



The Need of Interoperability For NASA Systems

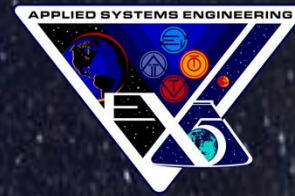
Erick Ordonez

Applied System Engineering and Integration(EX5)
Chief

NASA Johnson Space Center



Areas of Interoperability Focus



Design interoperability: The ability of computer systems or software to exchange and make use of information

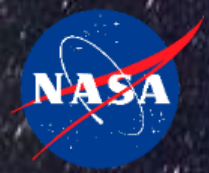
Mission Interoperability: The ability for equipment or groups to operate in conjunction with each other

Mission

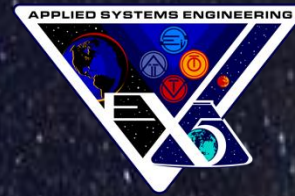
- **NASA Moon 2 Mars:**
 - Lunar Infrastructure
 - Lunar Terrain Vehicle
 - Habitats
 - Pressurized Rover
 - Human Lander Systems
- **Commercial LEO Destination Program**
 - Commercial Space Stations in Low Earth Orbit
- **Commercial Crew Program**
 - Crewed Vehicle Development
- **Extravehicular Activity and Human Surface Mobility**
 - LTV
 - Pressurized Rover
 - Suits

Design

- **Lunar Terrain Vehicles (LTV)**
 - Three Vendors
- **Human Landers System**
 - Two Vendors
- **Gateway**
 - Habitation and Logistics Outpost
 - Power Propulsion Element
- **In-Situ Resource Utilization**
 - Power Augmentation
 - Commodities Processes
 - Construction
 - Communication



Mission Interoperability



ARTEMIS BASE CAMP

Comm, Nav, Power >>

Surface Habitat >>

>> In-Situ Resource Utilization (ISRU)

