

ISS Exploration Platform Concept

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ISS Use for Exploration

Defense, Space & Security
Space Exploration

International Space Station

- For the past year, the ISS Industry partners have been studying potential exploration scenarios that use ISS as a base camp for exploration
- This study has investigated a broad range of mission classes from NEAs to Humans on Mars

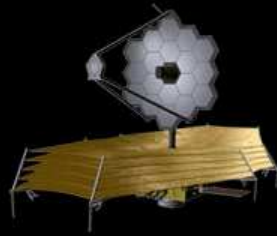


Flexible Path for Exploration

NEO



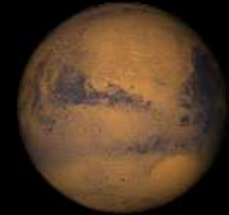
Telescopes



Moon

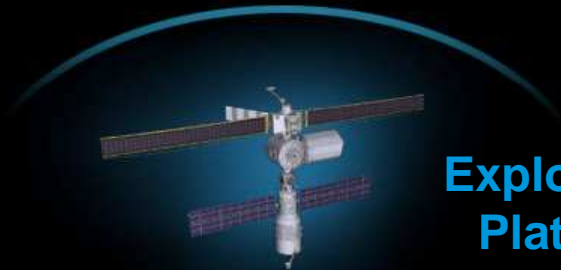


Mars



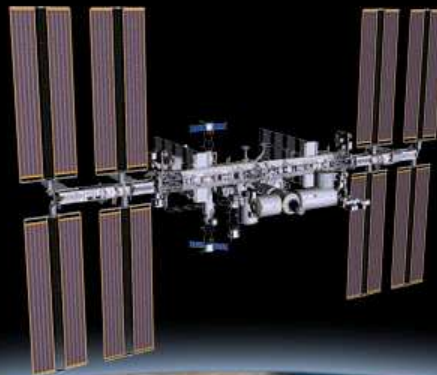
L1

L2



Exploration
Platform

ISS



ISS Exploration Platform

Purpose & Functions

Defense, Space & Security
Space Exploration

International Space Station

HSF Exploration Gateway at EML1/2

Primary destination for initial flights beyond LEO

- Provides a habitat destination for MPCV & Soyuz for medium duration stays
- Enables early characterization of environment outside radiation belts

“Local” control of Lunar robot assets

- Allows the use of tele-presence robots
- Development of remotely controlled ISRU capabilities critical for Mars exploration

Gateway for a mission to a Near Earth Asteroid

- Enables assembly, test, & checkout of NEA spacecraft prior to departure
- Enables lowest mass mission spacecraft which will shorten trip times to / from NEA

Base for re-usable Lunar lander

- Allows re-use of expensive lunar lander assets
- Enables much more flexible mission operations for lunar access and “anytime return”

Gateway for a human mission to Mars

- Enables assembly, test, & checkout of Mars spacecraft prior to departure
- Enables lowest mass mission spacecraft which will shorten trip times to / from NEA
- Safe orbit for nuclear tug assets

Service Station for Telescopes at SEL2

Repair and refueling for high value telescope assets

EML1 Exploration Platform

Functional Requirements



	<i>Near Term DSH Destination</i>	<i>Base for Lunar Telerobotics Assets</i>	<i>Gateway for a NEA Mission</i>	<i>Base for Reusable Lunar Lander</i>	<i>Gateway for a Mars Mission</i>	<i>Service Station for SEL2 Telescopes</i>
Life Support Systems	+	+	+	++	++	+
Docking Interfaces	2	2	3	4	6	3
Robotics - SSRMS			+	+	++	++
Robotics - SPDM / RRM			+	+	++	++
Robotics - Telepresence		++		+	+	++
ACS – RCS Propulsion	+	+	+	+	+	+
ACS – CMGs			+	+	+	++
Translation Propulsion	+	+	++	++	++	++
Propulsion Refueling	+	+	++	++	++	++
Contingency EVA			+	+	++	++
Ku / Ka Band Comm		++	+	++	++	++
Electrical Power / Thermal	+	++	+	++	++	++

