SAND2019-5021PE

Advanced and Exploratory System Concepts

Adam Monkowski | May 6, 2019

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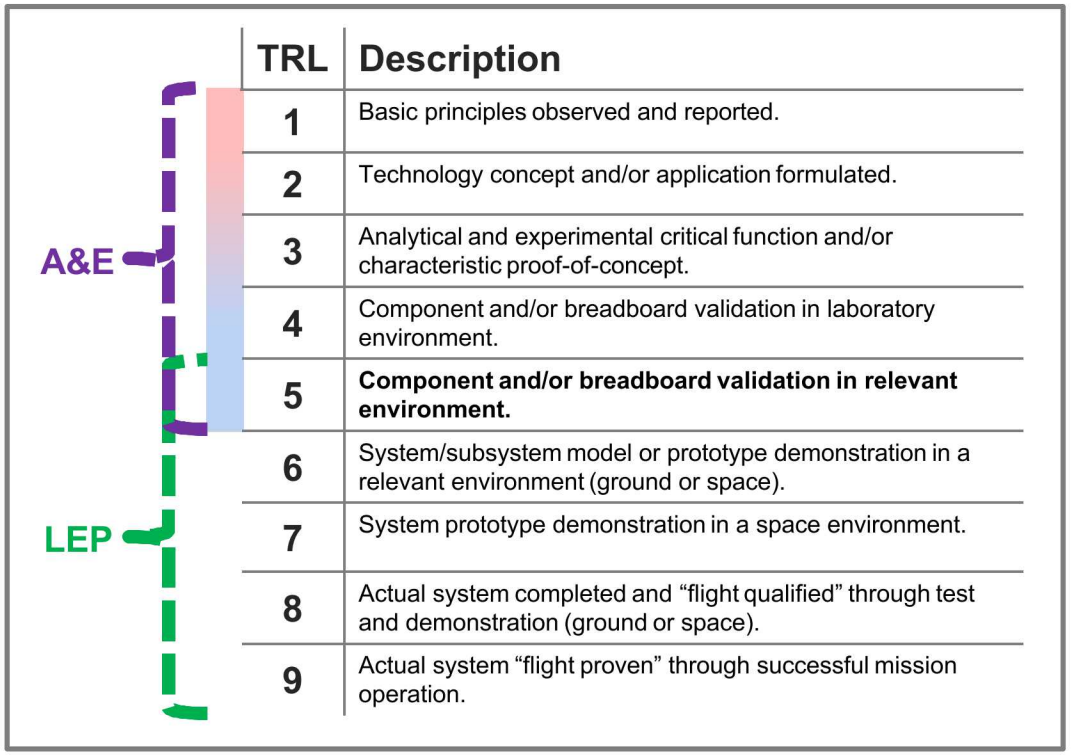
Advanced and Exploratory Systems