Pressurized Rover >>

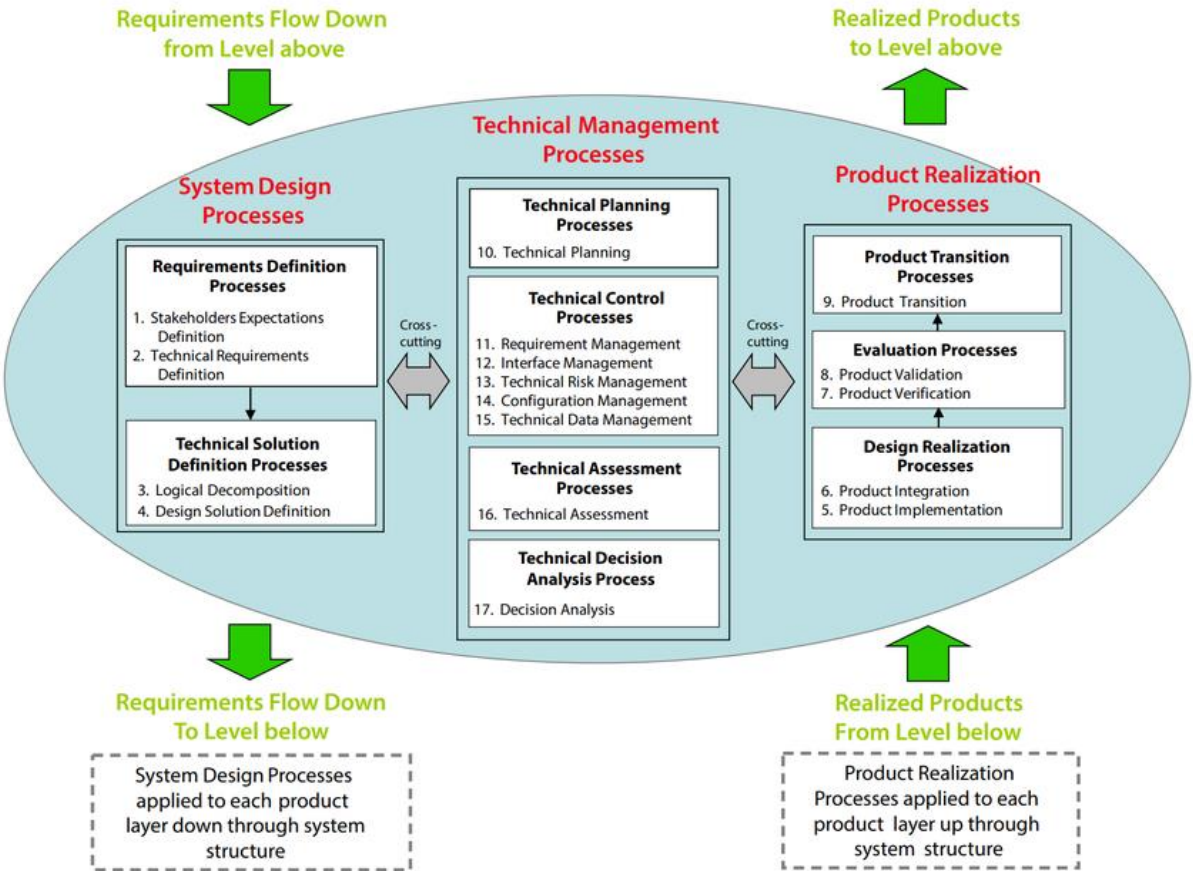
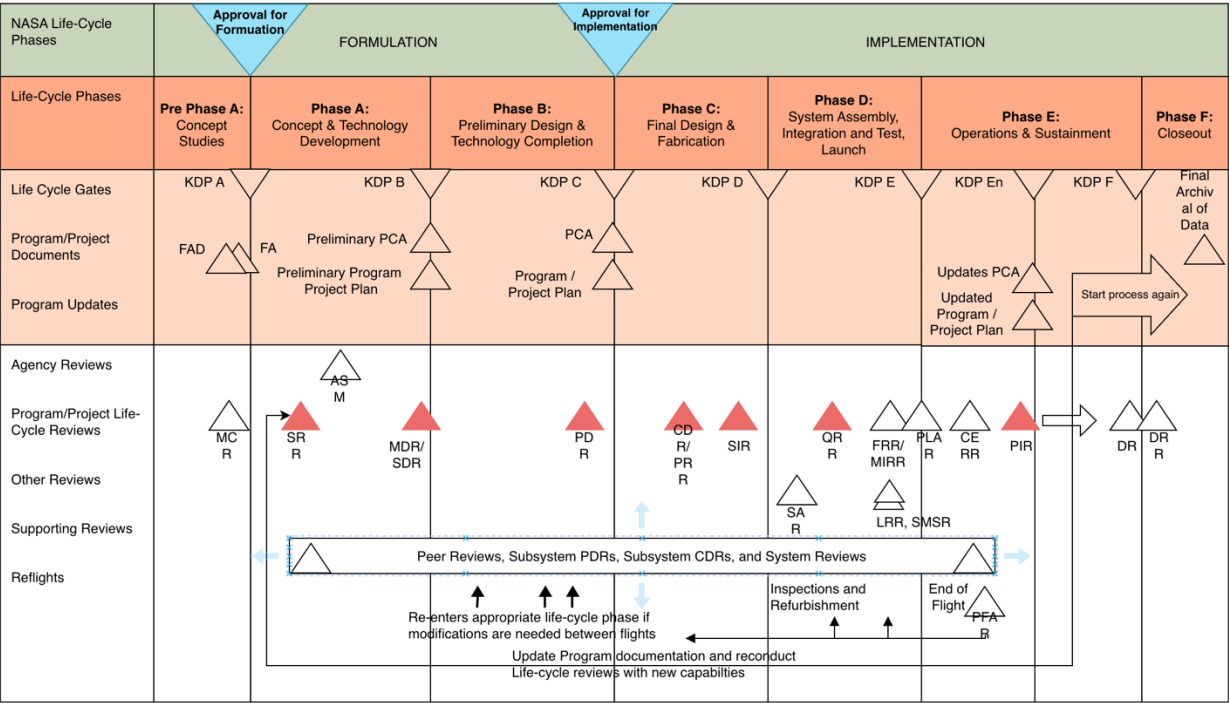
Spacesuits >>

Lunar Terrain Vehicle >>



Artist's illustration of Artemis Base Camp

How does Interoperability move schedules to the Left?



