Aviation Turbine Engines Project Office

PM ATE Program Overview

COL Roger Kuykendall
Project Manager

Mr. Bob Sheibley
Deputy Project Manager

8 April 2022

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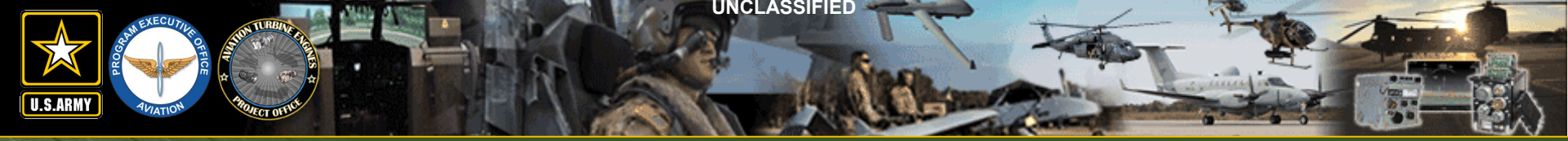
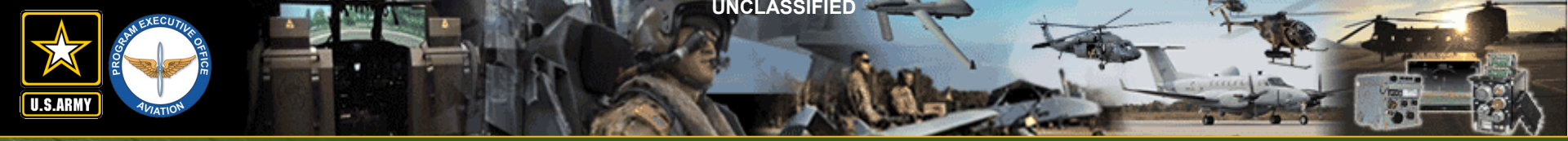


Agenda

- **PEO Aviation Organization**
- **PM ATE Mission and Organization**
- **Overview of Products**
  - Improved Turbine Engine Program (ITEP)
  - T700 Engine
  - T55 Engine
  - Electrical Power Systems (EPS)
  - Modernization roadmap
- **Q&A**



As of 9 Sept 2021

PEO Aviation

Requirements	Design, Develop, Deliver		Enduring + Future
AFC	PM FARA — COL Kevin Chaney — Office Size: 60+	PM FLRAA — COL David Phillips — Office Size: 140+	
AMC	PM CH — COL Al Niles — Office Size: 230+	PM AH — COL Jay Maher — Office Size: 510+	
USAACE	PM FW — COL James DeBoer — Office Size: 200+	PM UH — COL Calvin Lane — Office Size: 610+	
AISC	PM UAS — COL Joseph Anderson — Office Size: 420+	PM MASPO — COL Tim McDonald — Office Size: 140+	
MCOE	PM ATE — COL Roger Kuykendall — Office Size: 120	PM AMSA — COL Burr Miller — Office Size: 360+	

Platform Capabilities

Army Aviation

- FARA
- FLRAA
- FUAS
  - *AUAS*
  - *FTUAS*
  - *ALE*
  - *SCI*
- CH/MH-47 F/G
- AH-64 D/E
- UH/HH/MH-60M
- UH-60V
- FW Transport

ISR

- Gray Eagle ER
- FW ARL-E
- FW EMARSS
- FW Guardrail

Maneuver

- Short-range Recon
- Medium-range Recon
- Long-range Recon

Cross-cutting Capabilities

A-PNT **Operational Power**

Network **MOSA**

Aviation Turbine Engines Project Office

Project Manager
COL Roger Kuykendall

Admin Support
Sebrina Whitaker

Deputy Project Manager
Bob Sheibley

Operations
John Smith
Janice Sanders

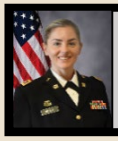
ATE Project Office

Tech Division Chief
Nate Curry

Logistics Division Chief/PSM
Brian Murphy

Business Division Chief
Jeff Bacon

ITE Product Office



Product Manager
LTC Kelley Nalley

Dep Product Manager
Brent Logan

Technical | Business
Product Support | Acquisition Support

T700/T55 Product Office

Product Lead
Chris Cousins

Dep Product Lead
(VACANT)

T700 | T55

ALC - T700 Division

Division Chief
Rakeshia McKinney

ALC - T55 Division

Division Chief
Claude McClendon

ACC Redstone

Division Chief, Propulsion Contracts (ACC)
LTC(P) Ross Lindsey

Aviation Turbine Engines Mission and Vision

- **Vision:** Provide Army Aviation with affordable and reliable power solutions.
- **Mission:** Centrally manage the Army's rotary wing turbine engine and electrical power capability by designing, developing, delivering, and supporting power solutions for U.S. aviation rotary wing and coalition partners.

