

Arnold Engineering Development Center



U.S. AIR FORCE

DOD/NASA Strategic Asset Management: Common Challenges, Uncommon Strategies

***Col. Michael Panarisi
AEDC Commander
May 12, 2011***

Integrity - Service - Excellence



Vector



AFMC

- **AEDC...your strategic partner**
- **Environment commonalities**
- **Shared challenges**
- **AEDC current (and failing!) strategies**
- **Alternatives to explore**

**Pressure Sensitive Paint
NASA Orion CEV**



**Aerodynamic testing
F-35 Lightning II**





Disclaimer!!



AFMC

- **No silver bullets to offer**
 - **We're in this together**
- **Fiscal uncertainty reigns supreme**
 - **Any “strategy” will need review**
- **“Reliance/Partnerships” are not necessarily aligned with national policy**

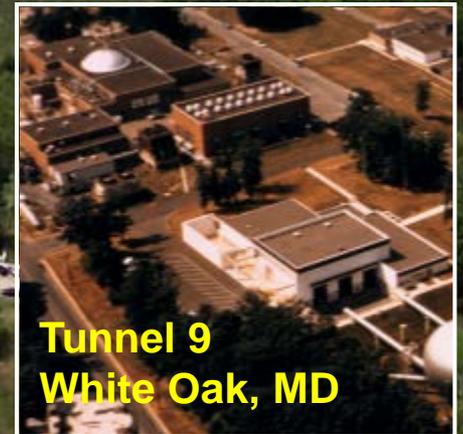
We must all hang together or most assuredly we will all hang separately!

\$11.3B Replacement value
~ \$400M Annual funding

43 test cells:
- 27 US unique
- 14 World unique
(Not all operational)

GSUs

- 2,358 on base**
 - 323 DoD Civilians**
 - 65 Military**
- 40,000 acres**
- 4,000 acre Industrial site**
- 4,000 acre reservoir (cooling)**





AEDC Mission



- **Accelerate the development of US aerospace power through advanced ground test / simulation techniques**
 - Wind Tunnels: aerodynamic and turbine engine
 - Space/vacuum cryogenic chambers: satellites, sensors, materials
 - Space/re-entry environment: materials & projectile tests
 - Advanced modeling and simulation: test methodology/technology development, supercomputing
- **Advance US research capabilities**
 - NASA, AFRL, NRL, UTSI partnerships
- **Bolster US aerospace competitiveness**
 - Facilitate US industry and partners (Unitary Wind Tunnel Act)



NASA Mission



AFMC

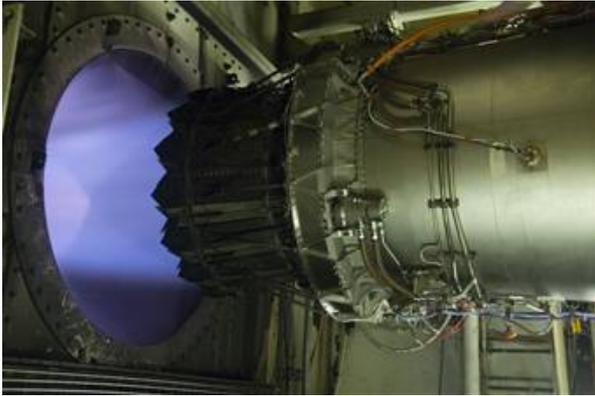
*To understand and protect our home planet
To explore the Universe and search for life
To inspire the next generation of explorers
...as only NASA can*

(2002 NASA Vision Publication)

- **Aeronautics:** Pioneer and prove new flight technologies that improve our ability to explore and which have practical applications on Earth.
- **Exploration:** Create capabilities for sustainable human and robotic exploration.
- **Science:** Explore the Earth, solar system and universe beyond; charts the best route of discovery; and reaps the benefits of Earth and space exploration for society.
- **Space Operations:** Critical enabling technologies for much of the rest of NASA through the space shuttle, the International Space Station and flight support.



