Capitalizing on the Benefits of Alternate Grade Electronics through Informed Risk

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20 April 2021

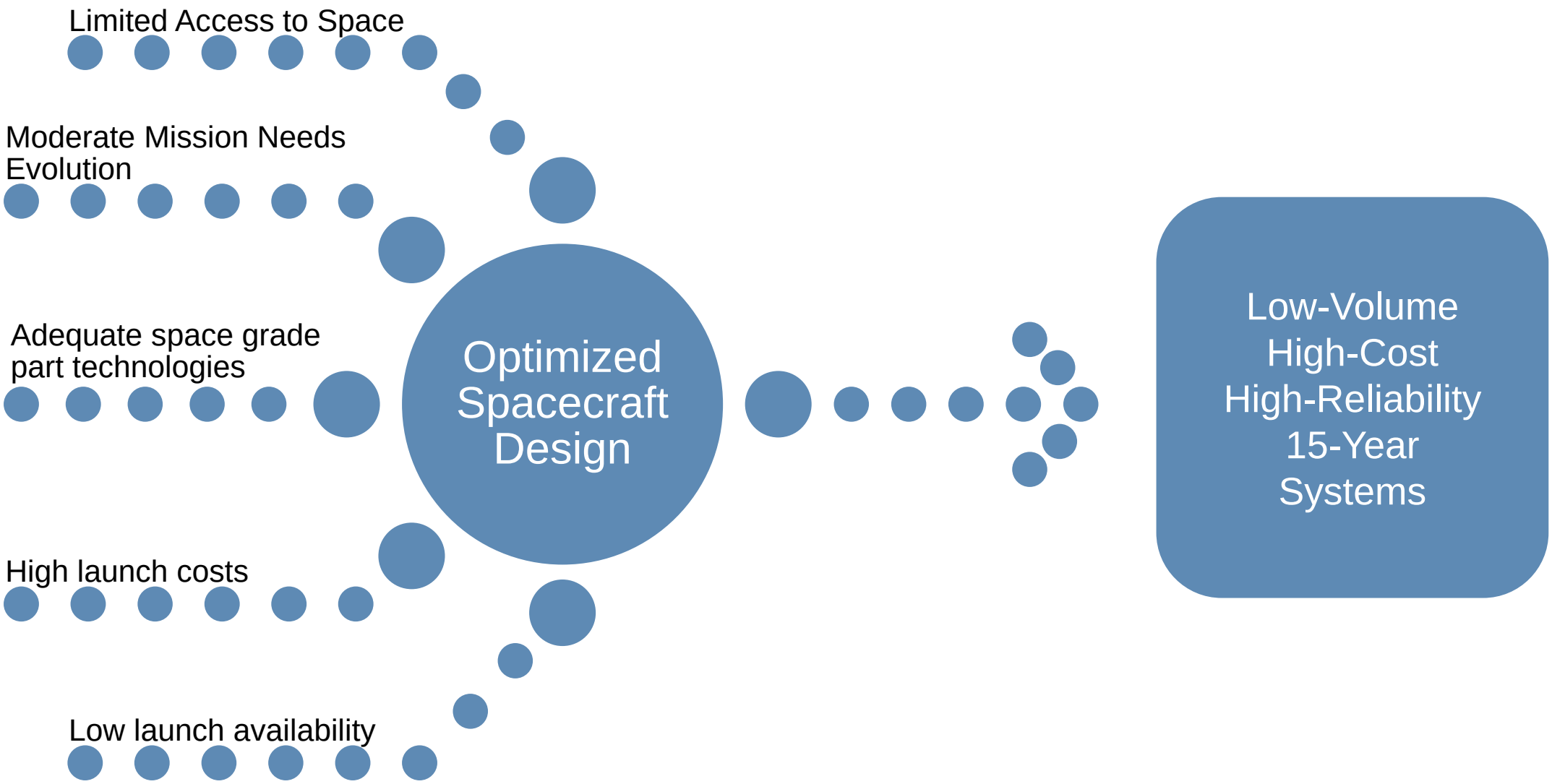
2021 Components for Military and Space Electronics Conference

Approved for public release. OTR 2021-00547.

