



Life Cycle Industry Days
“Accelerating Change to
Empower the Warfighter”
Propulsion Directorate Review

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AFLCMC/LP
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Overview

- **Propulsion Portfolio**
- **Propulsion Mission and Focus Areas**
- **Propulsion Challenges**
- **Propulsion Opportunities**
- **Propulsion Alliances**
- **Summary**



Propulsion Portfolio



AFLCMC/LP Directorate Portfolio

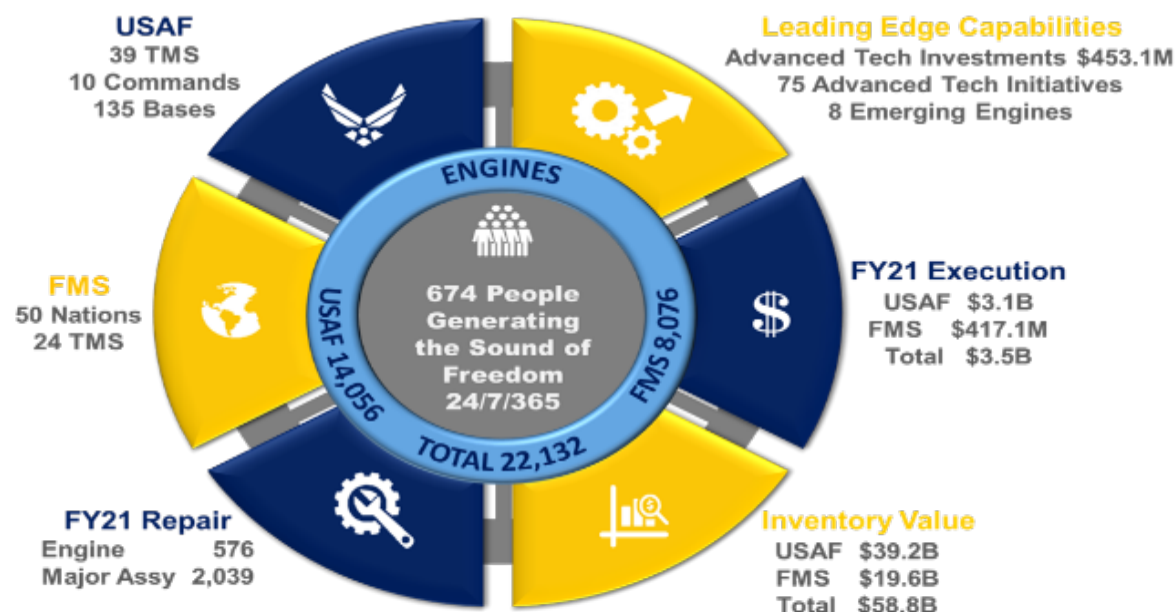
Mission: Deliver Ready, Affordable, Safe, and Effective propulsion solutions and innovations for the USAF and our partner nations

Vision: Be the partner of choice for revolutionizing war-winning propulsion capabilities and delivering agile solutions while providing the warfighter's edge

Focus Areas



Enterprise Scope



As of FY21 Q2

What We Do

- | | | | | | | |
|---------------------|----------------------|-------------------|----------------|---------------|-----------------|-------------------------|
| • AE1107 (V-22) | • F107 (ALCM) | • F118 (B-2, U-2) | • F138 (C-5M) | • JT15D (T-1) | • T106 (T-6) | • T700 (HH-60G) |
| • AETP | • F108 (E-6, KC-135) | • F119 (F-22) | • F139 (KC-46) | • T53 (TH-1H) | • T107 (MH-139) | • TF33 (B-52, E-3, E-8) |
| • F100 (F-15, F-16) | • F110 (F-15, F-16) | • F135 (JSF) | • F404 (T-7) | • T56 (C-130) | • T108 (C-130J) | • TF34 (A-10) |
| • F101 (B-1) | • F117 (C-17) | • F137 (R/MQ-4) | • J85 (T-38) | • T102 (MQ-9) | • T400 (UH-1N) | • (B-21) |