+ = Need it
 ++ = Really Need it

ISS Exploration Platform Functional Allocation

Docking
Interfaces



OR



Docking Node

Structural
Interfaces

Electrical
Power

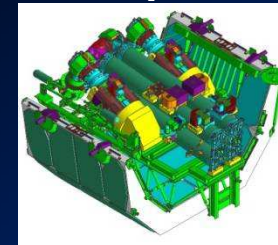


Shuttle
OBS

Comm

Heat
Rejection

+



SSRMS
On
SLP

Attitude
Control

SSRMS



Utility Module

Crew
Habitation
& Life Support



AND / OR



Airlock
(Contingency EVA)



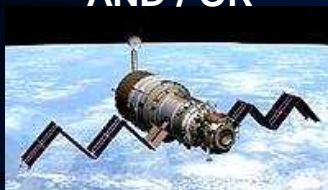
AND / OR



AND



Habitats



Long Duration Habitat Evolution

• Construction



Block 1
ISS-EP
(MPLM Derived)



Block 1a
NEA TransHab
(MPLM Derived)



Block 2
Mars TransHab
(Composite Shell or Inflatable)



Block 3
Mars SurfaceHab
(Composite Core, Inflatable Shell)

• Subsystems

ECLSS

- 3 crew, 3 months
- Replenishment
- Partially Closed

INTERFACES

- CBM/NDS

EVA

- Airlock

ECLSS

- 3 crew, 12 months
- No Replenishment
- Partially Closed

INTERFACES

- NDS on both ends

EVA

- Airlock

ECLSS

- 3 crew, 9 months
- No Replenishment
- Partially Closed

INTERFACES

- NDS on both ends

EVA

- Airlock

ECLSS

- 3 crew, 12 months
- No Replenishment
- Partially Closed
- Surface Hygiene Facilities

INTERFACES

- NDS on one end

EVA

- Airlock/Suit Lock

Mission Derived Requirements

- **Man tended: periodic presence of crew**
- **ECLSS sized for 3 crew; Surge to 6 crew for 14 days**
- **Docking support for:**
 - Simultaneous: MPCV, Soyuz, Lander, SEP Tug, Cargo module, & Spare
- **Propulsion / ACS:**
 - Station keeping RCS; refuelable; CMGs
 - Translation >300m/s; refuelable
- **Robotics:**
 - Berthing & assembly via SSRMS
 - Repair ops via SPDM / RRM type
 - Tele-presence workstation
- **EVA:**
 - Capability for contingency EVA; 2 EMUs
- **Communication:**
 - HDTV video transmission
 - High reliability command and control link
- **EPS & Thermal:**
 - Solar arrays: 30KW
 - Heat rejection: NH3 - 20KW

ISS Exploration Platform

Four Basic Elements

Docking Hub



- Structural Hub
- Docking Interfaces
- SSRMS Base
- CCAA

Utility Module



- 30 KW Power
- 20 KW Heat Rejection
- SSRMS launch carrier
- Ku / Ka Band Comm
- CMGs
- RCS
- Translation Propulsion (Hall Thrusters)
- Airlock for 2 EMUs