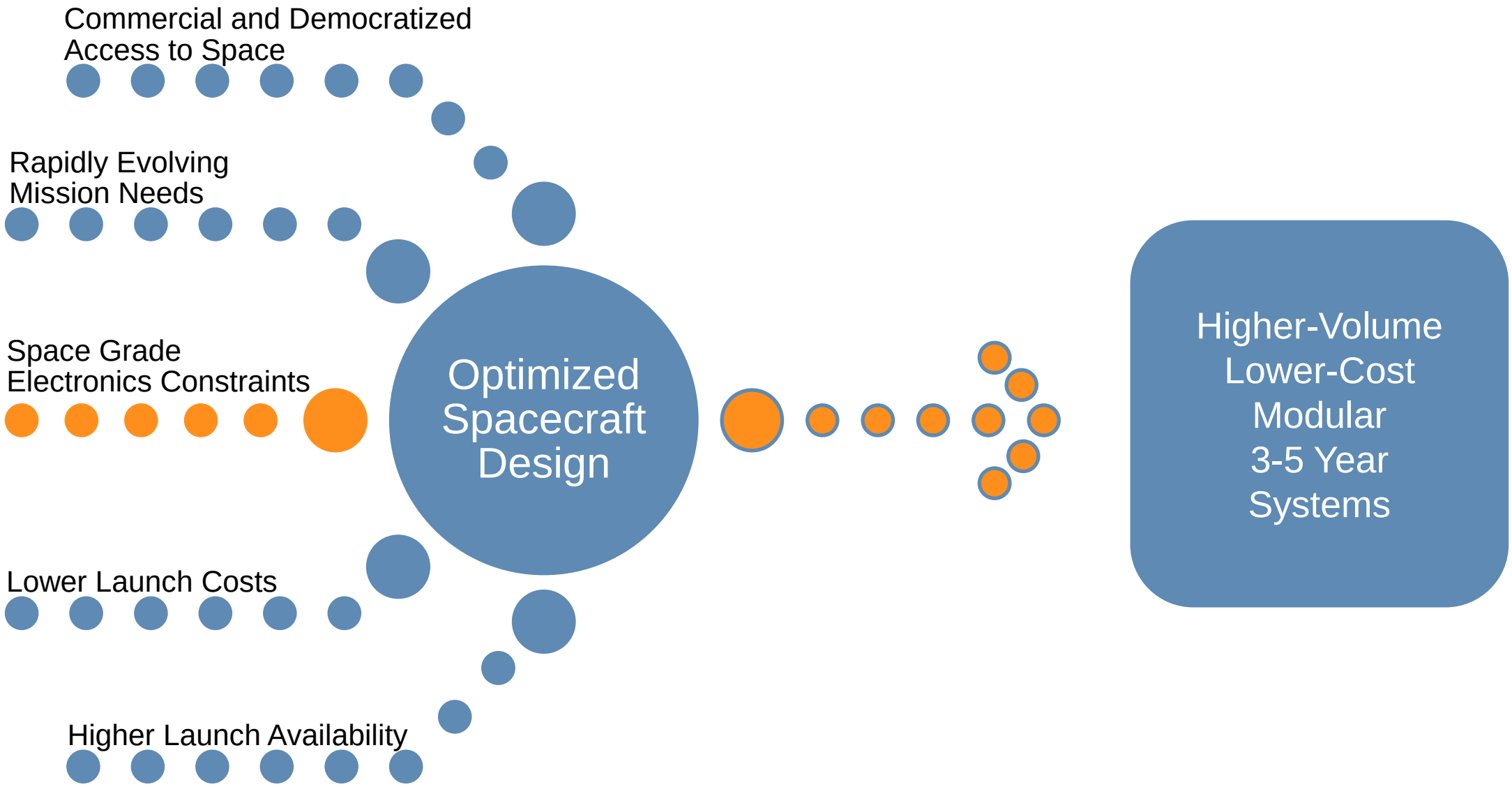
Agenda

- Evolution of Space Systems Needs
- Need for Alternate Grade Electronics
- Enablers for Broader Alternate Grade Electronics Utilization
- How we can help enable
- Questions