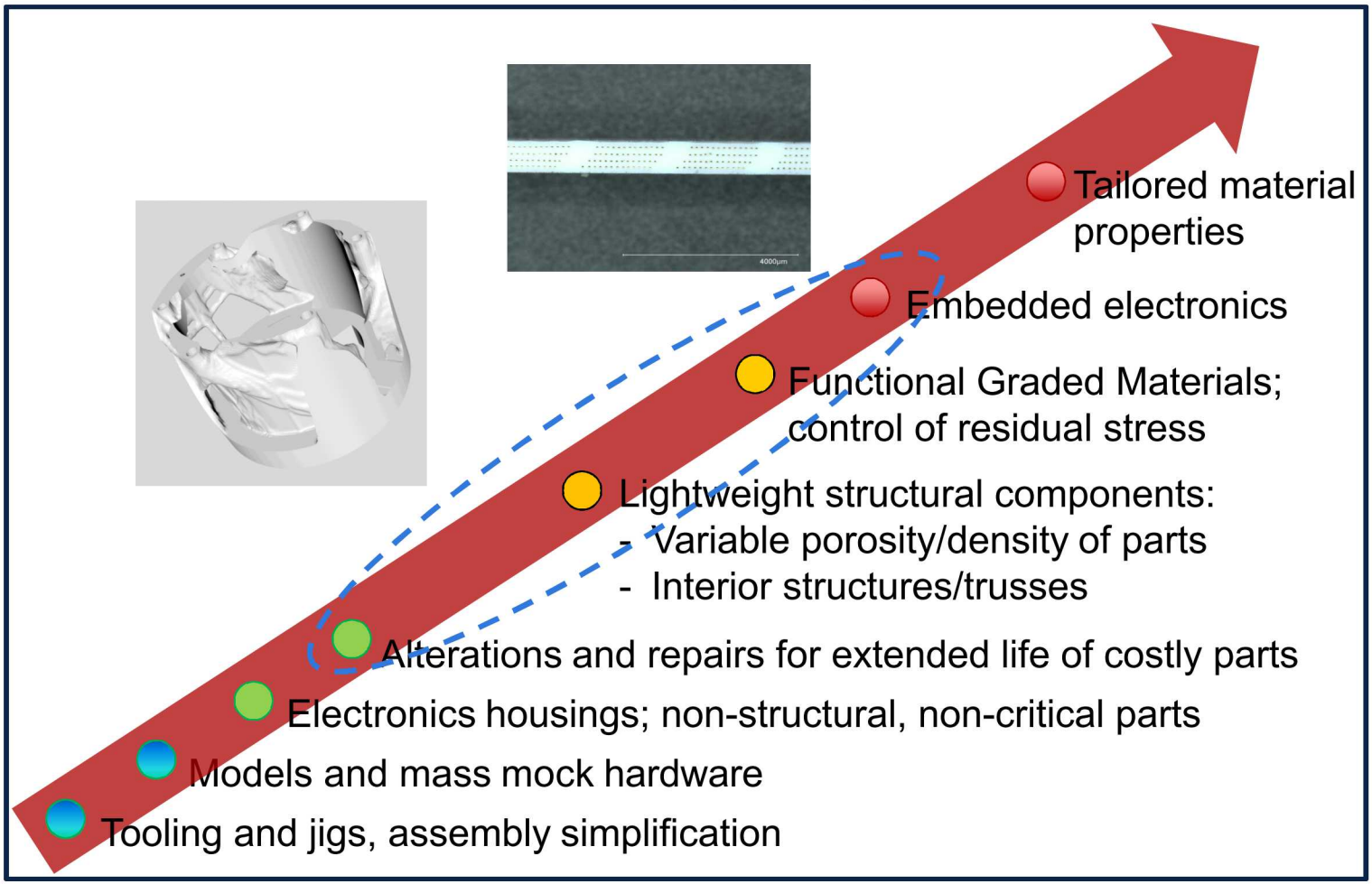
- **Sandia A&E develops and integrates forward looking systems**
- Focused on advancing TRL of compelling technologies
- TRL Advancement by:
  - Providing system (relevant) context to advance to **TRL5**
  - Partnership with ND component groups and S&T organizations for system-level guidance
- A&E systems are **technology demonstrators**
  - ***Not Life Extension Program (LEPs)***



A&E exists to shepherd new technologies & direct future R&D

Compelling Applications

Advanced → Exploratory

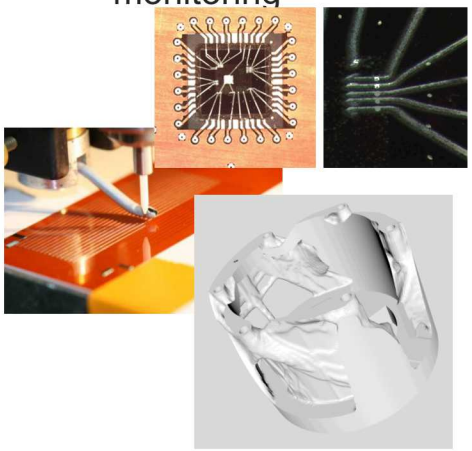


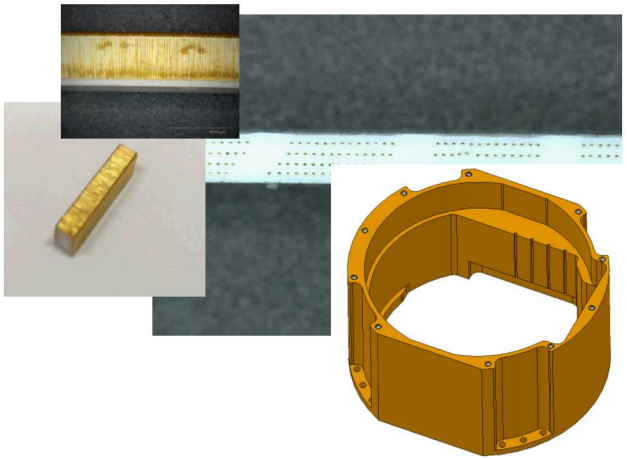
Key Technologies of Interest for A&E

System context for emerging technologies

TRL 0-2	2-4	4-5	5-9
Exploratory		Advanced	LEP

- **Topology Optimized Designs**
  - Multi-physics/multi-material
- **Exploratory tech**
  - Embedded sensors for structural health monitoring