Aviation Turbine Engines Overview

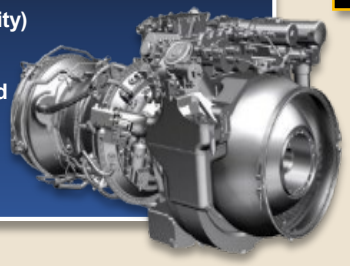
- ✓ ***Production Contract Management***
- ✓ ***Field Support***
- ✓ ***Safety of Flight Technical Assistance***
- ✓ ***Obsolescence and Safety Improvements***

T700-GE-701D

- Powers the Black Hawk and Apache Fleet
- 2000 Shaft Horsepower Turboshaft Engine

T901-GE-900 Improved Turbine Engine (ITEP)

- Will power FARA, Apache, and Black Hawk Fleets
- 3,000 Shaft Horse Power Class Engine
- Supports MDO (Army Aviation Reach and Lethality)
  - Worldwide Performance (6k/95°)
  - Significantly Increases Aircraft Range, Payload and Endurance with Full Mission Payload
  - More Power with Greater Fuel Efficiency

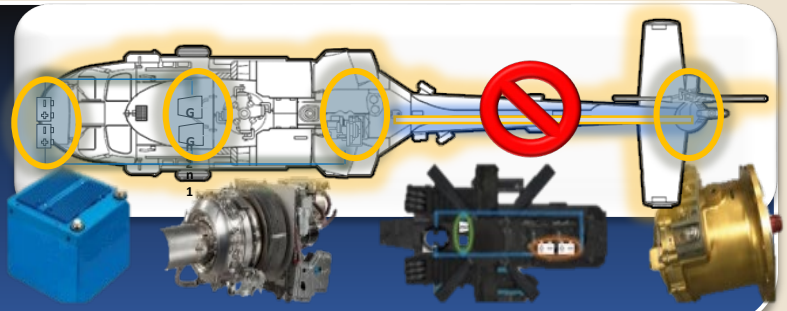


T55-GA-714A

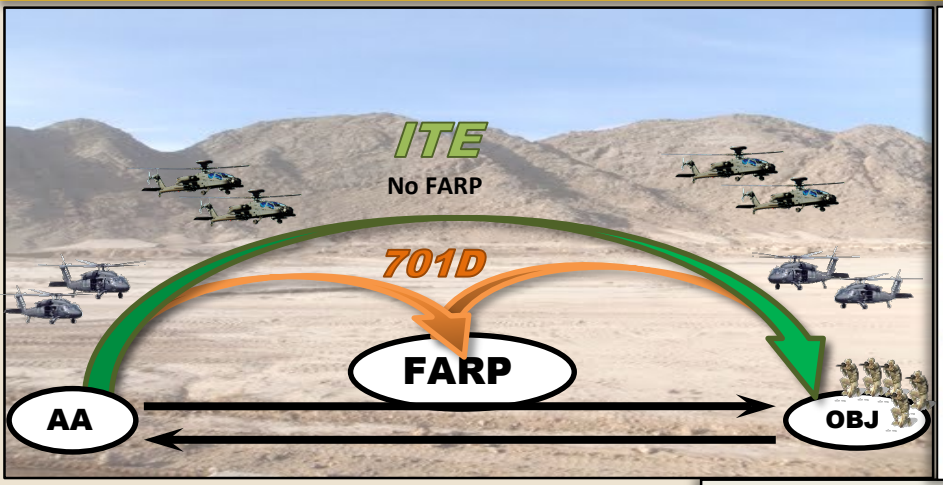
- Powers the Chinook Fleet
- 4800 Shaft Horsepower Turboshaft Engine
- MH-47G Specific Efforts
  - HMA (Fuel Control) Improvements
  - Engine Control SW Update