Historical Space Systems Model

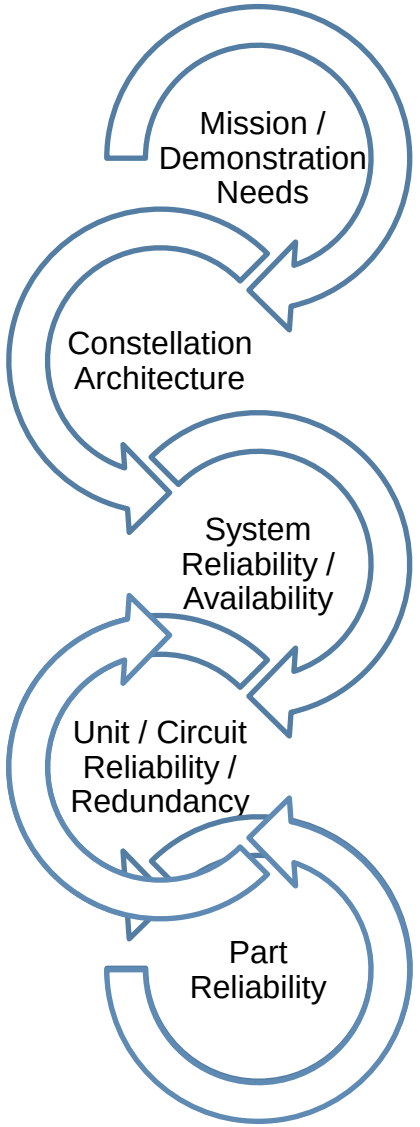


Evolving Space Systems Model



Enablers for Broader Alternate Grade Electronics Utilization

- Historically, most space systems utilized space grade parts
  - *Stringent requirements to ensure high confidence reliability*
  - *Accepted lag from commercial State-of-the-Art technologies*
- Limited use of alternate grade parts
  - *Higher risk missions with "up-screening"*
  - *Demonstrations and prototypes*



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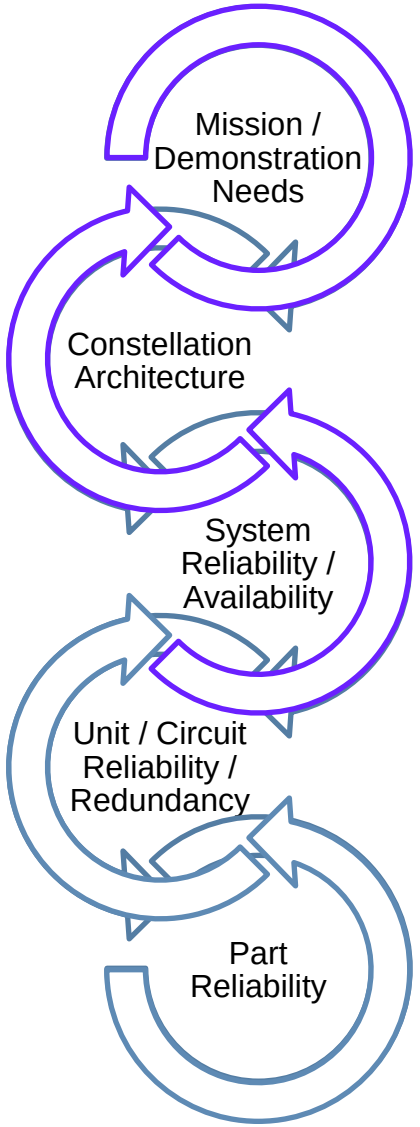