Propulsion Mission and Focus Areas



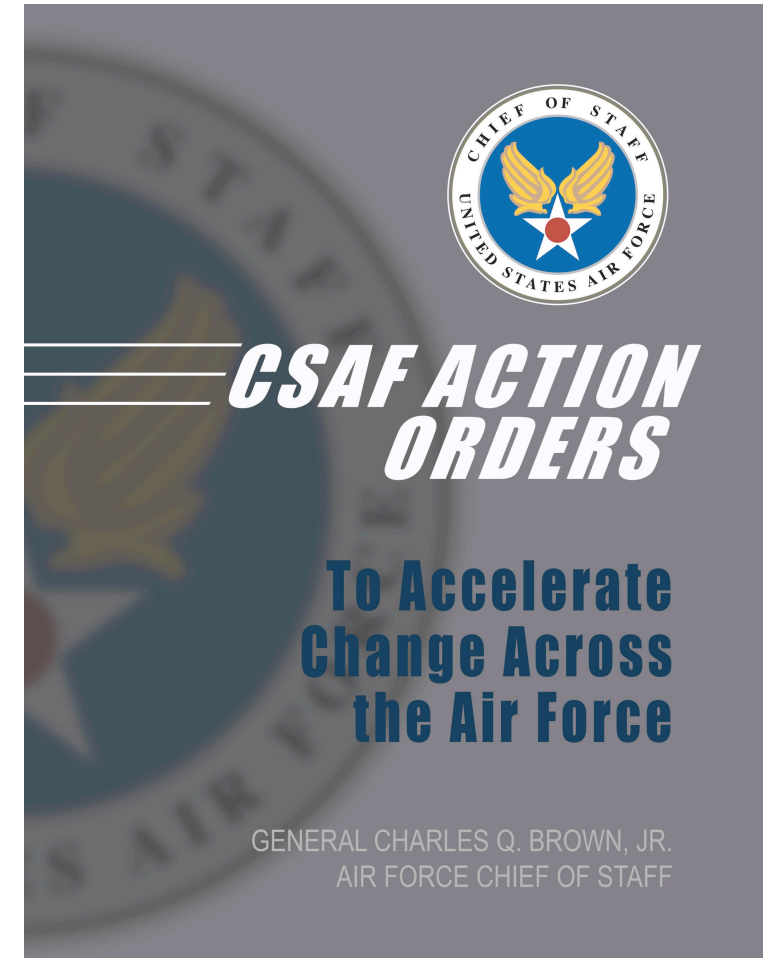
Current as of May 2021



CSAF Action Orders

“Good enough today will cause us to fail tomorrow.”

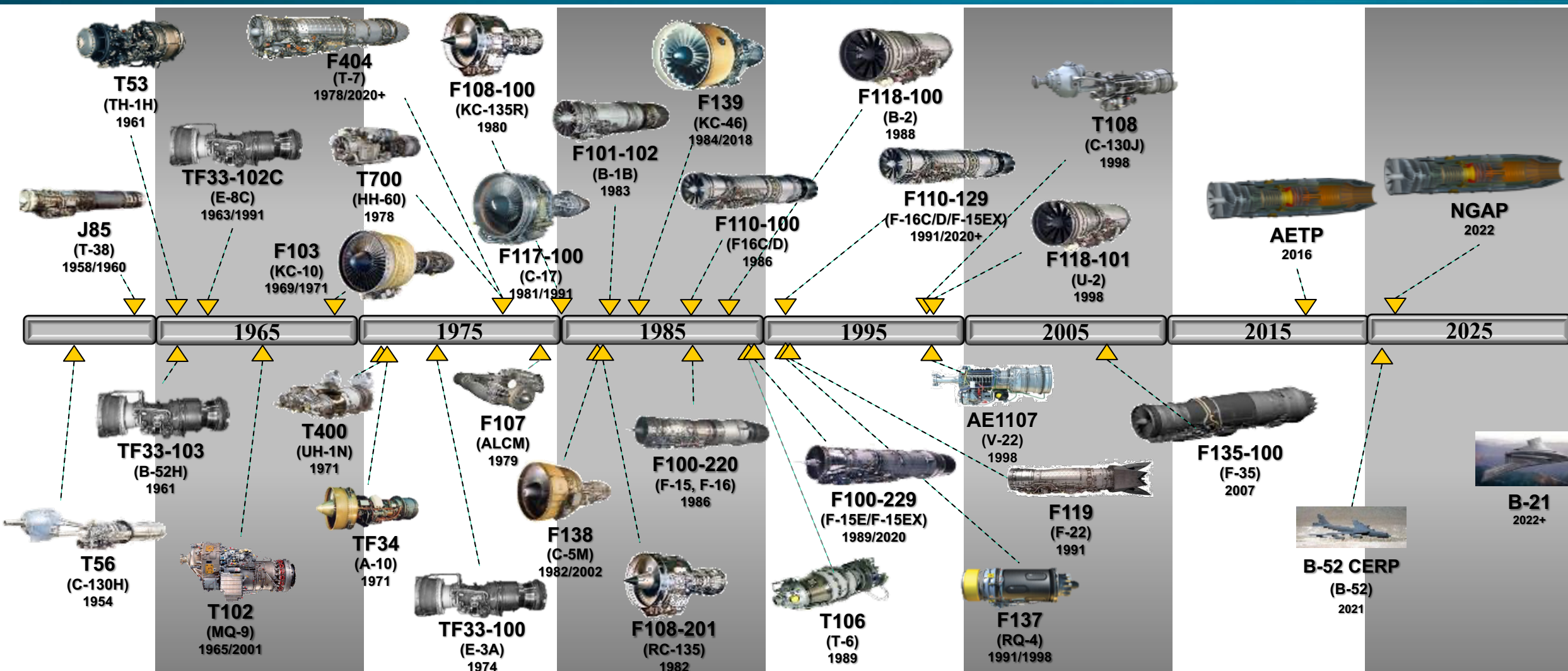
“Acceleration requires harnessing energy and focusing it in a purposeful direction.”



