U.S. ARMY

DEVCOM AVIATION & MISSILE CENTER

U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND AVIATION & MISSILE CENTER

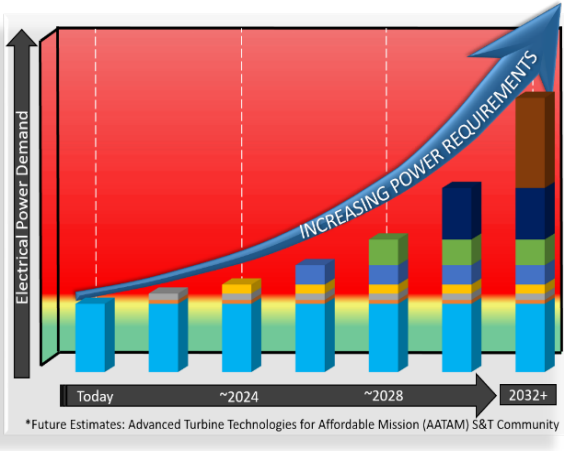
Hybrid-Electric Technology for Army Aviation

29 AUGUST 2023

FOCUS

- Innovation with advanced technology
- Operational energy and contested logistics
- Prepare for next-generation platforms

BACKGROUND CONDITIONS



Need

- Increasing power needs forecasted for Aviation systems
- Distributed operations in austere conditions
- High operational energy needs

Policy & Guidance

Stakeholders:
- Army senior leader interest
- Operational energy dominance area of emphasis
- U.S. Army/DoD policy (including Climate Strategy)

Commander's Intent: AFC has three priorities in support of our purpose: prioritize people, **design Army 2040**, and deliver Army 2030. - GEN Rainey, AFC Commander

Opportunity

Non-DoD Investment in Emerging AAM Technology

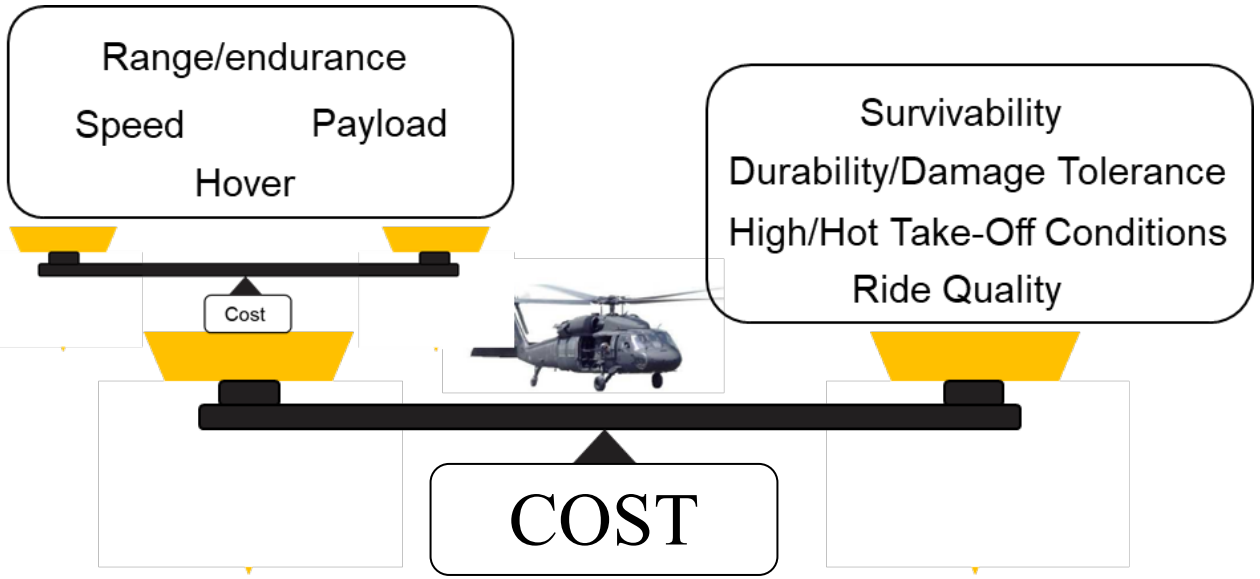
eVTOL Investments Will Continue Billion Dollar Trend in 2021, Woodrow Bellamy III
https://interactive.aviationtoday.com/avionicsmagazine/february-march-2021/evtol-investments-will-continue-billion-dollar-trend-in-2021/