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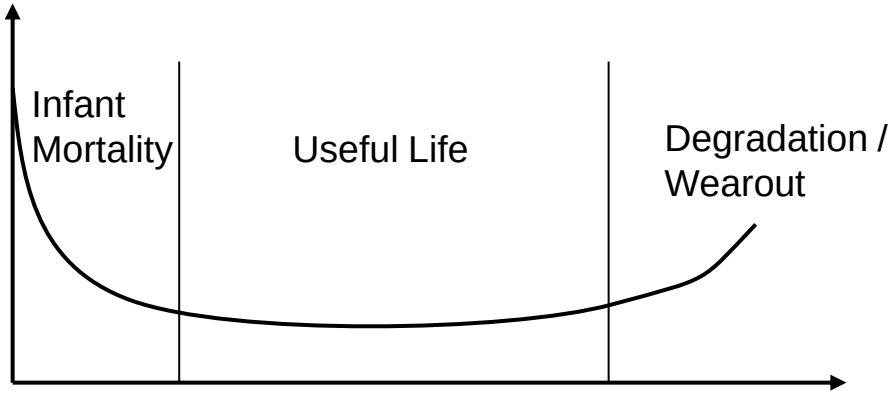
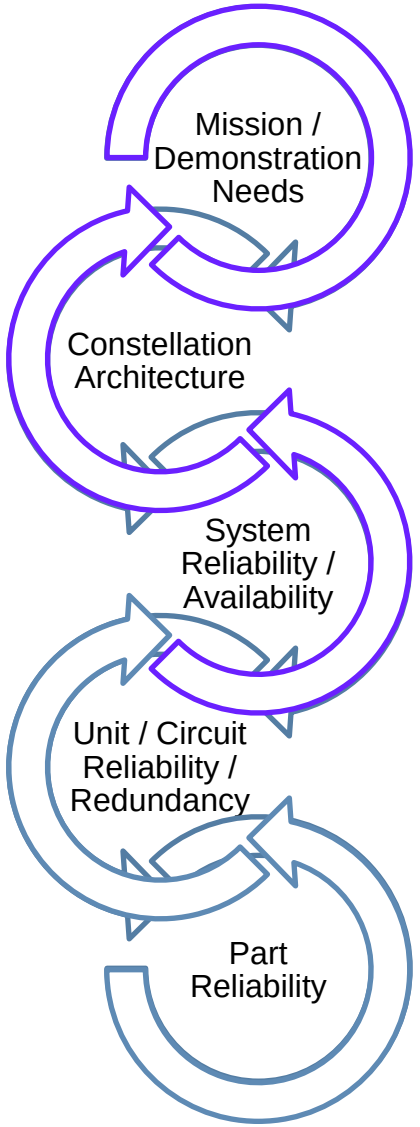
  - *Demonstrations and prototypes*
- Evolving mission needs and lower price points driving the potential to utilize alternate grade electronics, but requires…
  - *Sufficient confidence for informed risk management*
    - Avoidance of infant mortality failures
    - Known and consistent performance and failure modes
    - Knowledge of single event effect susceptibilities





Why Alternate Grade Electronics?

- Demand for state-of-the-art technology and reduced development cycles in today's space systems
  - *Commercial business case viability*
  - *US Government rapidly evolving missions and threats*

- Enabled by high volume, affordable and reliable alternate grade EEE global supply chain
  - *Alternate grade electronics include:*
    - Automotive, Aviation, Commercial off the Shelf (COTS), Industrial, Terrestrial Military
    - Piece parts, components and assemblies, subsystems

- Ability to manage risk at higher levels within mission architectures

What can we (the industry) do to accelerate alternate part utilization?

Provide information for informed risk-based decisions

- Leverage existing data and knowledge
  - *Comparison of standards/guidance to identify potential risk and inform mitigation options*
    - A Qualitative Comparison of EEE (Electrical, Electronic, Electromechanical) Component Requirements: Part I – MIL-PRF (Military Performance) vs AEC (Automotive Electronics Council) Standards - OTR-2020-00603
    - A Quick Reference Sheet for Risk-Tolerant Space Missions Using Alternate Grade Electronics – OTR- 2019-01255
  - *Pooling and sharing of data and experience*
    - Non-space industry data and experience
    - Additional part/electronics test data and analysis
      - *Space environment Single Event Effects (SEE) test data and guidance*
        - PMPedia.space vanguard.isde.vanderbilt.edu/RGentic/ s3vi.ndc.nasa.gov https://schema.space
        - spoonsite.com creme.isde.vanderbilt.edu modelbasedassurance.org
      - *Up-screening and On-orbit experience*
- Develop new innovative, efficient and cost-effective approaches to Incorporate features, guidelines and data mining in part design/manufacture to reduce backend testing
  - *New approaches to mitigate the introduction of new infant mortality, wearout and SEE mechanisms*
  - *More efficient and perceptive test approaches*
  - *Early characterization to inform redundancy trades for achieving reliability and availability needs*

Questions?