31 August 2020

Accelerate Change or Lose

Propulsion Challenges – Developmental Decline

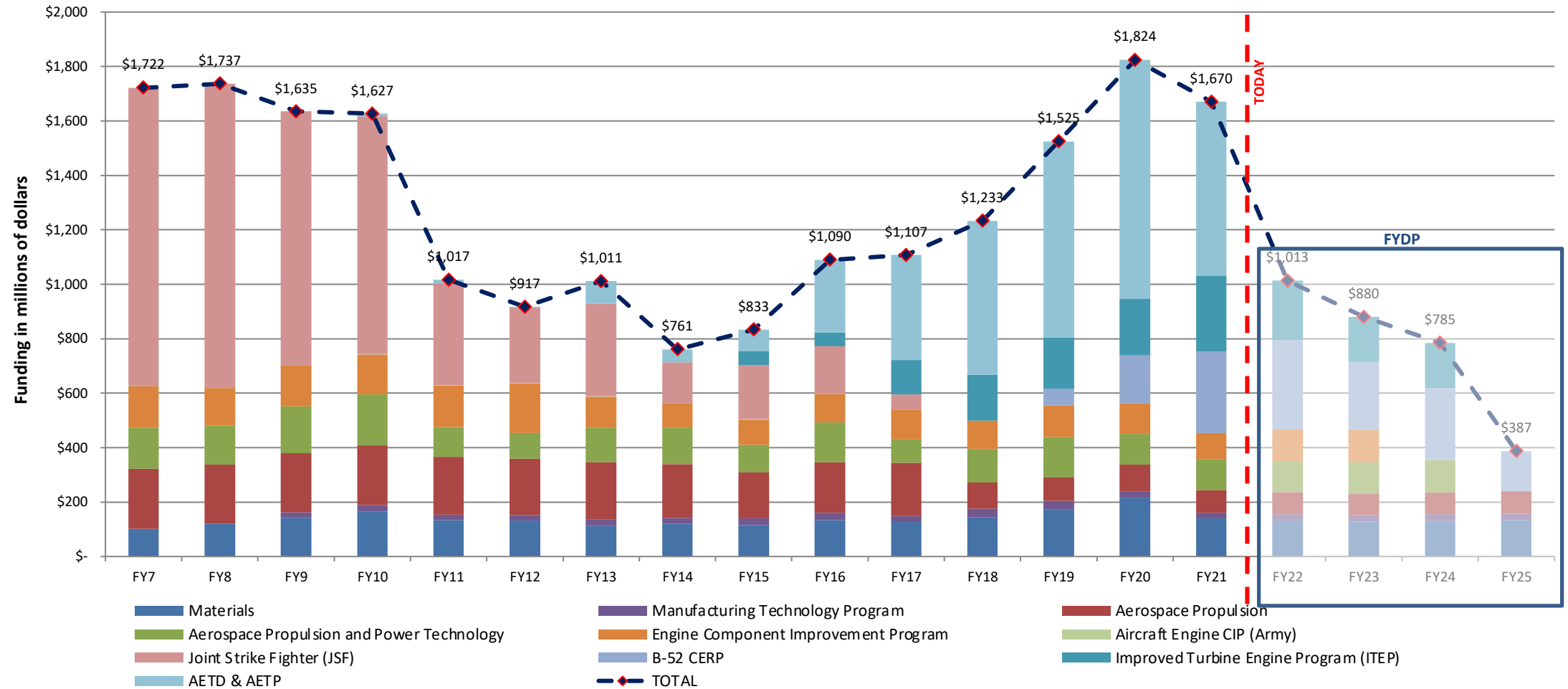


Pace of Engine Development is Slowing



Propulsion Investment Decline

*Source: Research Development, Test & Evaluation Programs (R-2) & Defense Innovation Marketplace