AEDC--The 'D' and some T&E in "RDT&E"



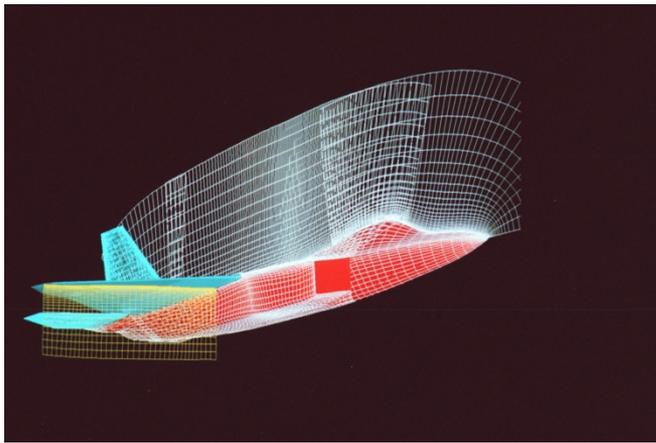
Aeropropulsion



Aerodynamics



Hypersonics



Modeling & Simulation



Rockets



Space



Major Test Facilities



- **Propulsion**

- Altitude Testing
- Sea Level RAM testing

- **Aerodynamics**

- Large Scale Subsonic
- Transonic
- Supersonic
- Hypersonic

- **Space and Missiles**

- Hypersonic Propulsion
- Satellite Sensors & Systems
- Missile Signatures
- Rocket Motors
- Reentry Materials / Vehicles
- Ballistic Ranges

Facilities:

- C1, C2, J1, J2, T3, T4, T11
- SL2, SL3
- NFAC (GSU – NASA Ames, CA)
- 4T, 16T
- Tunnel A, **16S***
- Tunnels B/C
- Tunnel 9 (GSU - White Oak, MD)
- APTU
- 7V, 10V, 12V, Mark-I Chambers
- Missile Signatures
- **J-4*** (liquid), **J-5***, J-6 (solid)
- H1, 2, 3 Arc Heaters
- **G, I*, S1*, S2*** Underground/Ranges

* **Mothballed**



AEDC Enabling Acquisition Decisions



USAF

F-22 WSEP

F119 CIP

F100 CIP

F137 (Global Hawk) CIP

Alt Fuels

Rocket System Launch Program

Minuteman III Aging & Surveillance

Alternative Infrared Space System (AIRSS)

Agile Combat Support (Speed Agile)

SEEK EAGLE

HIFiRE-1

Falcon HTV-2

LRGS?

USN

F-18 Weapons

NSWC Heat Shield

EM Railgun

P8-A

ONR Small Payload Delivery

Army

H-60 Individual Blade Control

Future Theater Vertical Lift

Joint

JSF Weapons

F-135

F-136

H-60 Individual Blade Control

Future Theater Vertical Lift

DoD (DARPA, MDA etc)

VULCAN

THAAD

GMD

SM-3

Advanced Hypersonic Weapon

E-MSIG

High Performance Computing

BMD

Aegis

DARPA/Boeing Vulture

NASA/Other

Ares/Orion

FMS – Navy/UK Heat Shields

Commercial - Rolls-Royce ADVENT, RR



Common Capabilities?



Propulsion

- Full scale, high altitude/speed

Facilities:

- Propulsion Systems Lab

J1/J2

Subsonic

- Aero/Acoustic
- Fixed wing/rotor craft
- Spin recovery
- Airframe icing

- 9' x 15' Low Speed
- 14' x 22' Subsonic
- 20' Vertical Spin Tunnel
- Icing Research Tunnel

16T? NFAC?

Transonic

- Cryogenic/air testing
- Airframe development
- Aeroelastically scaled models

- National Transonic (8')
- Unitary Plan Facility (11')
- Transonic Dynamics Tunnel

16T

16T

Supersonic

- Integrated propulsion
- Aero for fixed wing/reentry craft
- Fluid dynamics
- Aero/propulsion

- 10' x 10' Supersonic
- 9' x 7' Supersonic WT
- 4' Supersonic Unitary Plan
- 8' x 6' Supersonic WT

16S

16S

A?

A?

Hypersonic

- Flow physics & aero-heating
- Propulsion & thermal protection

- Aerothermodynamics Laboratory
- 8' High-Temperature Tunnel

APTU



Environment Commonalities



- **DoD**
 - Fewer systems in acquisition
 - Consolidated facilities
 - “Joint” basing trends
 - Joint “Reliance” frameworks
 - AEDC testing Navy systems
 - Navy electronic warfare testing facilities
- **NASA**
 - Industry consolidation
 - Fewer commercial programs
 - Fewer research programs?