Future air mobility funding still flows, although down from 2021, Johnston, Reuel, Riedel
…As of the end June 2022, cumulative disclosed industry funding totaled $15 billion.
https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/future-air-mobility-blog/future-air-mobility-funding-continues-to-flow-after-outlier-year-2021

Government Investment:
- Air Force Agility Prime program
- NASA Advanced Air Mobility
- FAA
- Department of Energy

Dual-Use Technology

CONVENTIONAL CHALLENGES



US Army makes largest helicopter award in 40 years, DefenseNews – 12/5/2022

Future Long-Range Assault Aircraft (FLRAA) is expected to enter the fleet in 2030

https://www.defensenews.com/industry/us-army-makes-largest-helicopter-award-in-40-years/

$400 per gallon gas to drive debate over cost of war in Afghanistan, The Hill – 10/16/09

https://thehill.com/homenews/administration/52568-400-per-gallon-gas-to-drive-debate-over-cost-of-war-in-afghanistan/

Can technology help?

- Rotorcraft design is a challenging set of engineering trade-offs.
- More is always desired
  - Speed, payload, range
  - World-wide operations (high/hot, cold, sand, all-weather)
  - Operational effectiveness (mission systems)
- Cost and development time increases with size, capability and complexity.


1979


1962


1984


2030

EMERGING TECHNOLOGY WATCH

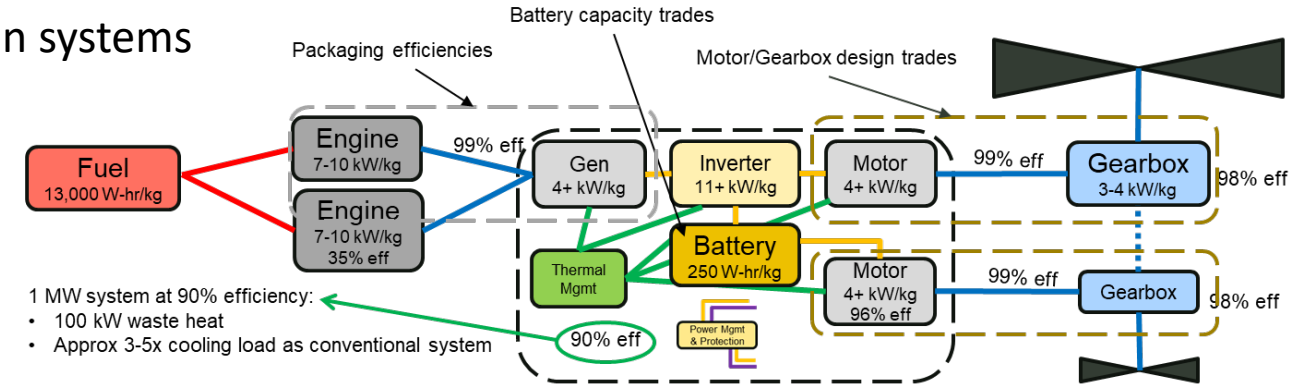
NASA Reference Concepts

Distributed Electric Propulsion Concepts

- Vertical Flight Society (VFS) tracking 800+ eS/VTOL concepts
- Many concepts 5,000-10,000 lbs. capable of 1000 lb.+ payloads
- Estimated investment over $10B, mostly by non-DoD
- Multiple companies in flight test phase with tech demonstrators and prototypes
- NASA, FAA investments providing support for civil uses

Challenges of electric propulsion
- Technical
- Airworthiness certification
- Infrastructure

Potential benefits of hybrid, distributed electric propulsion systems
- Relative simplicity & design flexibility
- Affordability
- Lower fuel consumption



Use to supplement helicopter fleet?