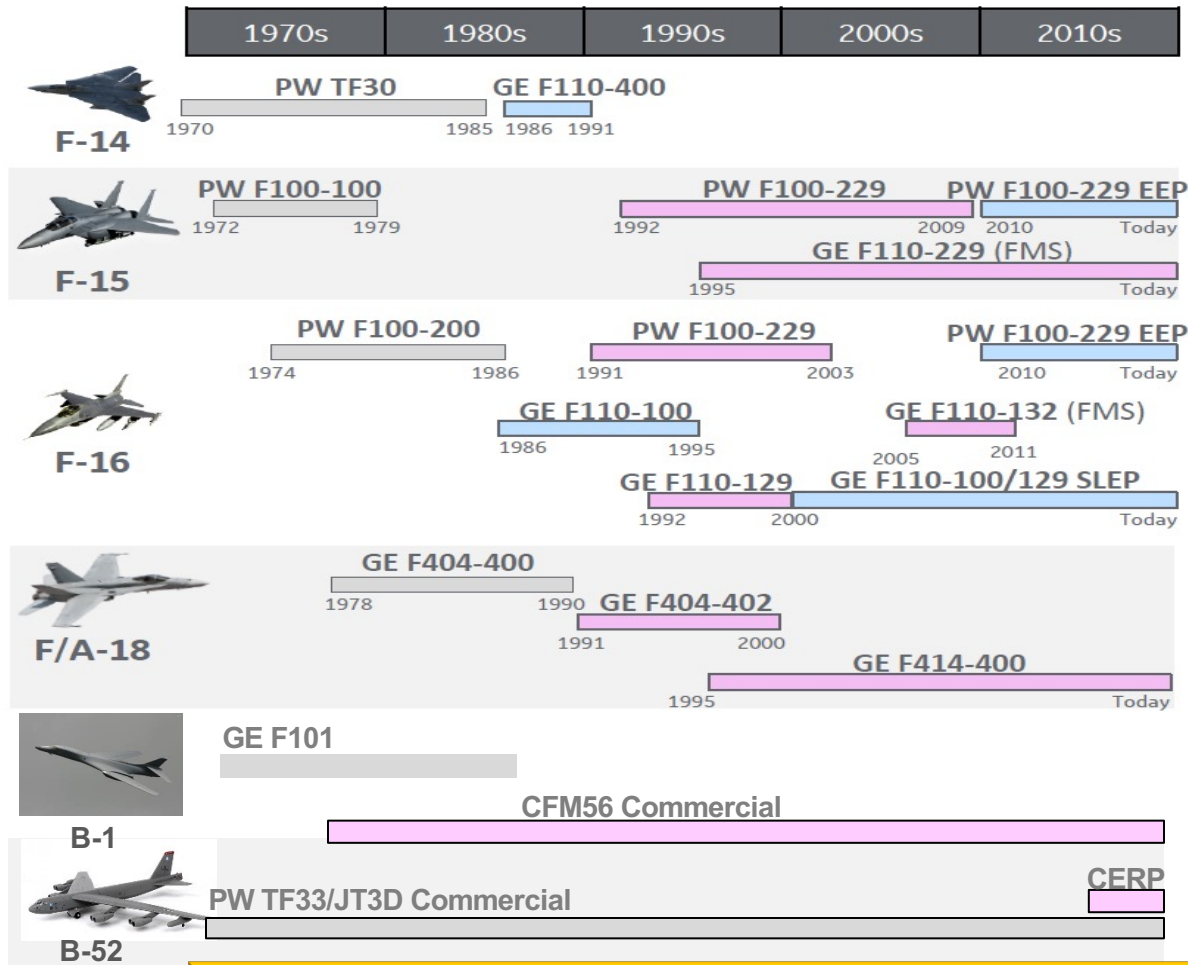
Not Investing; Not Evolving



Generational Upgrade Strategy Shift?