ISS-EP Hab



- Evolved ECLSS
- Central Computer
- Robotics Control

Zvezda 2

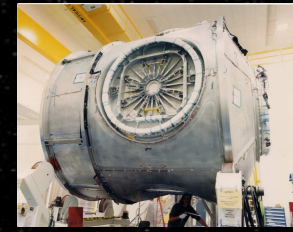
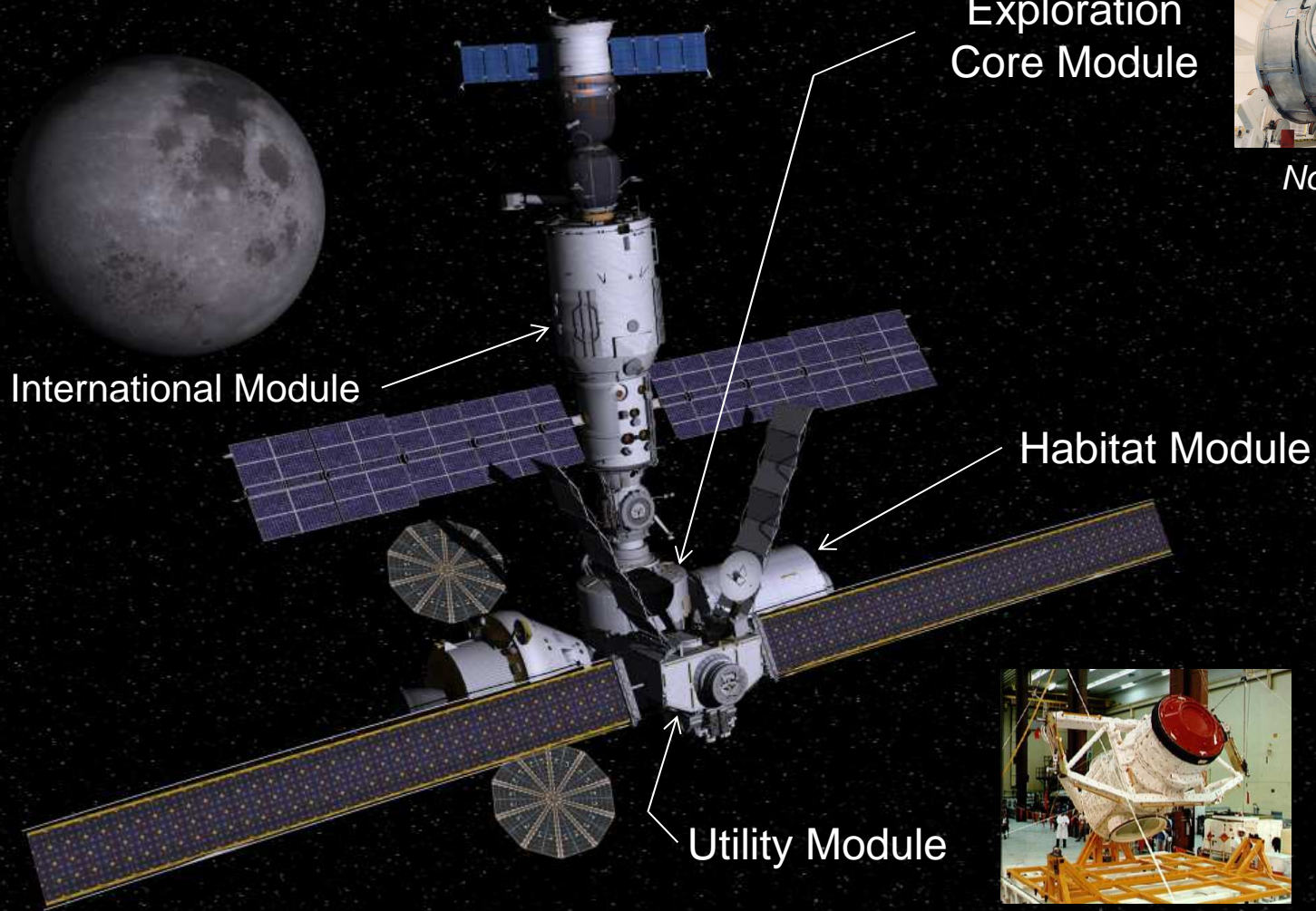


