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

Col. Michael Panarisi
AEDC Commander
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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!!

- 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

• 2,358 on base
  – 323 DoD Civilians
  – 65 Military

• 40,000 acres
• 4,000 acre Industrial site
• 4,000 acre reservoir (cooling)

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

GSUs

NFAC
Mountain View, CA

Tunnel 9
White Oak, MD
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)
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
- LRG5?

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

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

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

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

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

Facilities:
- Propulsion Systems Lab J1/J2
- 9’ x 15’ Low Speed
- 14’ x 22’ Subsonic 16T? NFAC?
- 20’ Vertical Spin Tunnel
- Icing Research Tunnel
- National Transonic (8’) 16T
- Unitary Plan Facility (11’) 16T
- Transonic Dynamics Tunnel
- 10’ x 10’ Supersonic 16S
- 9’ x 7’ Supersonic WT 16S
- 4’ Supersonic Unitary Plan A?
- 8’ x 6’ Supersonic WT A?
- Aerothermodynamics Laboratory APTU
- 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
- Hycoor
- 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

Boeing
Hughes Aircraft
Raytheon
Lockheed Martin
Northrop Grumman
Bombardier
BDM (Carlyle)

Commonality--Assessment

• 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 – Declining Workload

- Lack of Major Development Program Significantly Impacts 16T Workload
- Continued F/A-18E/F Integration
- New / Smart Munitions
- Prompt Global Strike Hypersonics
- Operationally Responsive Spacelift
- Seek Eagle FA-18E/F
- ABC Intermittent Downtime for Investment / Upgrades
- F-35 SDD
- Continued Weapons Integration

Fiscal Year: 2005 to 2020

UOH, hrs: 0 to 4500
Common Challenges - Declining Workload

NASA’s Aero Ground Capability Utilization Trends & ATP Predictions

[Line graph showing utilization trends over years for Langley, Glenn, and Ames.]
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?

- 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

• 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

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

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

• 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

• 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?

- Posturing for alternative missions
  - ENERGY!!! -- Engineering Services
  - M&S -- IT/server hosting
  - Rapid Prototyping
- “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

• 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

- 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