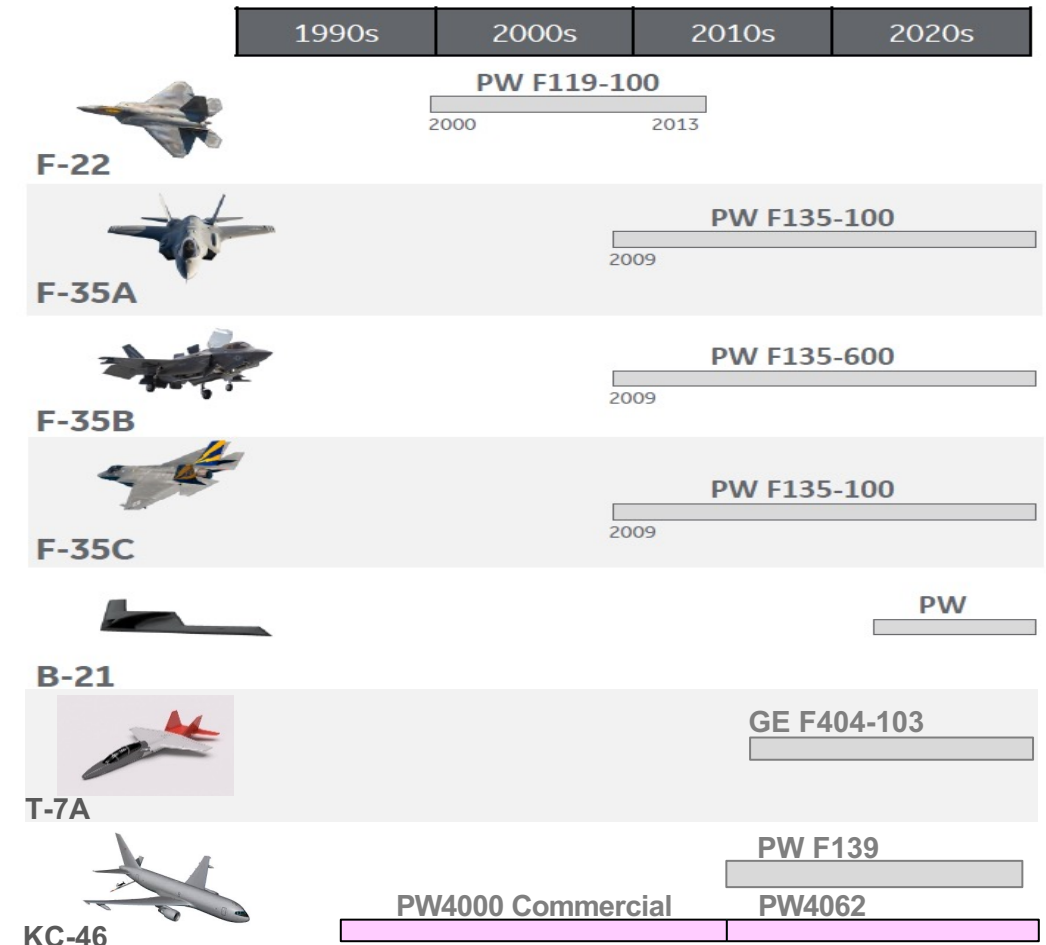
Legacy Combat Aircraft

Multiple Propulsion System Upgrades and Competitive Industrial Base



Recent Combat Aircraft

No propulsion upgrades, Sole-Source, Commercial Dependence



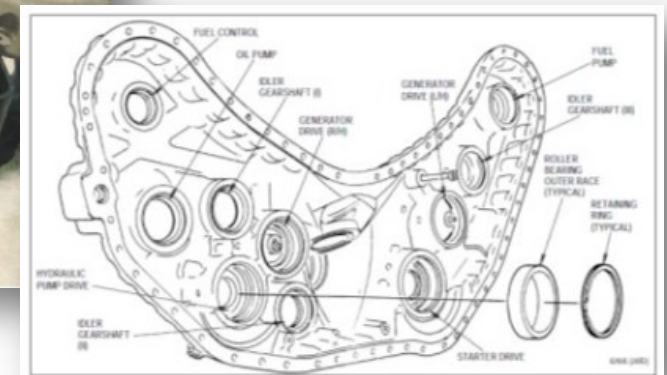
Evolutionary Updates Keep USAF Fighting Today's Wars with Modern Capability

Industrial Base Limitations

- Extensive development time – losing the competitive edge
- Limited manufacturing sources and capacity constraints
- Extended service life causing DMSMS issues
- Intellectual property limitations



