HITEMMP & ULTIMATE TECHNOLOGIES IN AEROSPACE

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CURRENT CHANGES AND PRIORITIES IN AEROSPACE

Healthy Travel

Digitization

Artificial Intelligence & Autonomy

Environment & Sustainability

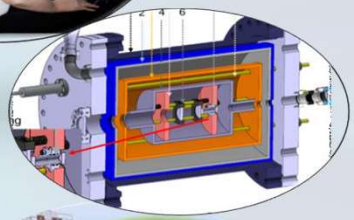
Electrification

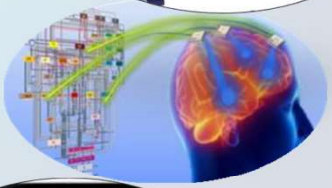
Advanced Materials & Manufacturing

Cyber Security & Quantum Technologies

Increased access to space

KEY TECHNOLOGIES AND CAPABILITIES





Digital Engineering

Autonomy

AI / ML

Sustainability & Future Mobility

Quantum Technologies

Hypersonics

Advanced Microelectronics

Propulsion, Power & Thermal

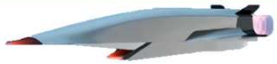
High Rate Composites

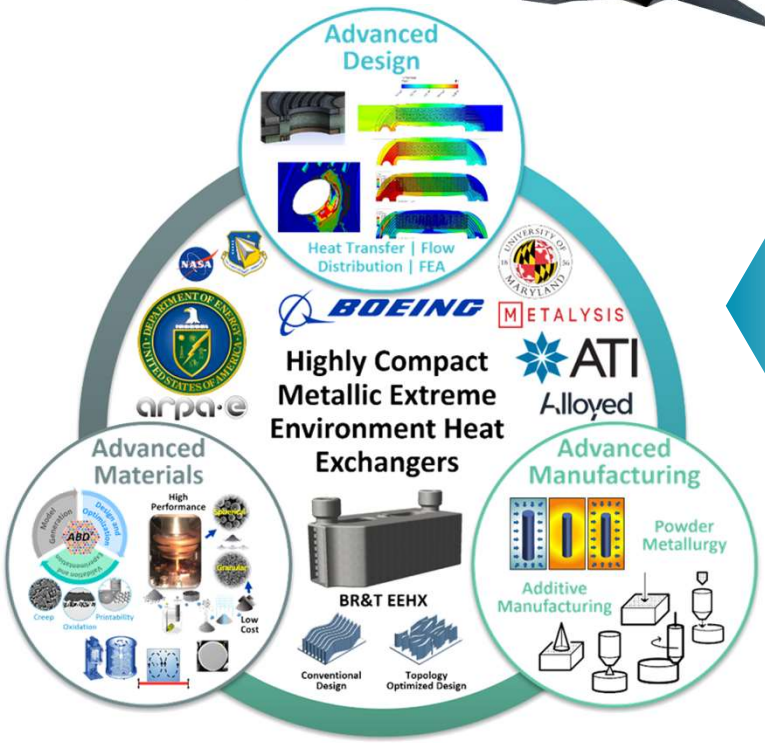
Global Engagement

Additive Manufacturing

BOEING/ARPA-E HITEMMP AND ULTIMATE PROGRAMS



HITEMMP
High **I**ntensity **T**hermal **E**xchange via **M**aterials and **M**anufacturing **P**rocesses

ULTIMATE
Ultrahigh **T**emperature **I**mpervious **M**aterials **A**dvancing **T**urbine **E**fficiency

Dr. Ali Yousefiani
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PROJECT VISION: Develop metallic 1000°C-capable extreme environment heat exchangers for use in terrestrial and aerospace power generation

PROJECT VISION: Develop metallic turbine blade components with coating solutions allowing for engine turbine inlet temperatures of 1800°C and beyond

ARPA-E REEACH and ASCEND

- Highly efficient and cost effective Energy Storage and Power Generation (ESPG) system
- Ultra efficient and lightweight electric motors, drives, and thermal management

https://www.boeing.com/principles/environment/ecodemonstrator

https://www.boeing.com/resources/boeingdotcom/principles/sustainability/assets/data/2021_Boeing_Sustainability_Report.pdf

CONCLUSIONS

- Strong alignment between Aerospace and Energy technology needs
- HITEMMP and ULTIMATE exemplify this alignment
  - High temperature materials
  - Additive manufacturing
  - Model-based engineering and multidisciplinary topology optimization
- REEACH and ASCEND are developing foundational technologies for future electric and hybrid-electric platforms

BOEING R&D PRIORITIES

- Model-based Engineering of Product, Production and Sustainment Systems
- Modular Architecture and Digital Backbone
- Advanced Production System
- Sustainability and Future Mobility

BCA	BDS	BGS