Explorer

Add

Standards Development

NPRs

JSC Standards

JSC-08080-2 JSC Design and Procedural Standard Document

JSC 20793 Crewed Space Vehicle Battery Safety Requirements

JSC 25863 Fracture Control Plan for JSC Space-Flight Hardware

JSC 27301 Materials and Processes Selection, Control, and Implementation Plan for JSC Flight Hardware C

JSC 27773 Avionic Systems Division General Operating Procedures for Laboratories and Facilities

JSC 29353 Flammability Configuration Analysis for Spacecraft Applications

JSC 63322 Packaging Requirements for Launch, On-Orbit Storage and Disposal of Batteries

JSC 63524 Avionic Systems Division Administration, Maintenance and Operations Requirements

JSC 65828 Structural Design Requirements and Factors of Safety for Spaceflight Hardware

JSC 66491 Standard for JSC Lead-Free Control Plans (LFCP)

JSC 67551 JSC Avionics Ionizing Radiation Effects Standard (AIRES)

PRC-5010 Process Specification for Pickling, Etching, and Descaling of Metals

8080 Revision

NASA Standards

NASA-STD-5017 Design and Development Requirements for Mechanisms

SMC-S-016 Test Requirements for Launch, Upper-Stage and Space Vehicles

Change History

Scope

Reference Documents

Definitions

SMC-S-016 Test Requirements for Launch, Upper-Stage and Space Vehicles

Appendix A. Thermal Test Considerations

Appendix B. Dynamic Test Considerations

MSFC-SPEC-164 Specification for Cleanliness of Components for use in Oxygen, Oxidizer, Fuel, and Pneu

GSFC-STD-7000 General Environmental Verification Standard (GEVS) for GSFC Flight Programs and Proje

KSC-C-123 Specification for Surface Cleanliness of Ground Support Equipment Fluid Systems

NASA-STD-6016 Standard Materials and Processes Requirements for Spacecraft

SpaceX Standards

SPX-00001600 Starship Test Requirements for Launch, Upper-Stage & Space Vehicles

Add tag

Cloud

List

Basic(1)

Change 1(2)

Design Reliability(1)

Revision 1(1)

Revision 2014(1)

Revision

B(5)

Revision C(3)

Revision D(2)

Revision E(1)

Revision G(1)

Revision I(1)

Revision J(1)

Revision M1(1)

Version 1(1)

Version 3(1)

SMC-S-016 Test Requirements for Launch, ...

Save

Export

0 items selected

←

SOURCE ITEMS

Filter items

Set columns

Standard (310), Text (90), Set (3)

	ID	Name	Description
☐	STD_Dev-SET-51	SMC-S-016 Test Req...	SMC-S-016 Test Req...
☐	STD_Dev-SMC_S_01...	General Requirements	This section addresse...
☐	STD_Dev-SMC_S_01...	Baseline Requirements	This standard establis...
☐	STD_Dev-SMC_S_01...	Program Requirements	The requirements pre...
☐	STD_Dev-SMC_S_01...	Testing Philosophy	The complete test pro...
☐	STD_Dev-SMC_S_01...	Development Tests	Development tests, or...
☐	STD_Dev-SMC_S_01...	Qualification Tests	Qualification testing (...)
☐	STD_Dev-SMC_S_01...	Protoqualification Tests	Protoqualification test...
☐	STD_Dev-SMC_S_01...	Acceptance Tests	Acceptance tests shal...
☐	STD_Dev-SMC_S_01...	Testing Approach	
☐	STD_Dev-SMC_S_01...	Development	Development tests on...