P&W Image



Areas We Need Help

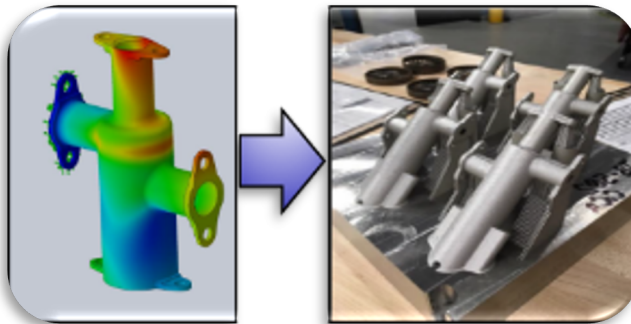
Digital Transformation



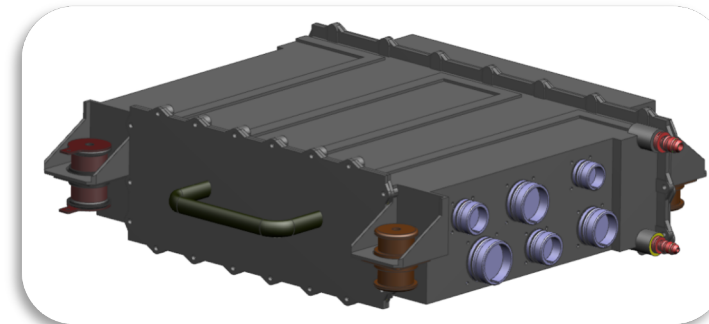
Small Engines



Advanced Manufacturing



FADEC



Need Industrial Base Expertise to Accelerate Change and Innovation



Propulsion Opportunities – Digital Transformation

Propulsion Data Management and Digital Infrastructure

MBSE

MB-DMI

DMRO

Digital Twin/EHM

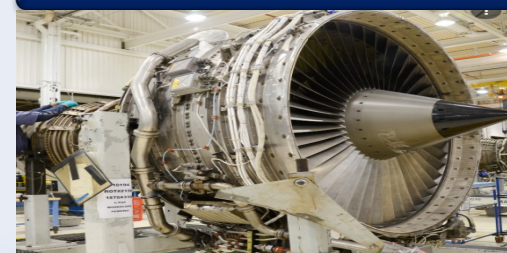
As Conceived

As Designed

As Built

As Serviced

As Flown



Engine OEM

Requirements

Capability

Engineering Design/ Models

Design Definition

Repairs

Manufacturing

Support data & findings

In-service data & findings

Supply Chain/Depot

Prognostics

Military Fleet

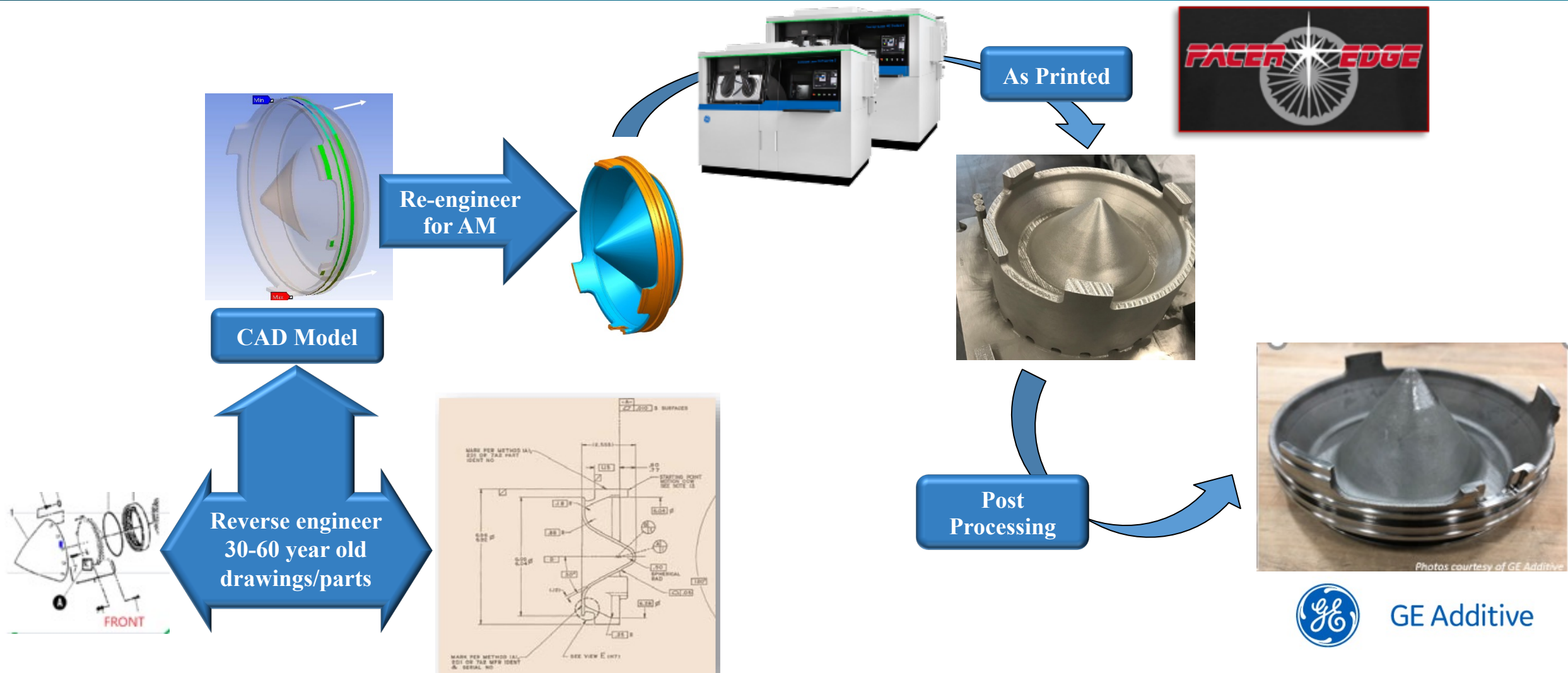
Accelerating Change Requires a Digital Revolution