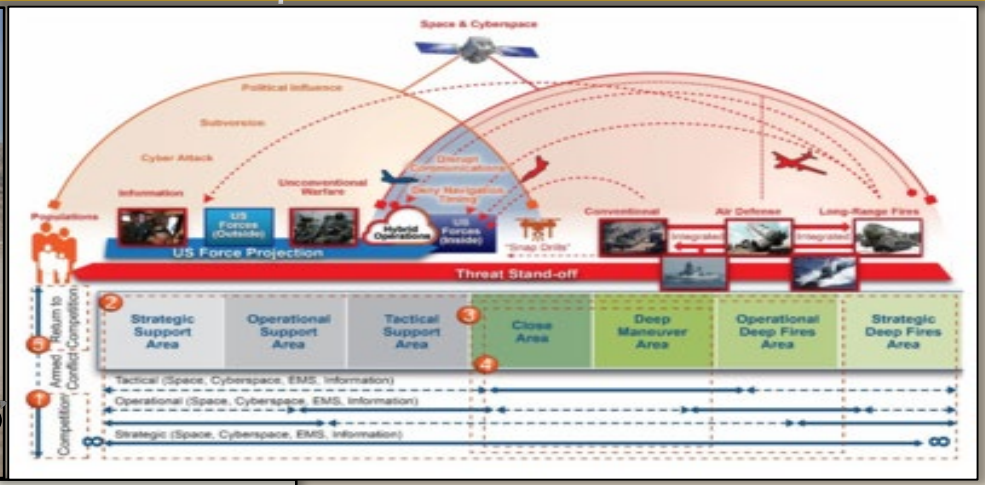
Electrical Power Systems

- Cross cutting, common capabilities to modernize Army Aviation Power Systems
- Common Aviation Battery, Generators, Flightworthy APU/SPU, and Smart Power Management
- Meet increasing Operational Power Demands



US Plans to use Multi Domain Operations to Defeat A2AD; ITEP is Critical to MDO Aviation Operations





Major Program Events

TMRR (FY16-FY18)

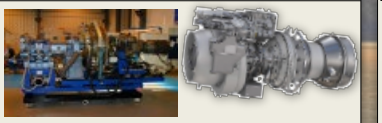
PDR

- Δ FIT Checks (PDR Design)
- Δ PDRs Completed
- – TMRR contracts executed $50M below estimate
- – Maintained Schedule
- – Both PDRs meet/exceed all (T) requirements

EMD CA CDR (FY20)

- Δ FIT Checks (CDR Design)
- Δ CDRs
- – Single Vendor EMD Contract
- – Ballistic Assessment
- – Product Drawings

FETT (FY22)



- Δ Full Scale Ground Testing
- Δ Endurance Test
- – Platform A-Kit Fabrication
- – Software Safety of Flight Release
- – Developmental Testing

PFR (FY23-FY24)

AWR

- Δ DT AWR
- Δ Flight Testing
- – Final Software Release
- – Ballistic Testing
- – System Verification Review

A/C Qual (FY24)

FARA CP Apache Black Hawk

BELL SIKORSKY

- Δ FARA CP First Flight
- Δ A-Kit SAQ
- Δ Physical Configuration Audit
- – Engine Qualification
- – Platform Qualification
- – Operational Assessments

Acronyms:
AWR – Airworthiness Release
A2AD – Anti-Access / Area Denial
CA – Contract Award
CDR – Critical Design Review
DT – Developmental Test
FARP – Forward Area Refueling Point
FETT – First Engine To Test
PDR – Preliminary Design Review
PFR – Preliminary Flight Rating
SAQ – Statement of Airworthiness Qualification

- – Significantly Increases Range and Endurance
- – Completes the Mission in **1/2 the time** using **1/3 the Fuel**
- – No FARP Required
- – ~ **2 x Payload Increase** for Apache to Increase Target Effects
- – Mass Combat Power on the Objective 2 x Faster*

