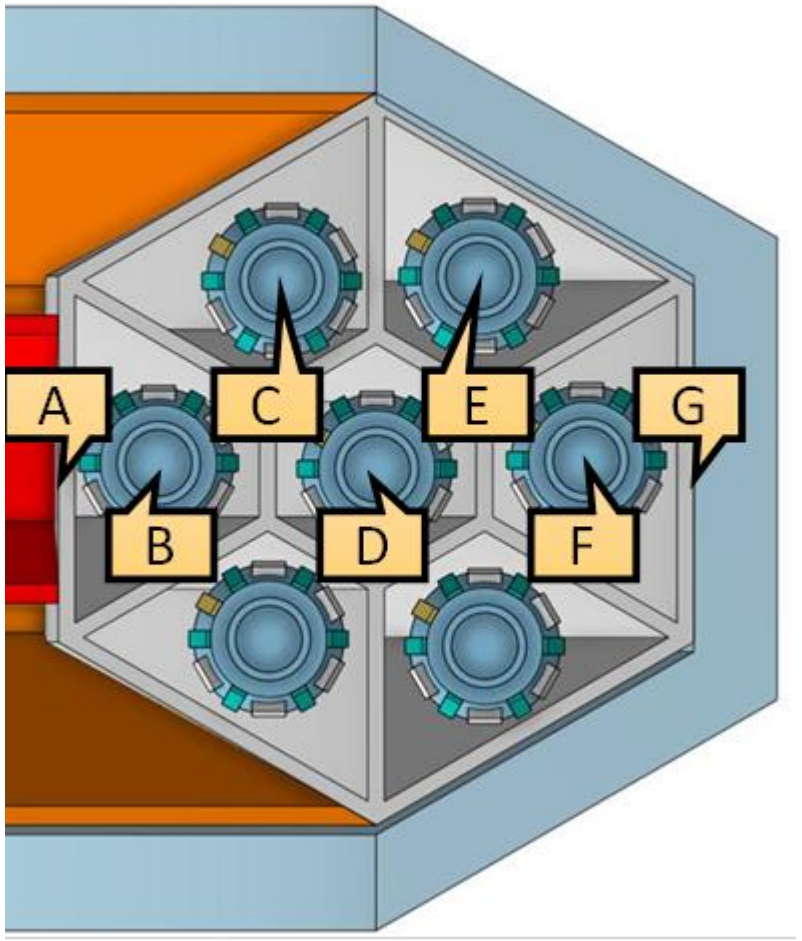
RING CAR CONFIGURATION

Ring	Ctr Dia. (m)	Car Count	Population (10/car)
A	245.32	0	Inner wall
B	258.82	19	190
C	265.57	19.5	195
D	272.32	20	200
E	279.07	20.5 x 2	205 X 2 rings
F	285.82	21	210
G	300	0	Outer wall
Total			**1205 people**



RING GRAVITY LEVELS

Parameter	Lunar	Mars
Max gravity	0.775 Earth G Boost of 3.7x	1 Earth G
Ring Speed	113 kph/ 70 mph	102 kph/ 64 mph
Bank Angle	50.28 deg	44.43 deg
Rotation Rate	2 RPM	2 RPM
Baseline	D ring center	



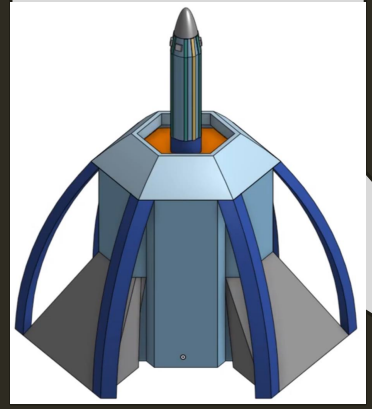
LOGISTICS

1: Load Propellant on Station in LEO

2: Launch up to 48 Starships to Station for Rapid Refueling

3: Send Mini-Fleet to Lagrange Station Until Launch Window Opens

Insight Lunar Outpost



CONCLUSION

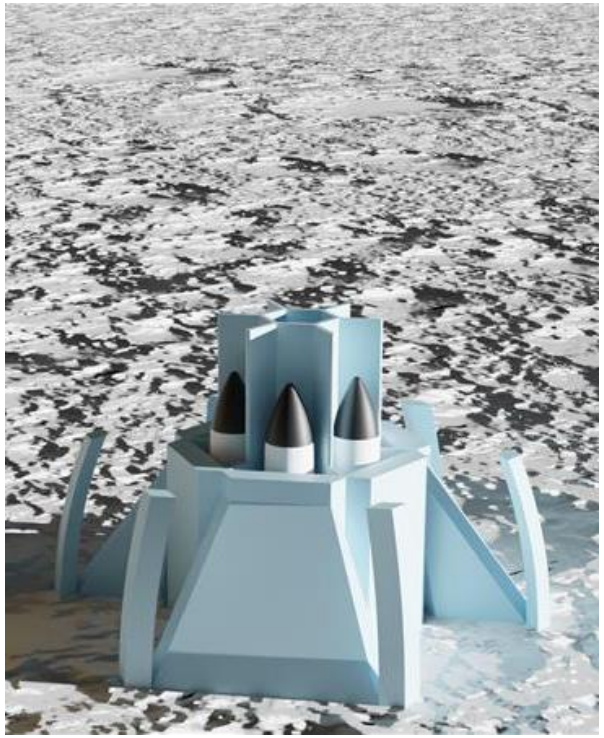
Extending the Starship Family to include Starcar and the framework system would allow full solar system settlement with near-term hardware, including surfaces.

A simple frame structure can make space settlements of any size from 10 to 10,000 people possible.

The Starcar/Frame combination offers a “pay as you go” modular system with almost no technology shift from Starship assembly lines.

Cities and factories can be built anywhere in the inner solar system and offer near-earth levels of habitat (gravity, shielding, local food, etc.)

THANK YOU!



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THANKS!

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