Industry Consolidations in '80s- '90s

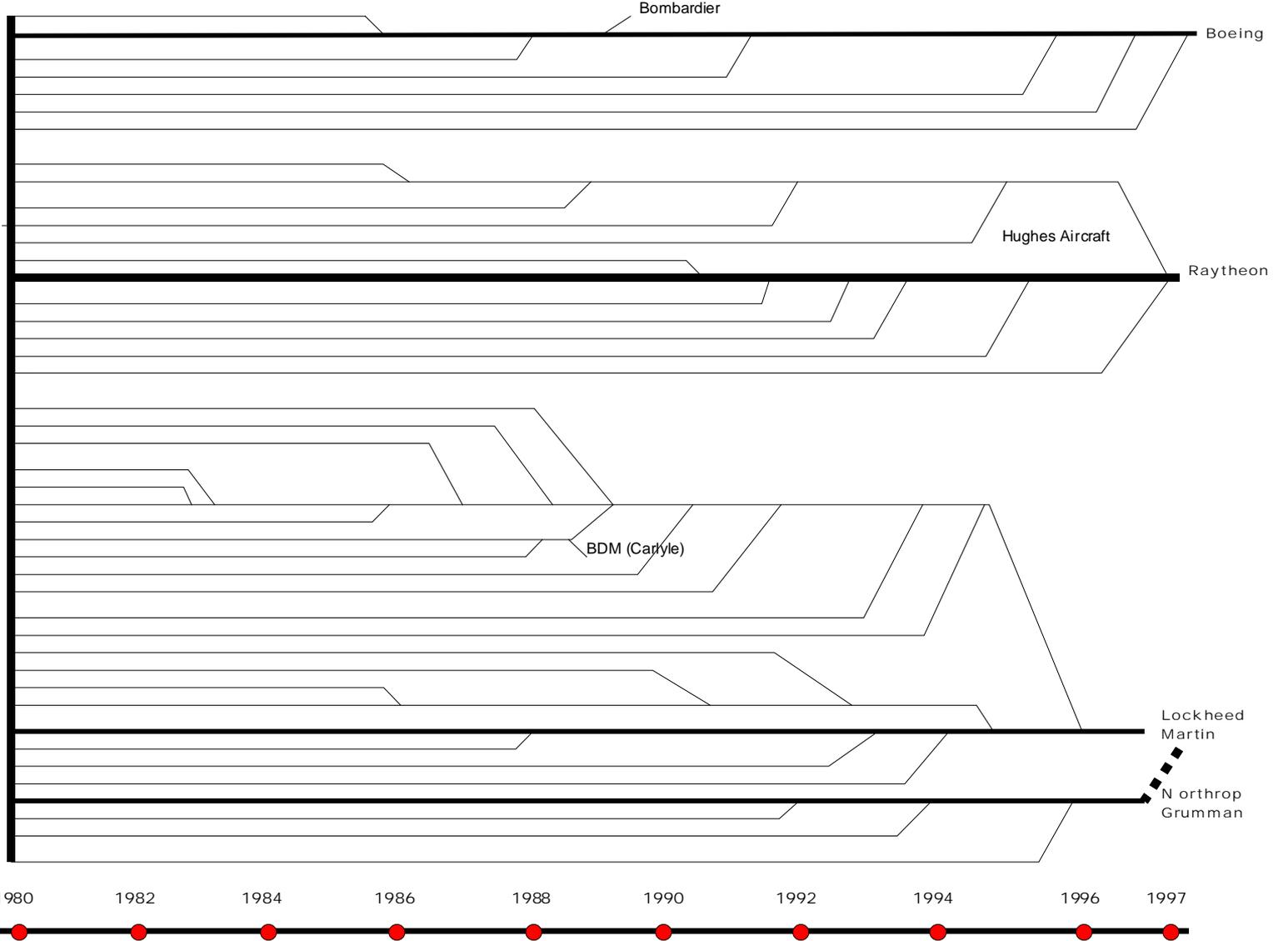


De Havilland Aircraft
Boeing
Argo systems
UTL
Litton Precision Gear
Rockwell International
McDonnell Douglas

Hughes
General Motors
BET PLC's Redifusion Simulation
General Dynamics Missile Division
Magnavox
REMCO SA
Raytheon
STC PLC - Navigation Systems
TRW-LSI Products
Corporate Jets
E-Systems
Texas Instruments DSET