T700 Engine Overview

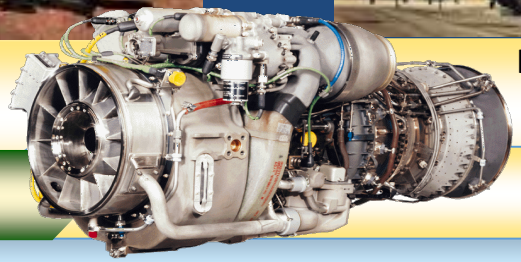
AH-64D
-701C/CC
-701D/CC
-701D/DC

AH-64E
-701D/DC

H-60A
-701C/CC
-701D/CC

H-60L
-701C/CC
-701D/CC

H-60M
-701D/DC



-701C~1900 shp / -701D~2000 shp

Front drive, modular turboshaft engine with a five-stage axial/one-stage centrifugal compressor, a two-stage gas generator turbine and a two-stage power turbine

Vendor: GE Aviation

T700 engine variants having accumulated over 50 million flight hours, six major performance upgrades, and integration into multiple premier helicopter platforms.

Current Efforts:
EDECU P09 Fielding
EDECU Obsolescence

T700 Fleet Description	
-701D Engines Installed (at end of FY20):	5900+
-701C Engines Installed:	3
-700 Engines Installed:	0

What We Do:
- Deliver and Support the Army's AH-64 and H-60 Helicopter Fleet T700 Engine and Controls
- Improve Durability, Reliability, Readiness, and Availability
- Obsolescence and Configuration Management

What We Manage:
- 701C, 701D (Apache & Black Hawk)
- Engine Control Systems
- Component Improvement Programs (CIP)
- Engine Publications (TM, DMWR, TB)
- Contractor Field Service Representative (CFSR) Program

Who We Are:
- Cross-Functional Program Management Team
- AMCOM Logistics Center (ALC) Co-Located Support
- Systems Readiness Directorate (SRD) Support
- Original Equipment Manufacturers (OEM) Support

T55 Engine Overview

CH-47F

MH-47G

~5000 shp

Front drive, turboshaft engine with a seven-stage axial/one-stage centrifugal compressor, a two-stage gas generator turbine and a two-stage power turbine

Vendor: Honeywell

12 Million Hours Of Operation During Nearly Six Decades Of Service

Current Efforts:

Time Before Overhaul Extension

T55 Fleet Description	
T55 Engines delivered:	2000+
T55 Engines Installed:	1000+

What We Do:

- Deliver and Support the Army's CH-47 Helicopter Fleet T55 Engine and Controls
- Improve Durability, Reliability, Readiness, and Availability
- Obsolescence and Configuration Management