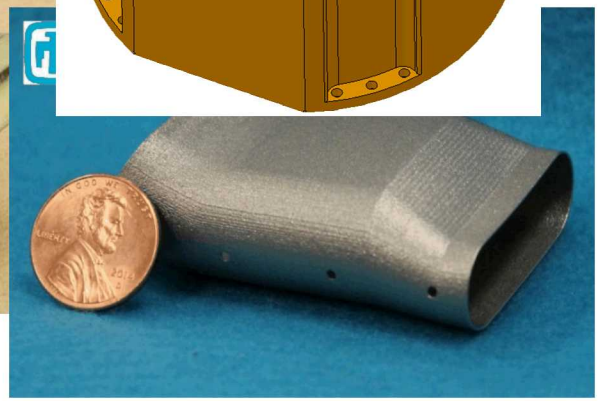


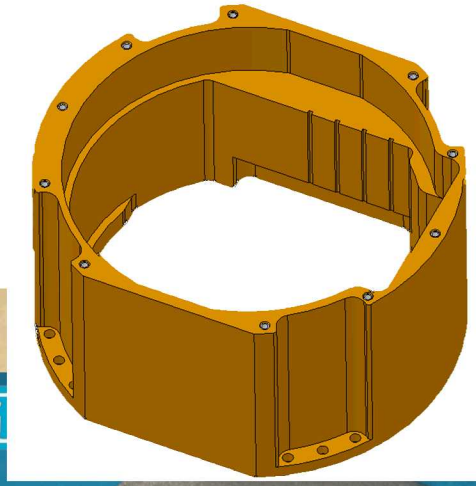
- **TO/Traditionally designed parts**
  - Challenging geometries
- **Squishy Bus**
  - Flexible blind connectors
  - Anisotropically conductive

- **Traditionally designed parts**
  - Alts/repairs, replacement of obsolete capabilities
- **Minaturized Connectors**
  - Modular components
  - B2B FPC interconnects
  - Low profile connectors

Product Realization

- Design/Model
- System Integration
- Manufacture & Post Process
- Test/Inspect
- Assemble & Ship





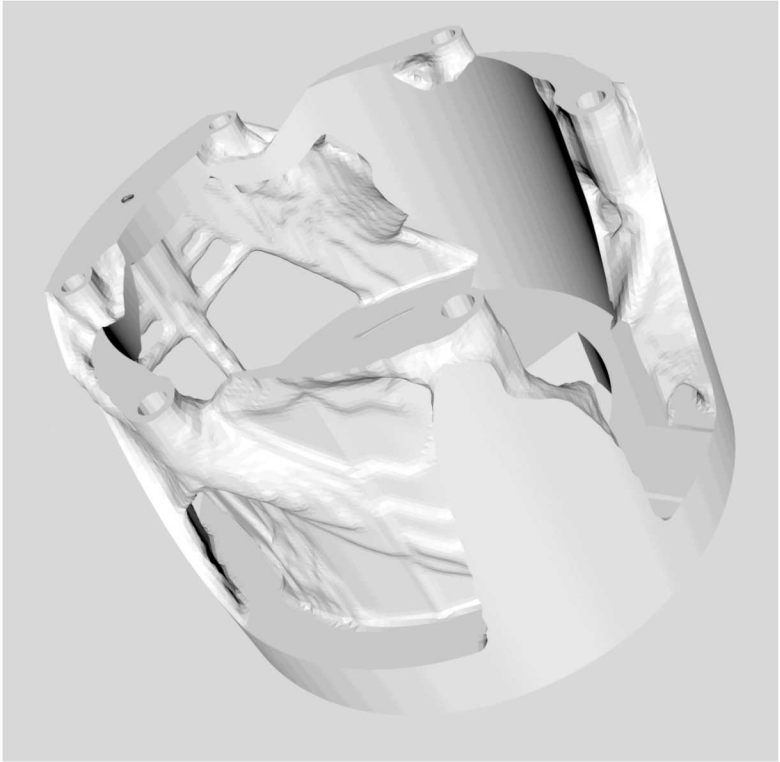
AM 17-4 stainless steel housing

- SNL/CA initial metal prototypes:
  - Electronic housings
  - Mechanical brackets