Honeywell Electro-Optics
Fairchild Weston System
Goodyear Aerospace
Xerox-Defense/Aerospace Division
Narda Microwave
Loral
Hycor
Ford Aerospace
BDM International
Librascope
LTV Missile Business
IBM Federal Systems
Unisys Defense
General dynamics-Fort Worth
MEL
Sanders Associates
Lockheed
Martin Marietta
Gould Ocean System Division
General Electric Aerospace
General Dynamics Space Business

Northrop
LTV Aircraft Operations
Grumman
Westinghouse ESG





Commonality--Assessment



AFMC

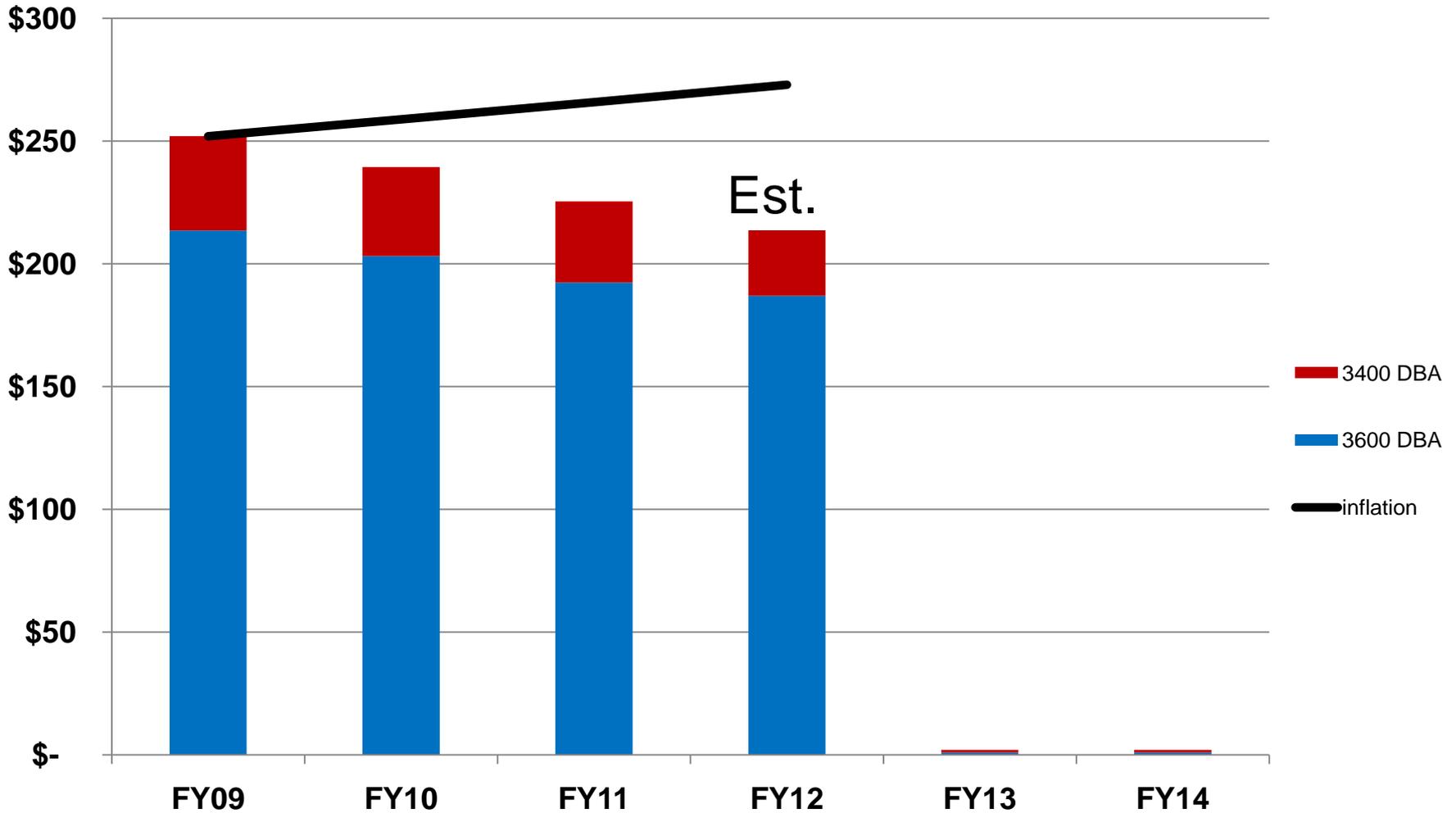
- **Some overlapping facility envelopes**
 - Different intents? (R vs D?)
- **LOTS of facilities**
- **Diverse mission set, uneven demand**
- **Shifting priorities**
 - National and parent organization
- **Aging infrastructure**
- **Foreign “competition”**