USAF Deployment Readiness Tool

Engine Model	Engine Status	Deployment Start Date	Deployment End Date	Deployment Flight Hours	Deployment Flight Hours (Max)	Deployment Flight Hours (Avg)	Deployment Flight Hours (Min)	Deployment Flight Hours (Max)	Deployment Flight Hours (Avg)	Deployment Flight Hours (Min)
1	Good	2020-01-01	2020-12-31	1000	1000	1000	1000	1000	1000	1000
2	Good	2020-01-01	2020-12-31	1000	1000	1000	1000	1000	1000	1000
3	Good	2020-01-01	2020-12-31	1000	1000	1000	1000	1000	1000	1000
4	Good	2020-01-01	2020-12-31	1000	1000	1000	1000	1000	1000	1000
5	Good	2020-01-01	2020-12-31	1000	1000	1000	1000	1000	1000	1000
6	Good	2020-01-01	2020-12-31	1000	1000	1000	1000	1000	1000	1000
7	Good	2020-01-01	2020-12-31	1000	1000	1000	1000	1000	1000	1000

Propulsion Opportunities – Advanced Manufacturing for Production

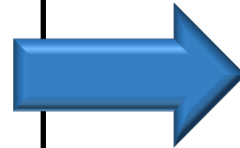


Additive Acceleration Requires 2D to 3D Drawing Conversion

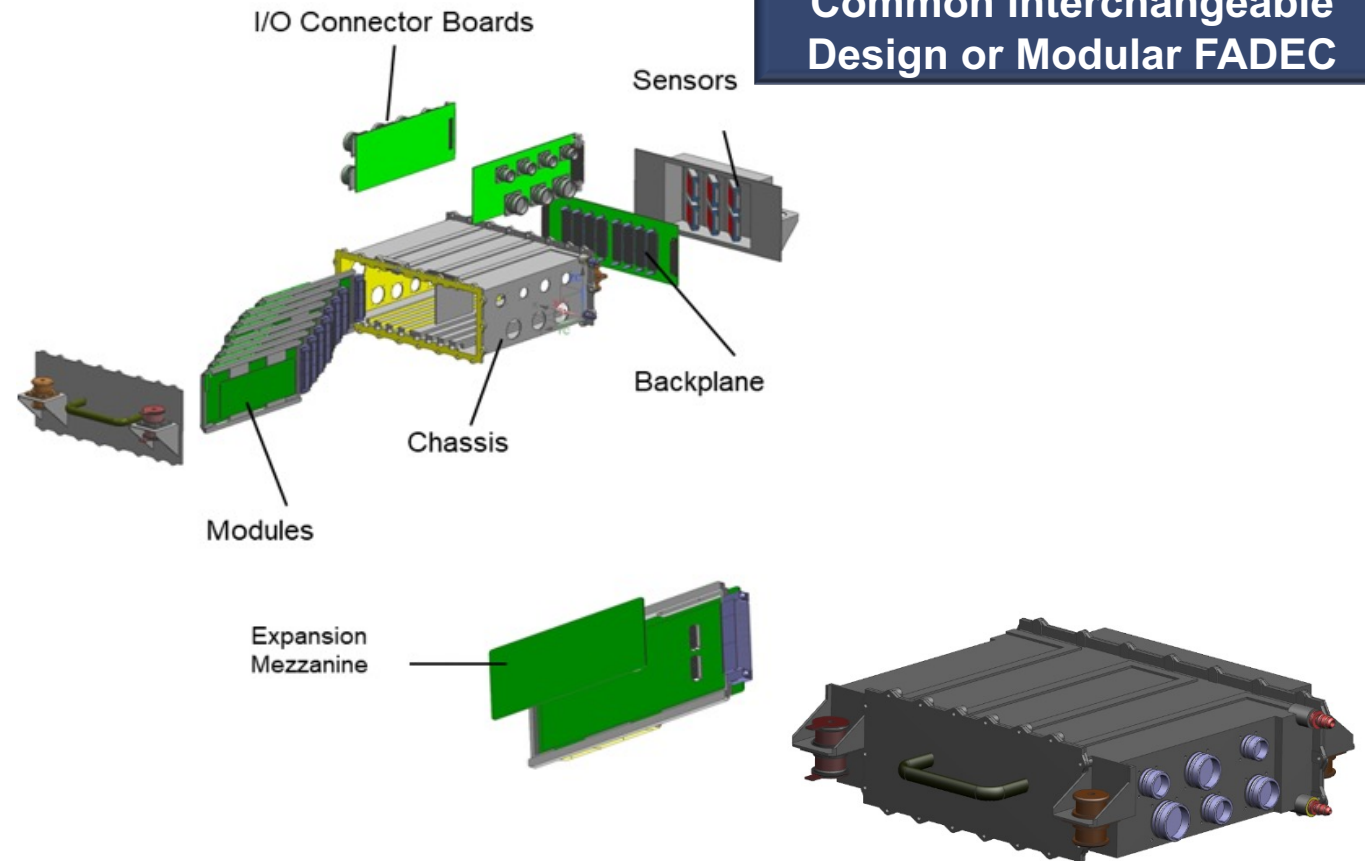


Propulsion Challenges – Digital Engine Controls (DEC/FADEC)

Separate DEC/FADEC for each Engine Variant

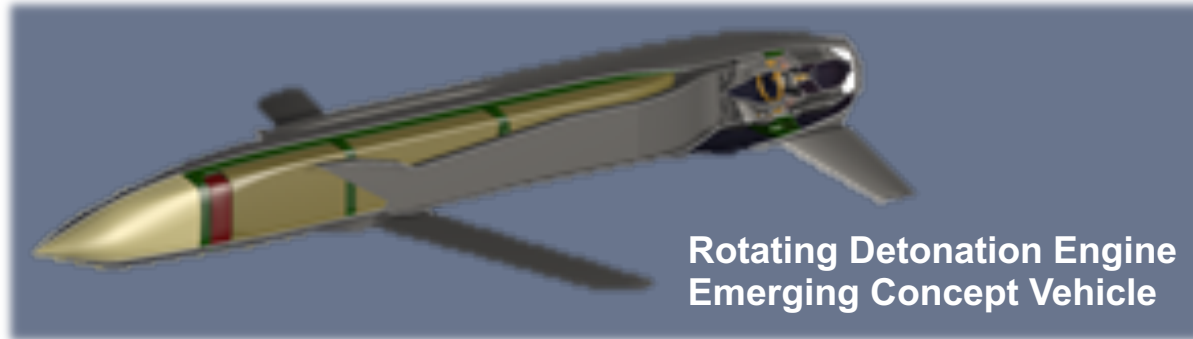


Common Interchangeable Design or Modular FADEC



Common Design Drives Cost and Readiness Improvements

Propulsion Opportunities – Small Engines



New Propulsion Paradigm

- Born Digital
- Rapid Prototyping
- Innovative/Non-Standard Designs
- Attritable – Design to Usage, not Long Life



Growth Market – Need Digital Infrastructure for Rapid Development/Production



LP Agile Propulsion Planning