- Evolved ECLSS
- RCS
- Translation Prop
- Soyuz Docking

ISS-Exploration Platform

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Space Exploration

International Space Station



Node STA

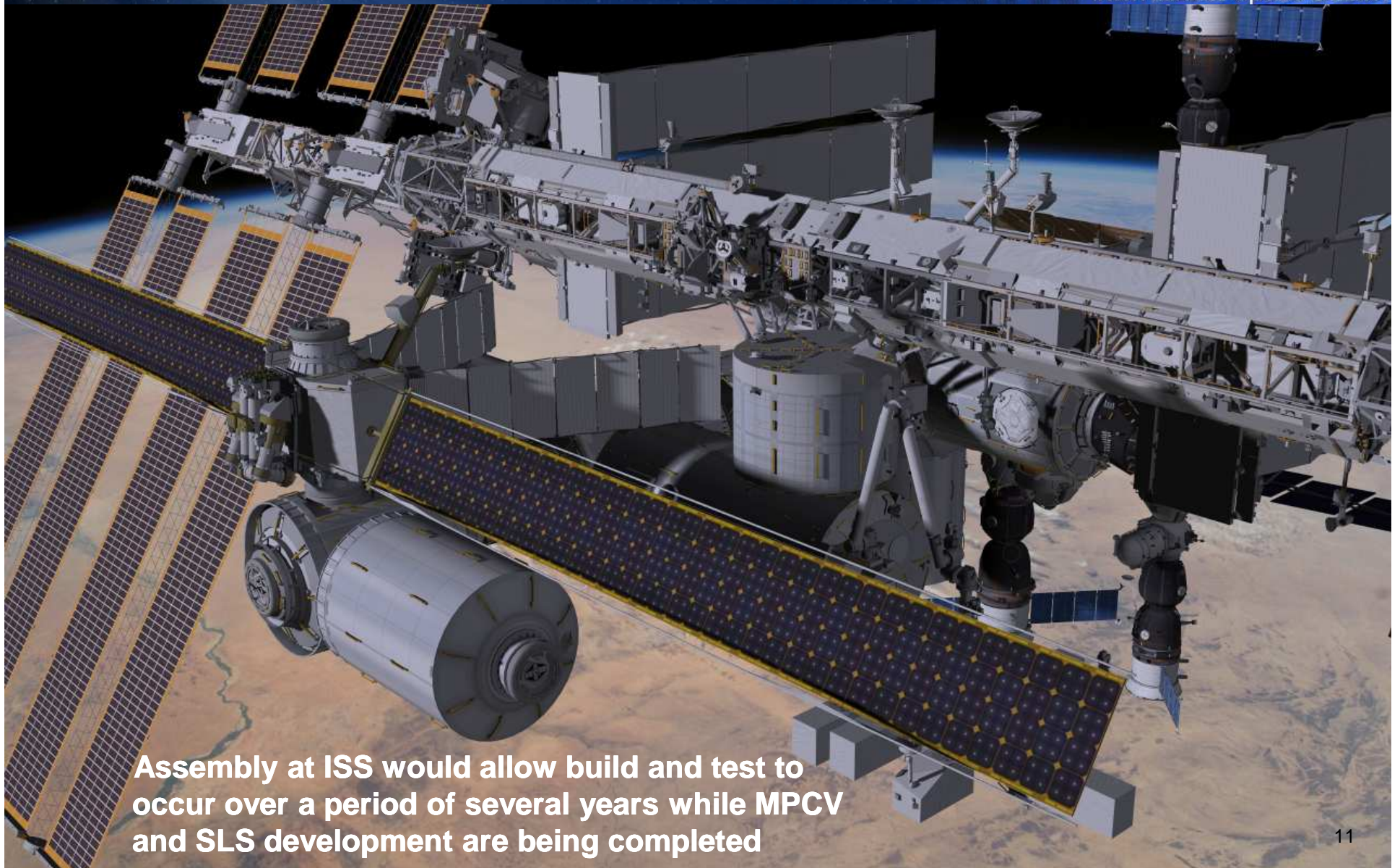


MPLM (2 Avail)



Orbiter External Airlock (2 Avail)