1 LEVEL DOWN

Filter items

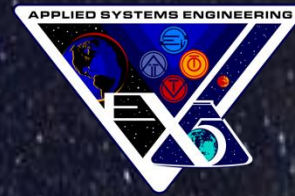
Set columns

Standard (216)

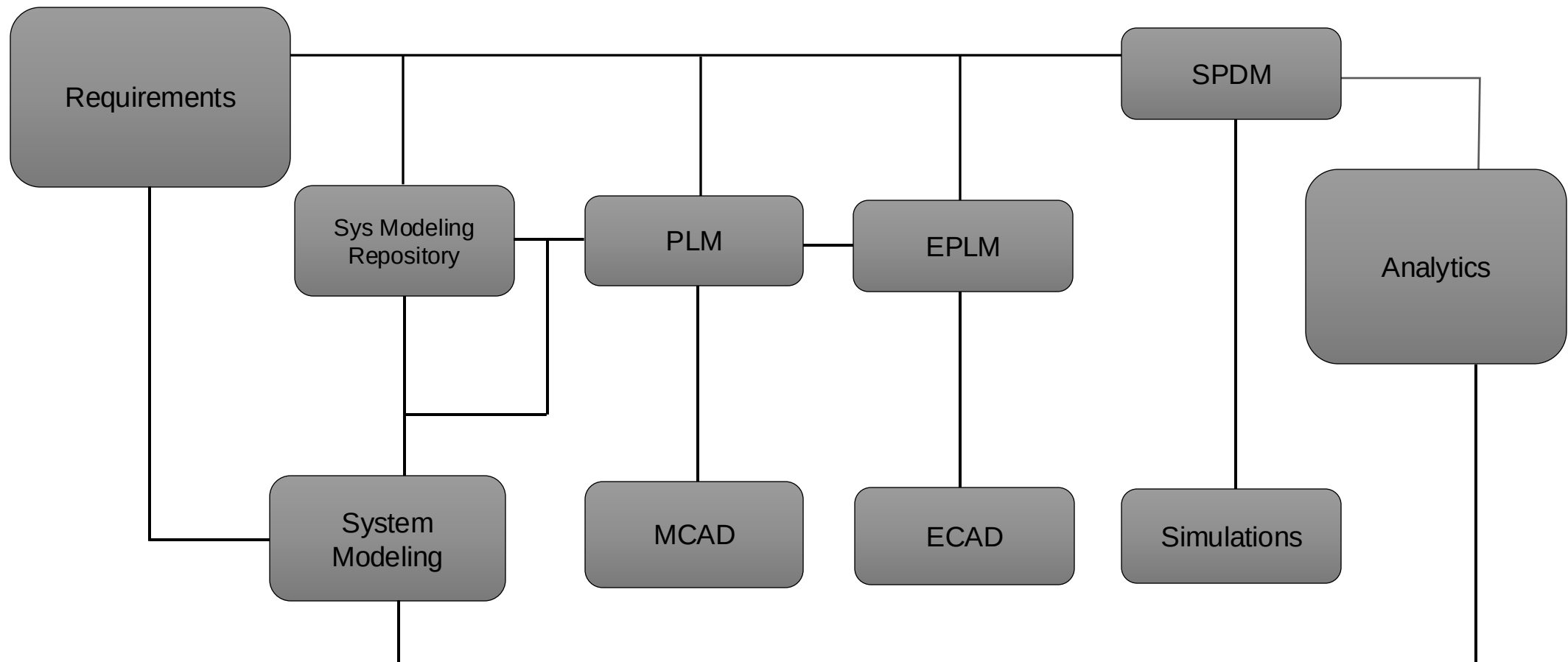
☐					
☐				Add Coverage	for STD_Dev-SMC_S_016-1
☐				Add Coverage	for STD_Dev-SMC_S_016-2
☐					
☐				Add Coverage	for STD_Dev-SMC_S_016-3
☐				Add Coverage	for STD_Dev-SMC_S_016-4
☐					
☐				Add Coverage	for STD_Dev-SMC_S_016-5
☐				Add Coverage	for STD_Dev-SMC_S_016-6
☐				Add Coverage	for STD_Dev-SMC_S_016-7
☐				Add Coverage	for STD_Dev-SMC_S_016-8
☐				Add Coverage	for STD_Dev-SMC_S_016-9
☐					
☐				Add Coverage	for STD_Dev-SMC_S_016-10
☐					