Traditional designs can leverage traditional product realization process

Product Realization II:

- Design/Model
- System Integration
- Manufacture & Post Process
- Test/Inspect
- Assemble & Ship



Advanced design & materials will need innovative product realization processes

Product Realization II

- Design/Model
- System Integration
- Manufacture & Post Process
- Test/Inspect
- Assemble & Ship

DASSAULT SYSTEMES
TOSCA STRUCTURE

INSPIRE
solidThinking 2015

- Multi-physics optimization
- Dynamics optimization
- Multi-material optimization
- DFM driven optimization

Product Realization II

- Design/Model
- System Integration
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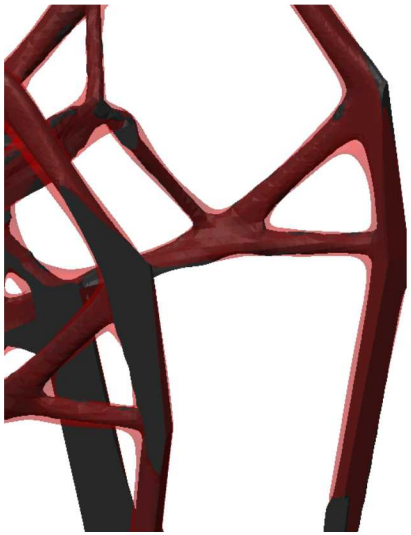
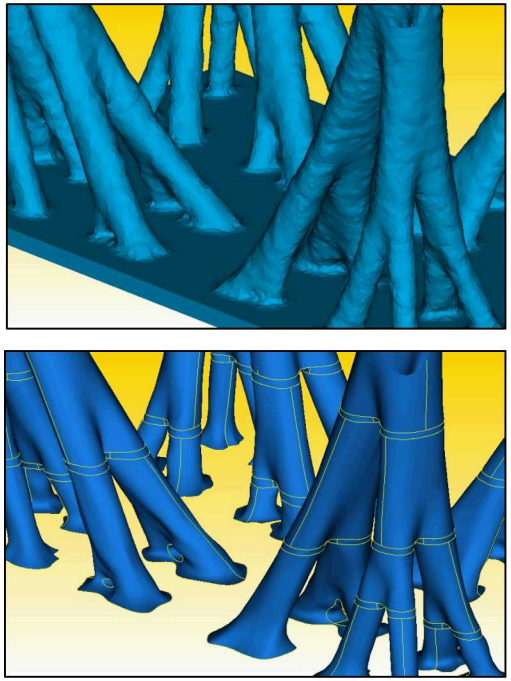
➢STL (stereolithography) translation optimization

Manual → Automated



Black: TO output STL
Red: Solid CAD model



(Courtesy of Paul Stallings, Ryan Viertel)

Product Realization II

- Design/Model
- System Integration
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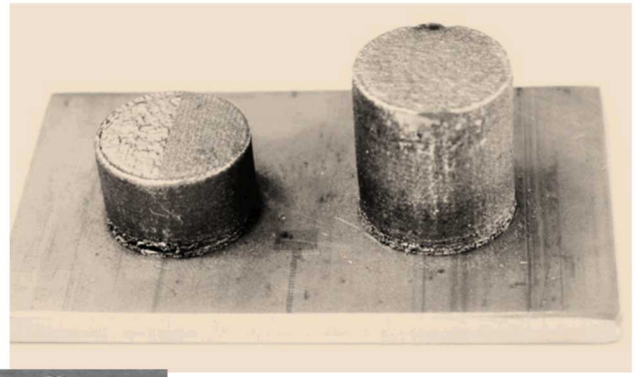
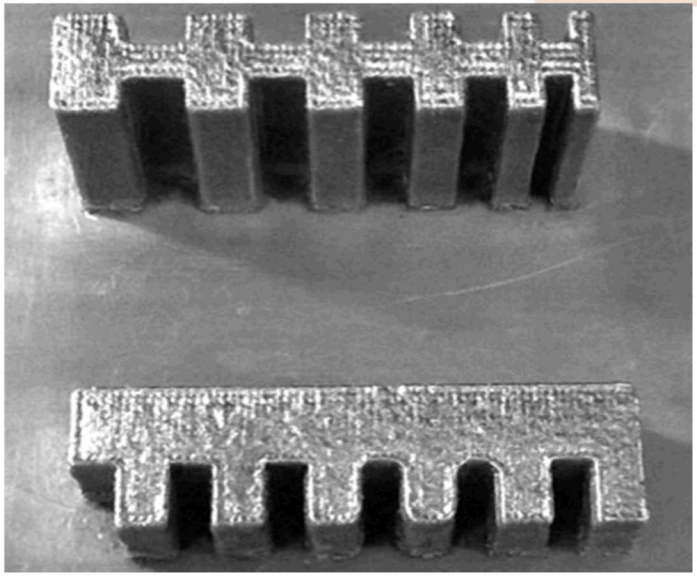
- Test/Inspect
- Assemble & Ship