Common Challenges - Funding



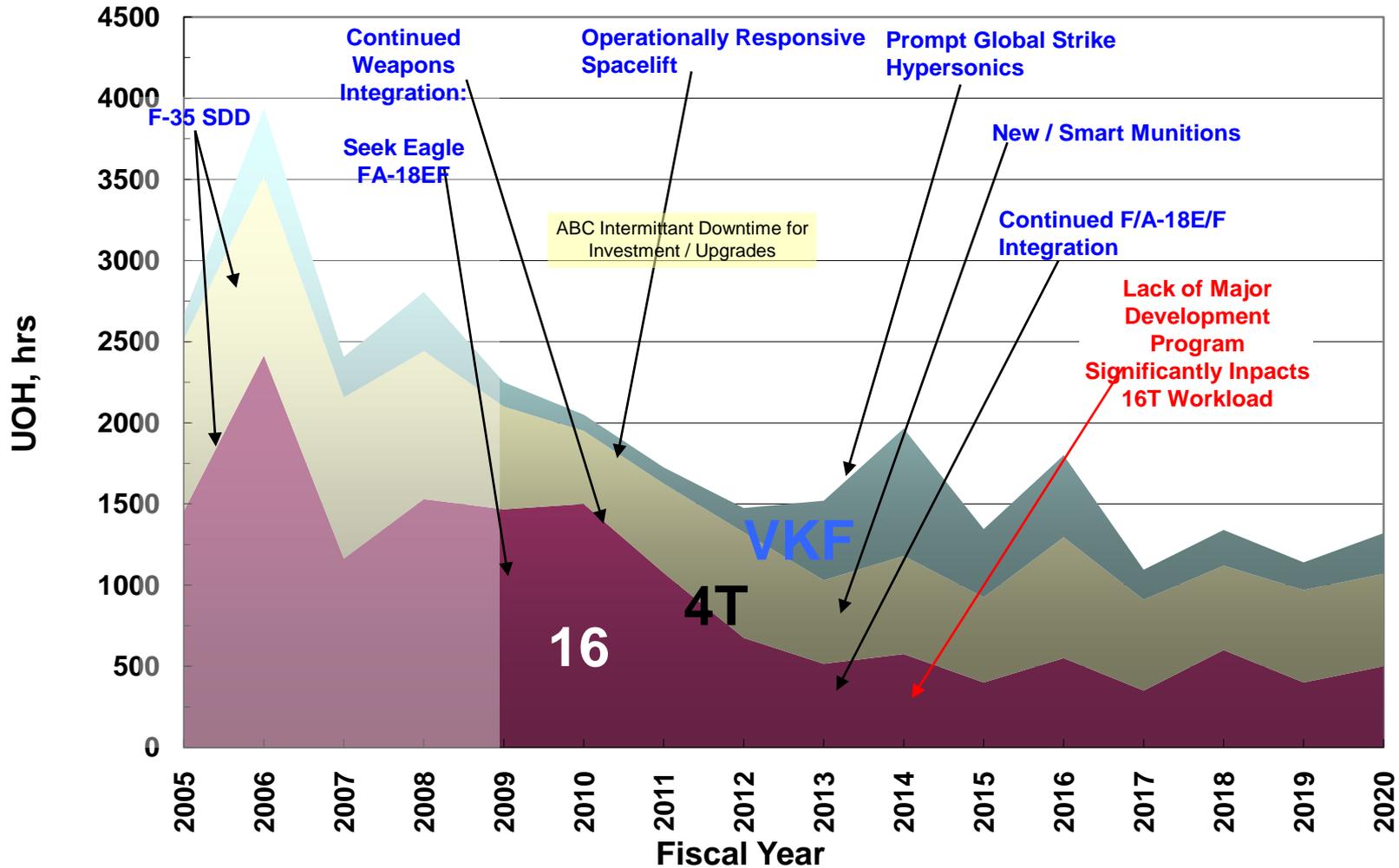
AFMC



AEDC Budget Trends



Common Challenges – Declining Workload

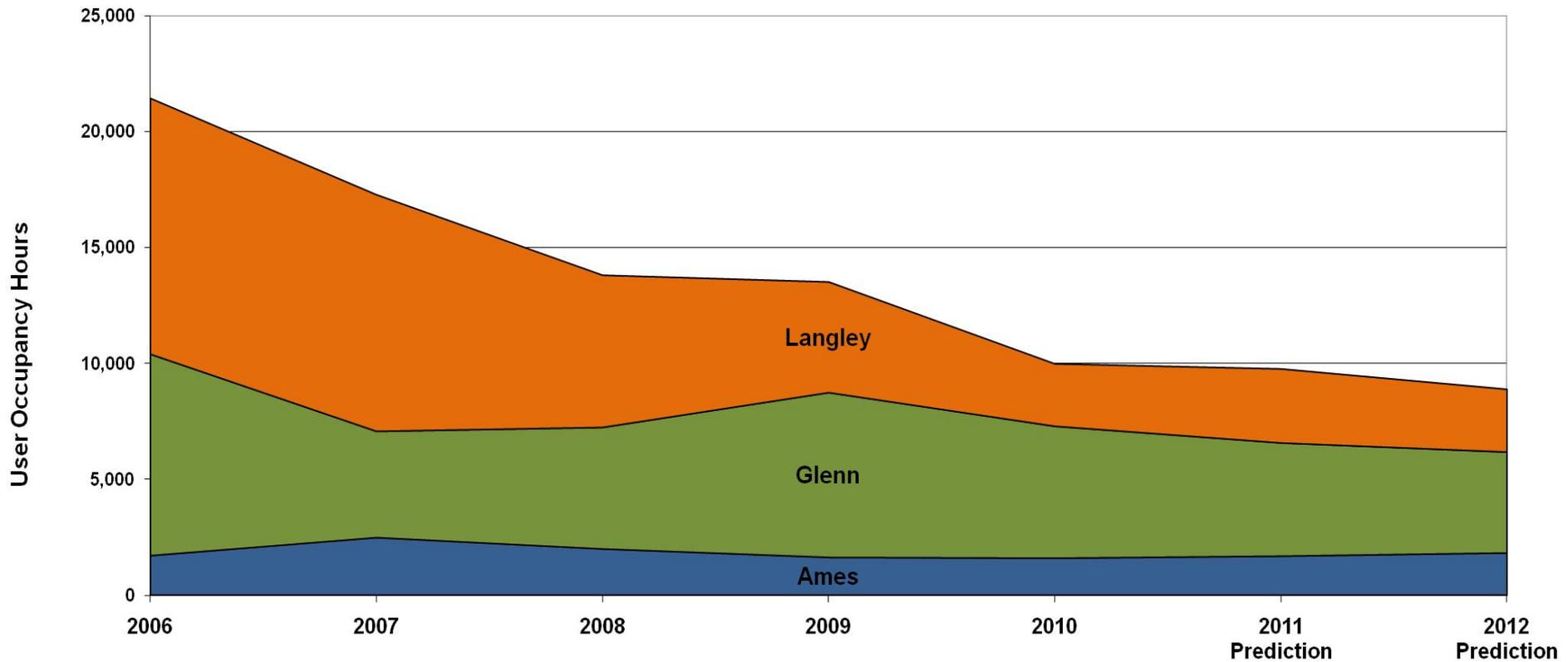




Common Challenges - Declining Workload



NASA's Aero Ground Capability Utilization Trends & ATP Predictions





Strategic Environment--Assessment



- **Capability / resource / demand mismatch**
- **Development program dynamics**
 - Slips, cancellations, fits and starts
- **Shifting funding models**
 - Full cost recovery, direct costs, hybrids
- **Unclear national priorities**
 - Infrastructure de-linked from national direction
 - Mission changes



How Did We Get Here?