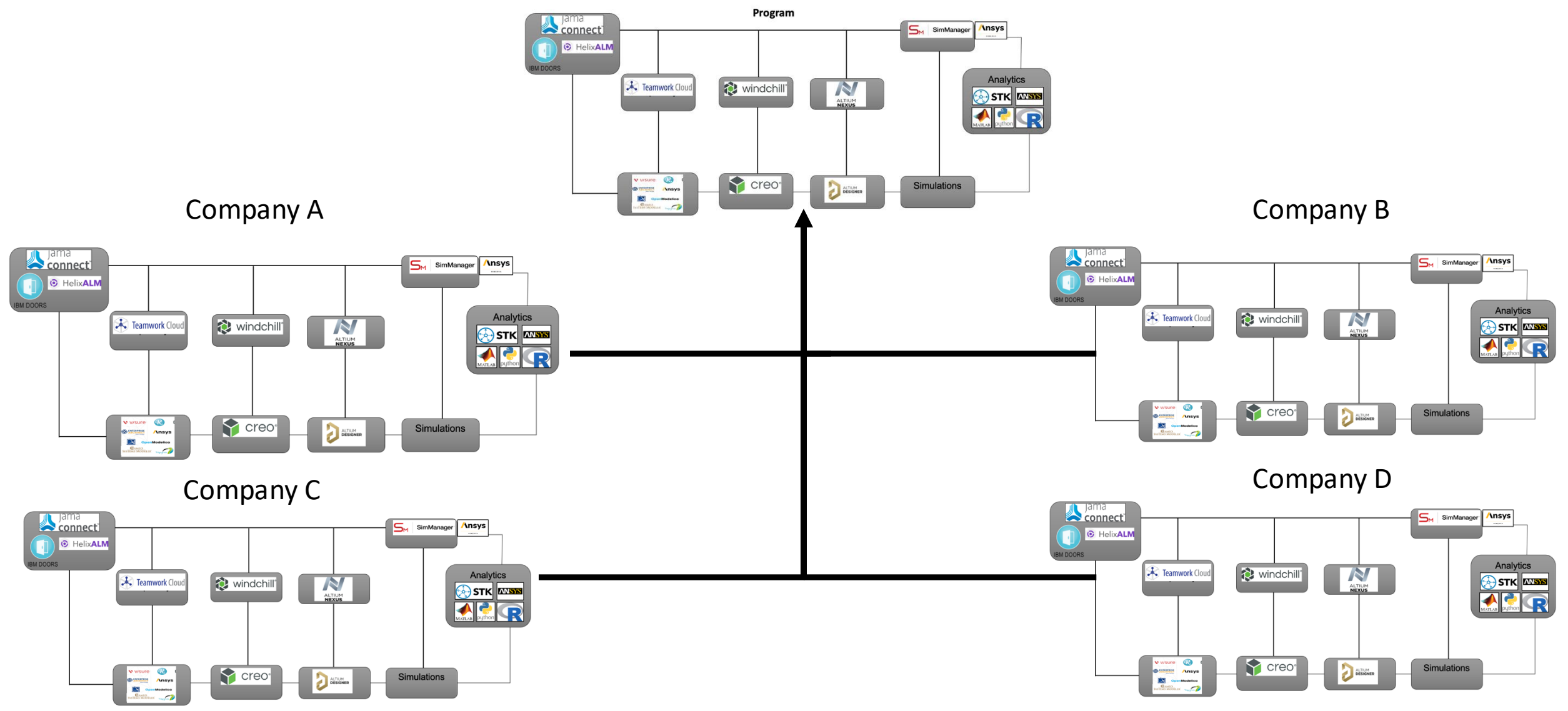


Design Interoperability

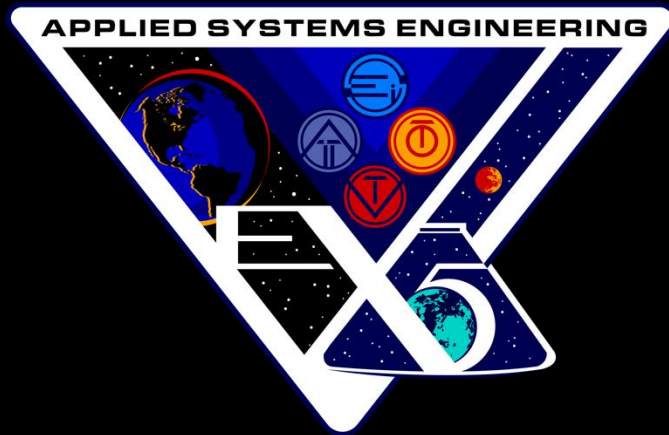