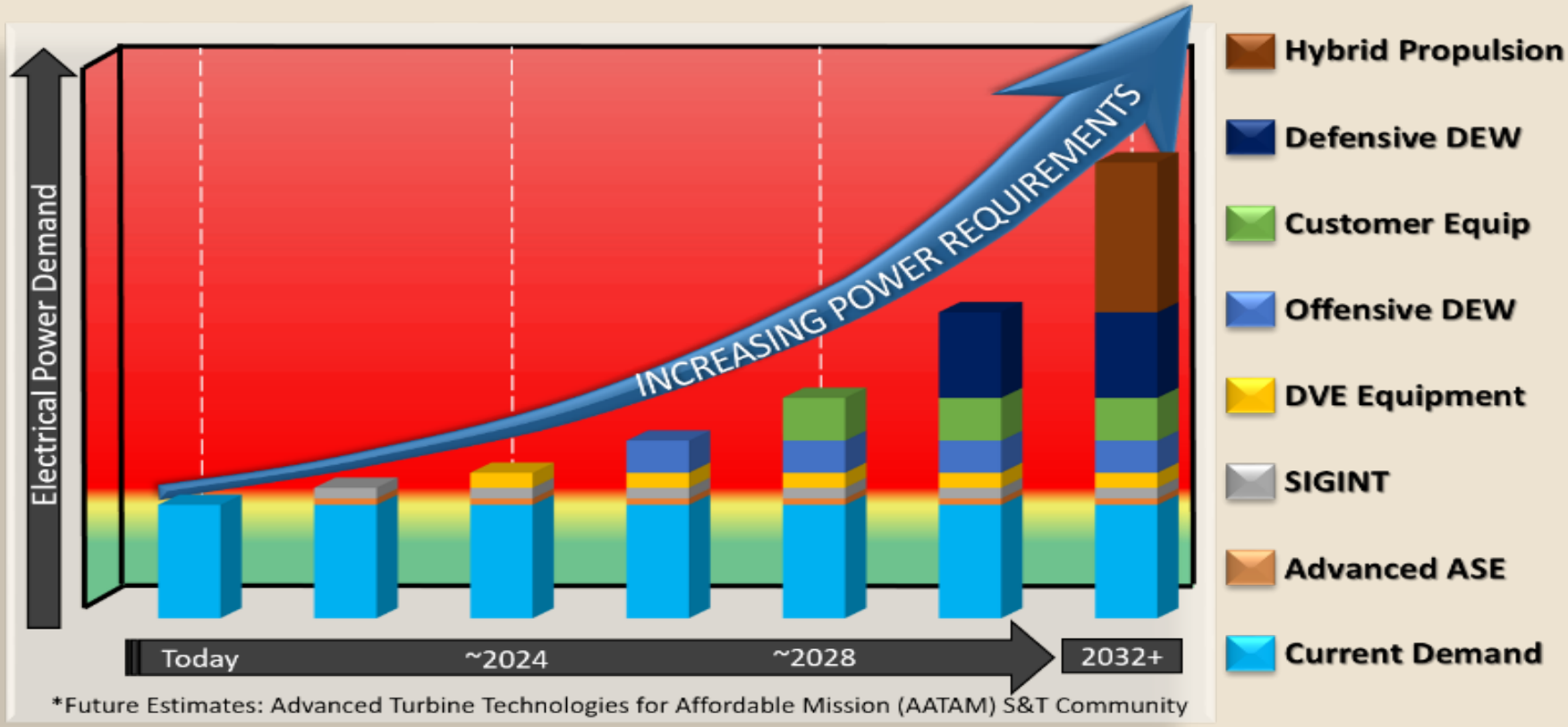
What We Manage:

- T55 Engine program (Chinook)
- Engine Control Systems
- Component Improvement Programs (CIP)
- Engine Publications (TM, DMWR, TB)
- Contractor Field Service Representative (CFSR) Program

Who We Are:

- Cross-Functional Program Management Team
- AMCOM Logistics Center (ALC) Co-Located Support
- Systems Readiness Directorate (SRD) Support
- Original Equipment Manufacturers (OEM) Support

Electrical Power Systems (EPS) Increasing Requirements



Aviation platforms have electrical power capability gaps today and are not postured for Multi-Domain Operations

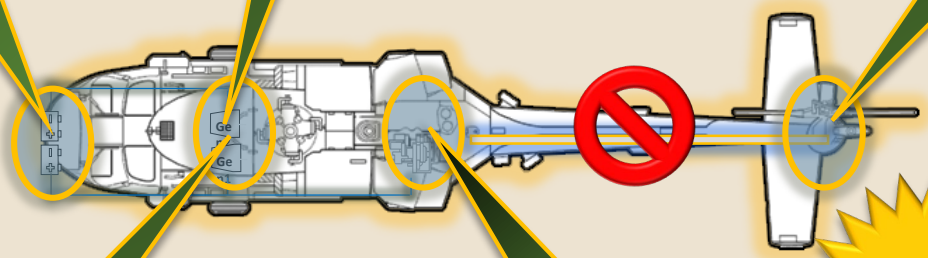
Addressing Aviation Operational Power Demands

Advanced Common Battery
- > 30 Min E-Power
- > Survivability
- > Maintenance Intervals
- > Commonality

Electrical System and Power Management Modernization
- > Thermal Management
- > Reliability & Maintainability
- < Weight

Hybrid Electric Propulsion
- > Fwd. Speed – Electric Tail Rotor
- > Power to Main Rotor – SPU
- > Fuel Efficiency – Reach
- < Mech. Complexity (Drive Shaft)

Required Aviation Attributes
- Reach: Speed, Range, Power, Endurance, Agility
- Lethality
- Protection
- Sustainment



MDO Capable

Across Platforms

Future Vertical Lift
FARA & FLRAA

Advanced Common Power Generation
- > Redundancy in Single Gen Failure
- > Margin for Future Power Requirements
- > Reliability & Maintainability
- > Commonality
- < Weight