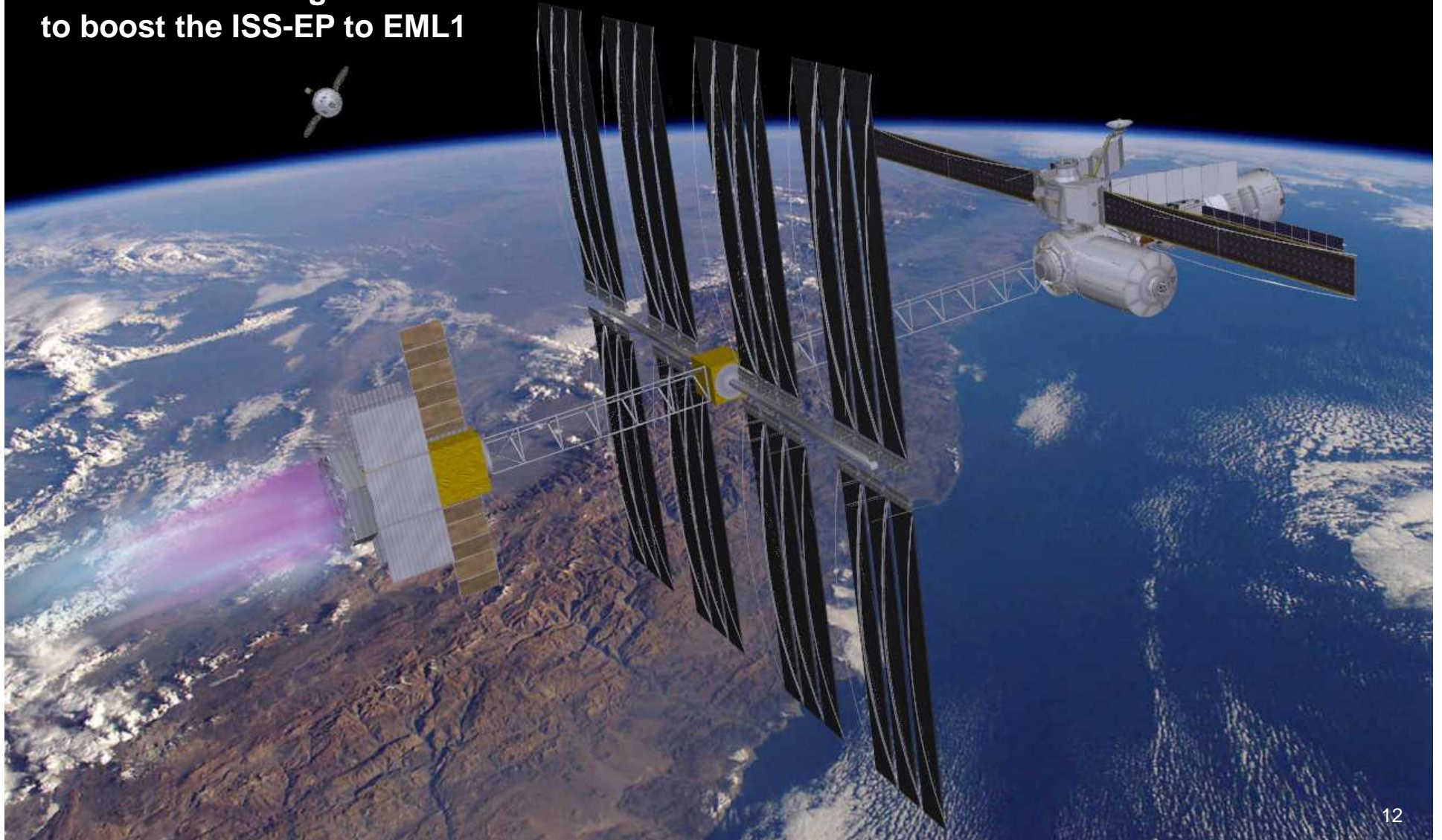
Assembly at ISS



Assembly at ISS would allow build and test to occur over a period of several years while MPCV and SLS development are being completed