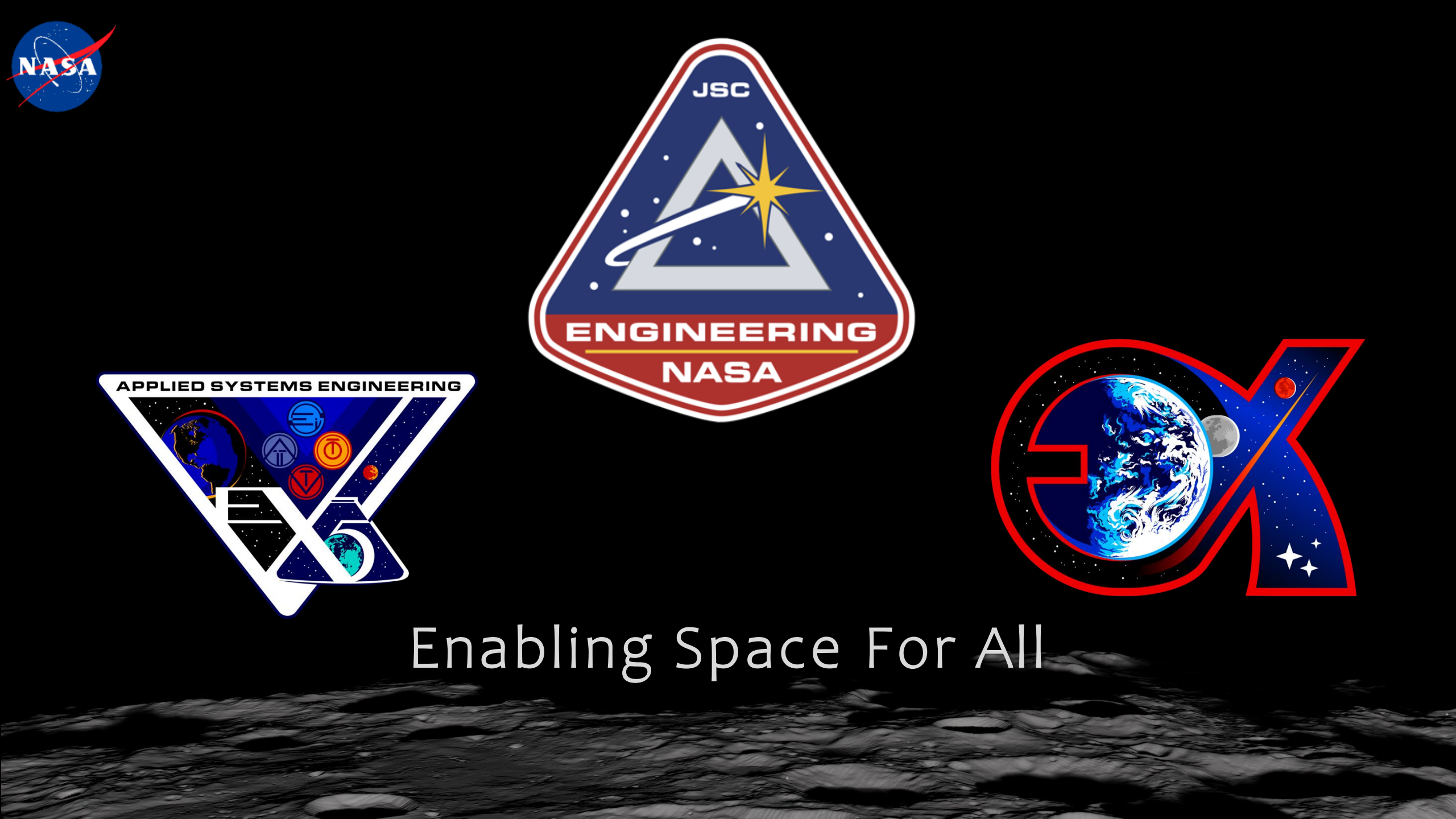


NASA Digital Thread









Enabling Space For All