AFMC

- **What were the “good ol’ days?”**
- **What was different?**
 - **Funding?**
 - **Talent?**
 - **Economy?**

Or was it something MUCH bigger



Failing Strategies



- **Full cost recovery—abandoned 2003**
- **DBA/RBA mix, Institutional funding (NDAA 2003)**
- **\$1B+ maintenance backlog, reliability concerns**
 - Reduced reliability drives uncertainty, hits demand
- **Consolidation**
 - Not really occurring, ownership is shifting
 - NFAC – NASA Ames, Mountain View, CA
 - Tunnel 9 – Naval Ordnance Center, White Oak, MD
 - SL2 – Naval Air Warfare Center, Trenton, NJ
- **“Efficiencies”**
 - Maintenance is the first bill payer
- **Mothballing—huge reactivation costs**



Unhelpful Indicators



AFMC

- **Utilization rates**
 - “Air on Hours”
 - “Occupancy Days”
 - Income / revenue ratios
- **Industry Trends**
 - Globalization
 - Increased reliance on CFD, M&S
 - “Outsourcing” (out of the US!)



Common Misperceptions



- **Demand signal as a decision aid**
 - What is “demand”
 - What defines “capacity”
- **Alternative fee strategies can adjust revenue**
 - Highly elastic demand curve?
 - Programmatic obstacles
 - Death spiral
- **Closure to save \$\$**
 - Demo / Environmental restoration
 - Sub-optimal residual workforce (interdependencies)



Alternatives?



- **Faced with...**
 - **Rising costs**
 - **Declining demand (under what measure?)**
 - **Mission uncertainty**
 - **Excess capacity**

Is this phenomenon unique to the Government owned/operated aerospace enterprise?



Troubled Relatives



AFMC

- **Auto Industry**
- **US Mail**
- **Airlines**
- **Film based photographic industry**
- **Newspapers**

***How did these institutions adapt? Did they?
Lessons for us?***



Strategies to Explore



AFMC

- **Auto industry**

- Introduce new/updated models annually (demand)
- Globalize production / design

VS.

- USAF has one aircraft in development – F-35
- AEDC/NASA have a US focused mandate

- Auto profit driven = **best business practices**

VS.

- AEDC/NASA are national assets = compliance at all costs.



Strategies to Explore



- **Airline industry**
 - **Fluctuating demand -- excess capacity**
 - **Variable rates**
 - **Robust lease agreements / partnerships**
 - **Profit driven – reinvestment**
 - **Alternative missions (cargo)**



Strategies to Explore



AFMC

- **US Mail**
 - Increased fees (inelastic demand?)
 - Upgraded technologies
 - Web, home scales, tracking
 - Scanning / barcoding
 - **Rent capacity** from local / commercial entities
 - UPS does USPS!
 - Airlines carry most overnight mail



Strategies to Explore



- **Film Based Photography (Kodak)**
 - Digital media
 - **Web services**
 - Home based publication (via Web)



What is AEDC doing?



AFMC

- **Posturing for alternative missions**
 - **ENERGY!!!**
 - **M&S**
 - **Rapid Prototyping**
 - **Engineering Services**
 - **IT/server hosting**
- **“Invest to Save”**
 - **Improve reliability, reduce energy costs**
- **Boosted analytics**
- **Re-focused partnerships**
 - **UTSI, UT, Sim Center, TVA, DOE, DOT**
- **Revitalized remote test / web connectivity**
- **Resurrecting commercial test**



Back to the Good Ol' Days



AFMC

- **The real difference? – Unifying Mission!!**
 - NASA -- Space Race
 - DoD – Cold War
- **Supporting Casts**
 - Gov't / Industry partnerships
 - Academia too?
 - Visionary leaders
 - Continuity of purpose



Ideas for NASA / AEDC



- **Publish and follow a unifying mission set**
 - **Shed secondary missions**
- **Focused Capability Roadmaps**
 - **“Dominant Medium”**
 - **DoD – air, then space**
 - **NASA – space, via the air**
- **Usage mandates?**
 - **Can NASA steer researchers?**
- **Advocate for national “ownership” (policy)**
- **Link visions/missions directly to resources**
- **Formalize reliance at the National level**



Closing Thoughts



AFMC

- **Adapt or die! Is Big Iron/Air coming to an end?**
 - Not yet! Nature of test vs quantity
- **Where do we stand with Industry partnerships?**
- **Do we have “too many lines in the water?”**
- **What laws/policies are in the way?**
 - Who is best to change them?
- **Can we trace strategic assets to strategic goals?**
- **Can we advocate for a new “National” entity?**

The key to Strategic Asset Management...is to think Strategically!



Questions



AFMC