SOSSEC | system of systems consortium

Propulsion Consortium Initiative (PCI)

Contract Vehicle

- OTA vehicle = rapid propulsion prototyping
- PoP: 1 Aug 17 – 31 Jul 22; \$400M ceiling
- Outcomes: 21 Prototype valued at ~\$100M
- Average award: 80 days, Fastest 42 days

Members

- 813 partner companies
- 675 Non-Traditional
- 36 Non-profit
- 22 Universities

Customers

- DOD Propulsion
- AFLCMC
- AFRL
- DARPA
- AEDC
- AFSC
- Army CCAD

Successes

- Turbojet - 200lb thrust
- B-52 CERP Integration Prototyping
- Additive cooled rotors
- F107 component repair
- TF33 Commercial Overhaul
- Blade Root Fillet Eddy Current

Model for AFLCMC Consortium Initiative (ACI)

Future Focus Areas

- Digital Transformation
- Small Engine Design
- Novel Engine Power/Thermal
- Improved Fabrication Capabilities

Goals

- Re-invigorate propulsion industrial base
- Encourage/support non-traditional vendors
- Change design/production paradigm of propulsion
- Improve performance of propulsion technologies

Propulsion Consortium Initiative Pt II In Work



Summary

- **Air Force Propulsion is the Propulsion Center of Excellence for the USAF and international partners**
- **Our alliances provide rapid, agile and innovative solutions ensure our Air Force Propulsion is *Ready, Affordable, Safe and Effective***
- **We need industry help to accelerate change or we will lose**
- **For additional information or to further discuss opportunities please email: AFLCMC.LP.Workflow@us.af.mil**

AIR FORCE LIFE CYCLE MANAGEMENT CENTER