Modernized and Airworthy Auxiliary Power Unit
- > Redundancy in Single Gen Failure
- > Margin for Future Power Requirements
- > Efficiency
- > Commonality
- < Weight

Balanced Set of Trades Between All Systems That Optimize Reach, Lethality, Protection, and Sustainment

Propulsion Technology Roadmap

FY20 | FY25 | FY30 | FY35 | FY50

Current State

- Long Dev/Acq Cycles
- Limited Use of COTS Tech
- $$$$ for Growth Capability
- Highly Tethered to Fossil Fuels
- World Class Turbine Technology

Turbine Technology

ITE/FATE

- MOSA Controls
- Additive Manufacturing
- Variable Speed Power Turbines
- Advanced Materials
- Cyber Secure Systems

Hybrid and Electric Technology

- e-Tail Rotors
- e-Pusher/Lift Fans
- Electrically Augmented Turbines

FLRAA

FARA

Emerging Threats

New A/C Configurations

JADO Environment

All Electric Propulsion Systems

Future State

- Quick Tech Insertions via CIP
- Leverage Commercial Investments
- $$ Growth Capability
- Reduced Tether to Fossil Fuels
- Performance Surge/Boost Capability
- Ability to Use Modern A/C Configurations
- Flexible Distributed Propulsion

Opportunities to Leverage Commercial Industry

eVTOL:

- Uber Elevate 2020: **~200 companies** working concepts, **12+ prototypes** built
- "**Toyota** investing nearly **$400 Million** into Air Taxi Startup"
- "Hyundai invest on urban air mobility by 2025: **$1.5B**"
- **~$1B** spent annually on eVTOL development
- **$90B battery market** by 2025: Significant advancements in energy storage

Commercial Aviation:

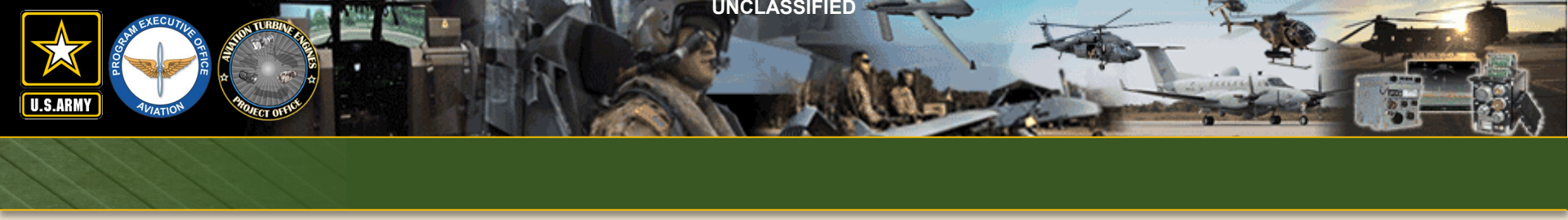
- Airbus 2019, builds **$1B+ facility** to test hybrid propulsion system and has **6+** hybrid electric **demonstrators flying**
- Boeing plans for **hybrid electric regional airliners** by 2030

World Class Military Turbine Tech

+ Commercial Hybrid Tech

New Propulsion Baseline *to ensure capability growth for decades to come*

Traditional Turbine Technologies will continue to advance, but Hybrid and Electric Propulsion Technologies present the largest growth area and potential capability increase for the future of Propulsion Power.


U.S.ARMY
PROGRAM EXECUTIVE OFFICE AVIATION
AVIATION TURBINE ENGINES PROJECT OFFICE

Questions?

PEO Aviation Mission and Vision

VISION: Effective and efficient execution of the Aviation Portfolio to provide enhanced reach & reliability to combat commanders.

MISSION: Serve Soldiers and our nation by designing, developing, delivering and supporting advanced aviation capabilities for operational commanders and our allies.

- *World Class Organization of **3,000** Skilled Acquisition, Logistics and Technical Professionals*
- *Executing Over **$8B Annually** 9 Active ACAT I Programs, 2 Pre-MDAP (Pre ACAT I)*
- *Milestone Decision Authority for **15 ACAT II** and **ACAT III Programs***
- *Foreign Military Sales Portfolio of **455 Cases** Valued at **$50.1B***
- *Executing Other Government Agency Portfolio Valued at Over **$430M***

Managing 30% of the Army's Major Defense Acquisition Programs