

20th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)Interactive Presentations - 20th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE
EXPLORATION AND DEVELOPMENT (IPB)Author: Mr. Gary Barnhard
XISP-Inc, United States, gary.barnhard@xisp-inc.comARCHITECTING THE FUTURE OF SPACE: A SYSTEMS ENGINEERING FRAMEWORK DRIVEN
BY CRITICAL OUTCOMES**Abstract**

Evolving to a thriving, sustainable spacefaring society will entail a transdisciplinary fusion of architecture, engineering, and understanding. We must learn to wield the art of design, the application of science (a.k.a. technology), the orchestration systems engineering, and test the limits of our understanding to be the best stewards of Earth and our expanding habitat in space that we can be.

Architecting the future of space is motivated by several vital postulates: What you can learn to do really does matter, and why your doing can matter just as much, if not more. • Defending Earth against Asteroids and Comets, o The consequences of extinction-level events are irreconcilable. • Space Development o Bringing new resources (energy, material resources, and habitable area) to the table for use in space and on Earth for the dramatic betterment of humanity provides options for a positive future. • Space Settlements o Understanding how to build and maintain viable space settlements is a microcosm of providing for all life as we know it.

Space offers Arcs of Opportunity spanning venues and work vectors. The venues include Ground, Space-to-space, Surface-to-surface, Space-to-Moon/Asteroid, and Space-to-Earth. The work vectors include: Technology Development, Demonstration, and Deployment orchestrated into missions. These arcs necessarily entail flows of people, material, energy, and information. The stakeholders include government, commercial, non-profit, educational, and individuals.

Reducing the systems engineering to practice for the development of new space systems requires understanding the general problems before point designs. An excellent place to start is by lending your efforts to understanding both the problem space and the potential solution space. From there, identifying threads that can be used as lenses to look at each aspect of the proposed work and its execution. You could think of these threads as "Outcome elements."

To provide a framework for space development, we need to identify the critical outcome elements. We must ensure that what we are architecting is mission-enabling, sustainable, and affordable to use. We must reconcile programmatic objectives to physical and economic reality and the critical outcome elements necessary to sustain the political will. The point is to bias collective actions towards better outcomes. A short work list of critical outcome elements includes maintaining the Global Energy Market, addressing Climate Change, fostering Economic Development, enabling Regulatory Evolution, enabling Situational Awareness, implementing Open Standards and Interfaces, and providing for long-term sustainability.

Space is our future. Let's not wait for it; let's build it!