- LENS deposited prototypes with SS 316L

Source: N. Yang, K. Gaiser, L. Clemon

Product Realization II

- Design/Model
- System Integration
- Manufacture & Post Process
- Test/Inspect
- Assemble & Ship

- Post-process machining
- Surface finishing methods for reproducibility or property enhancement
  - Electropolishing
  - Extrusion honing
  - Other abrasives

Product Realization II

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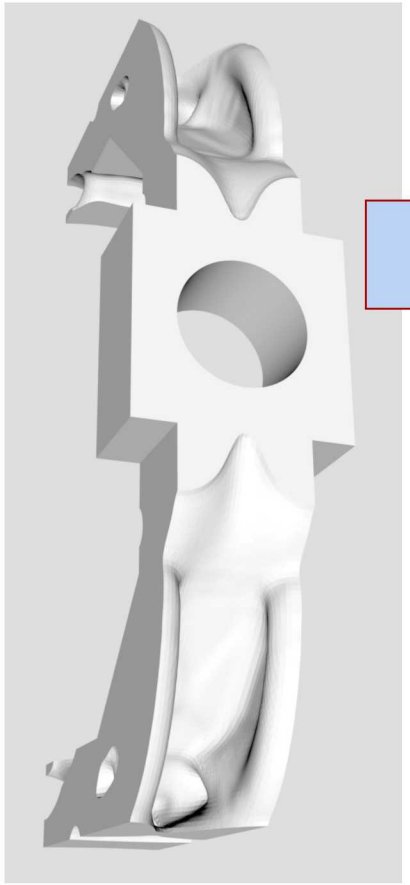
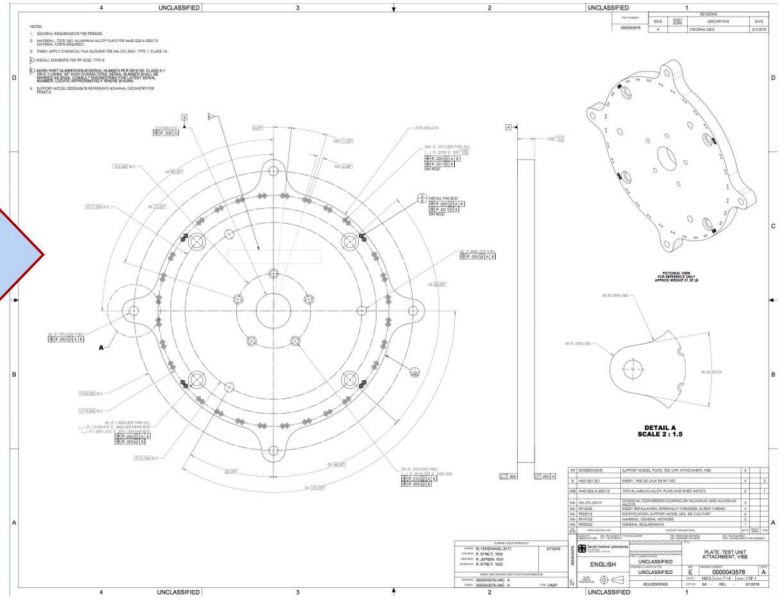
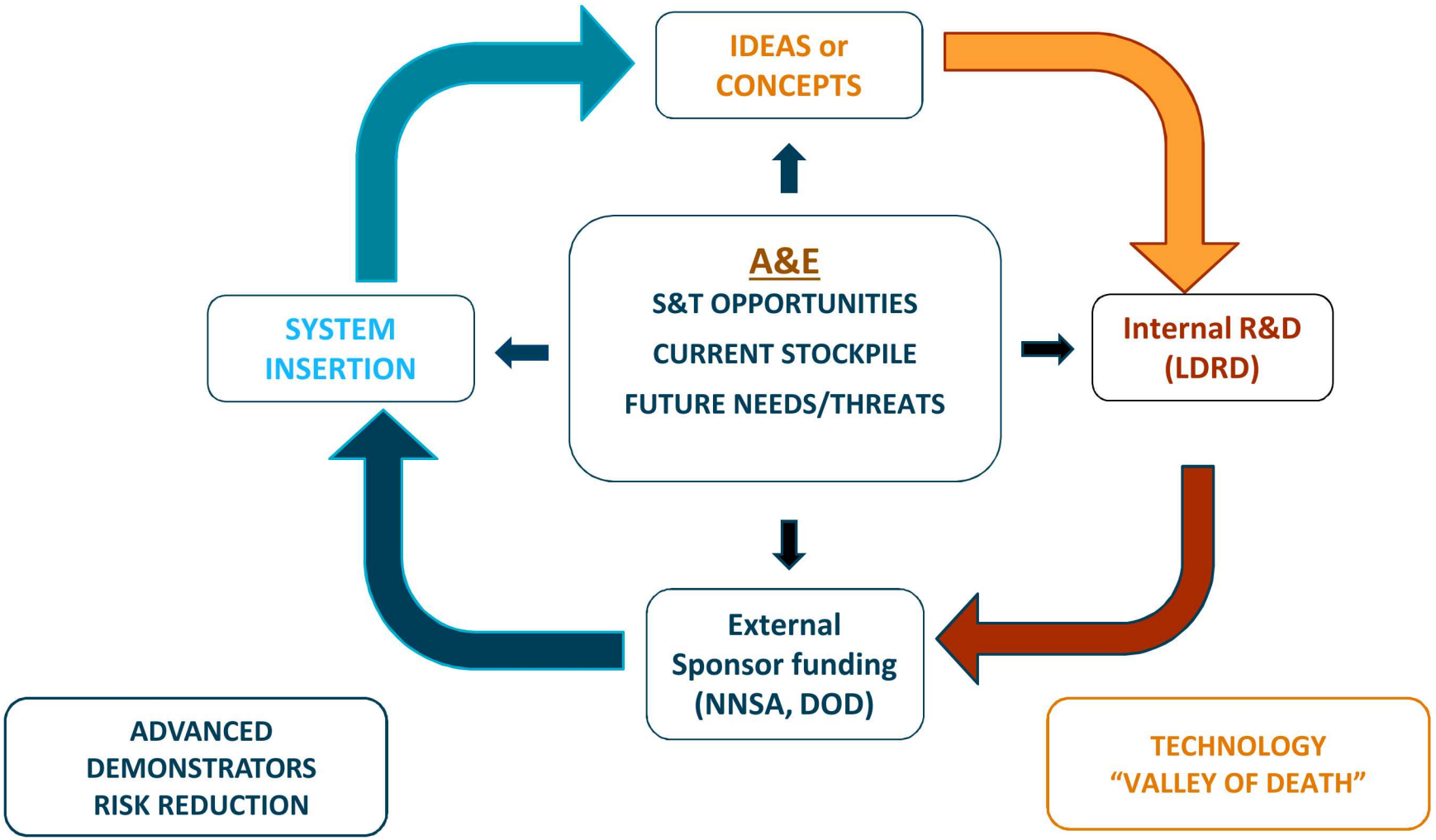




- How is design communicated?
- How are tolerances communicated?
- How are tolerances calculated in design?
- How are complex surfaces inspected?
- How are materials properties evaluated?
- **Are new methodologies or approaches required?**

A&E Systems


IDEAS or CONCEPTS
A&E
S&T OPPORTUNITIES
CURRENT STOCKPILE
FUTURE NEEDS/THREATS
SYSTEM INSERTION
Internal R&D (LDRD)
External Sponsor funding (NNSA, DOD)
ADVANCED DEMONSTRATORS RISK REDUCTION
TECHNOLOGY "VALLEY OF DEATH"

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END

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