ISS-EP SEP Boost to EML1

A solar electric tug could be used to boost the ISS-EP to EML1



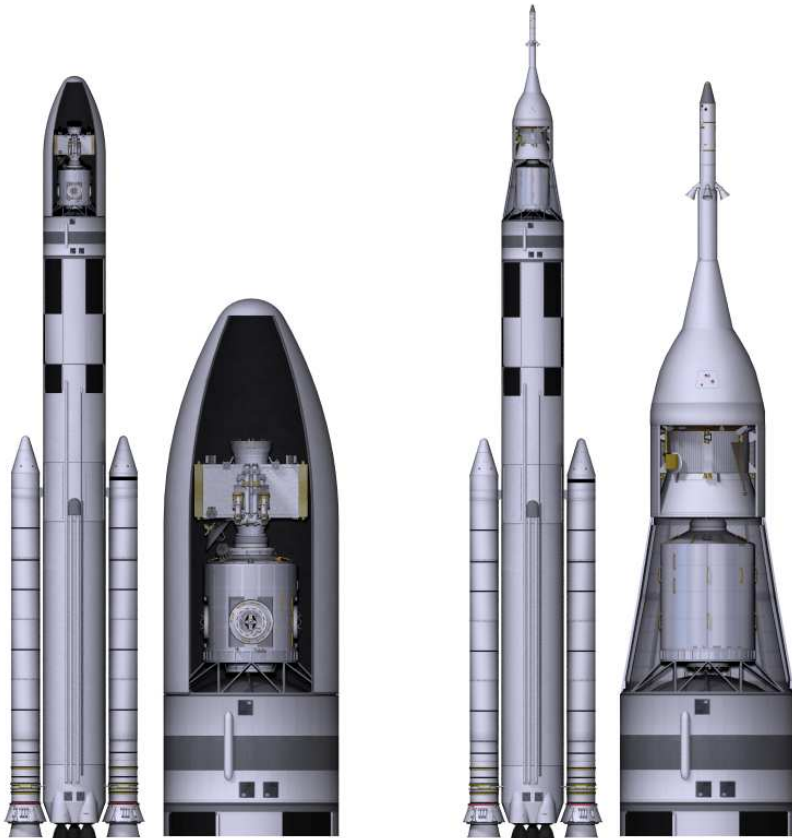
ISS-EP Chemical Boost to EML1

If the SEP tug is unavailable then the SLS could be used to boost the ISS-EP to EML1

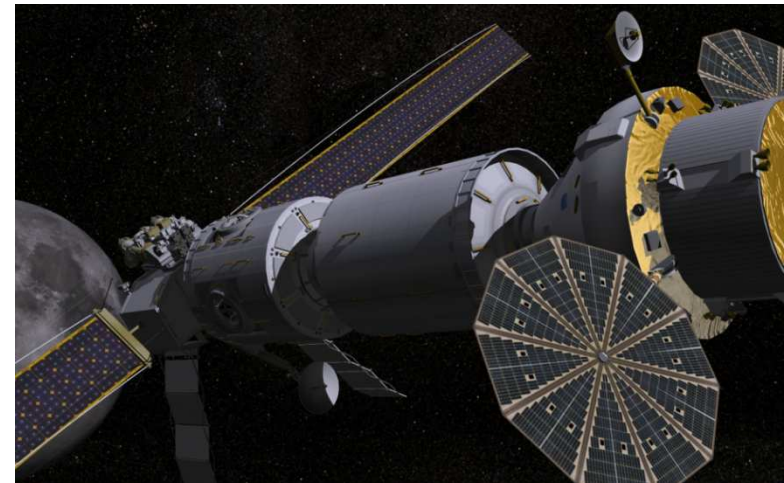


Direct launch of ISS-EP to EML1

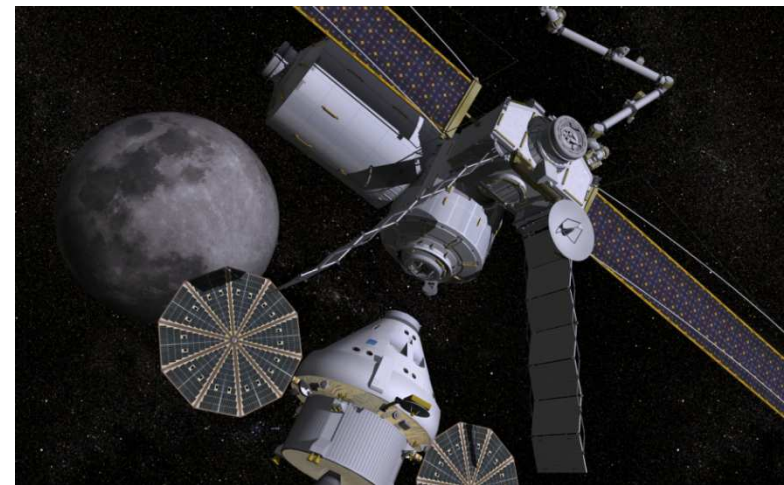
- The ISS-EP could also be launched directly to EML1 with two SLS launches
- A commissioning crew would be sent on the second launch to activate the platform and prepare it for mission support



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Before Crew Activation



After Crew Activation

ISS Exploration Platform (ISS-EP) at EML1

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Space Exploration

International Space Station

Two separate means should be provided for Crew access to the ISS-EP

SLS-MPCV

Soyuz???