POTENTIAL APPLICATION OF NEW TECHNOLOGY

Army Aviation Core Competencies:

- ✓ **Provide accurate and timely information collection**
- Provide reaction time and maneuver space
- Destroy, defeat, disrupt, divert, or delay enemy forces
- Air assault ground maneuver forces
- ✓ **Air movement of personnel, equipment, and supplies**
- ✓ **Evacuate wounded or recover isolated personnel**
- ✓ **Enable command and control over extended ranges and complex terrain**

FM 3-04 Army Aviation

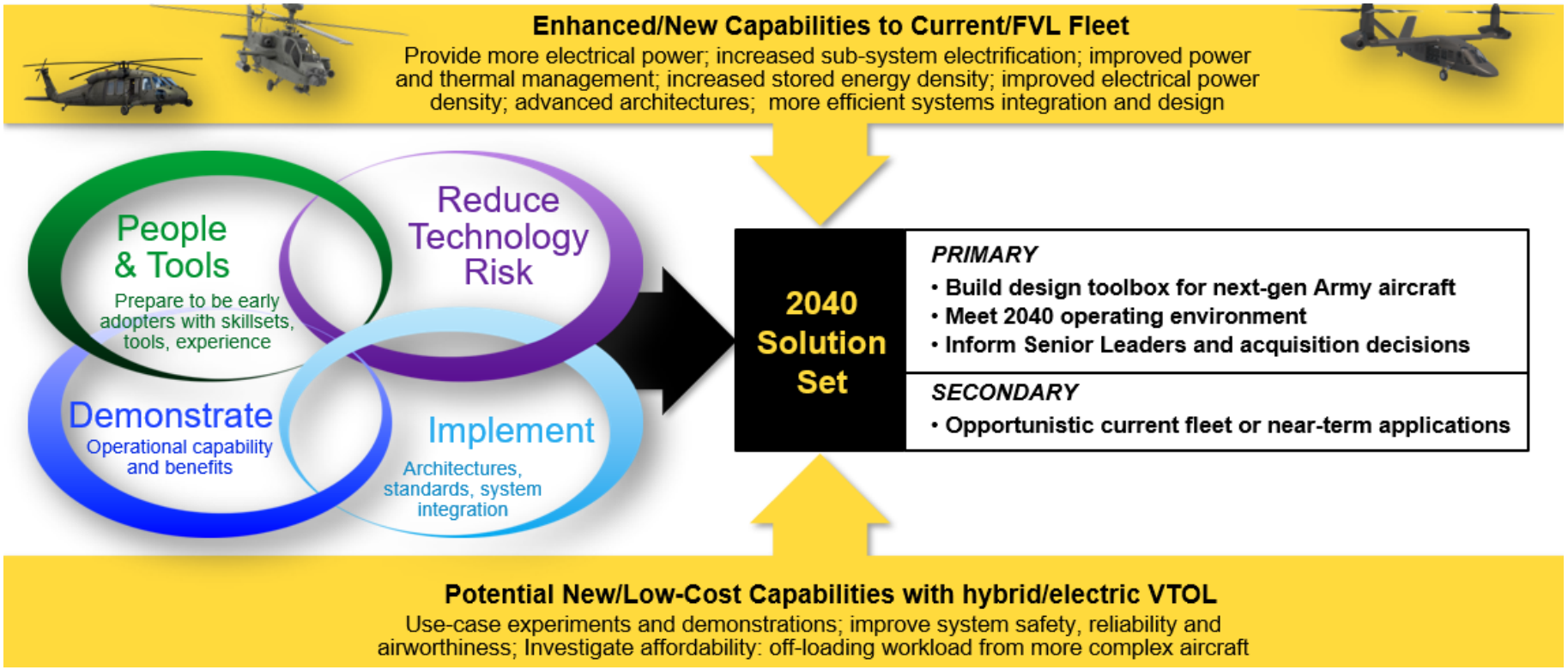
Experimentation needed

- Potential application of new class of aircraft
  - Off-load some aviation missions from current fleet aircraft
  - New capability enabled by technology – signature management
  - Harvest technology to make conventional fleet better

- Desired benefits
  - Lower cost
  - Reduced fuel usage
  - Faster time to fielding
  - Higher availability of combat aircraft

Distribution Statement A

ARMY AVIATION ELECTRIFICATION S&T INVESTMENT FRAMEWORK



- Currently within Science & Technology purview
- Building knowledge base to:
  - Become early adopters
  - Acquisition expertise (inform requirements, write specifications, provide airworthiness releases)
- Investigating technologies and use cases
  - Risk reduction
  - Operational suitability
- Demonstrate operational value
  - Off-load jobs to low-cost platforms
  - New technology-enabled capabilities

QUESTIONS?

U.S. ARMY