

Headquarters U.S. Air Force

Integrity - Service - Excellence

Operational Energy Considerations

June 14, 2010

Oliver Fritz

**Year of the Air Force
Family**



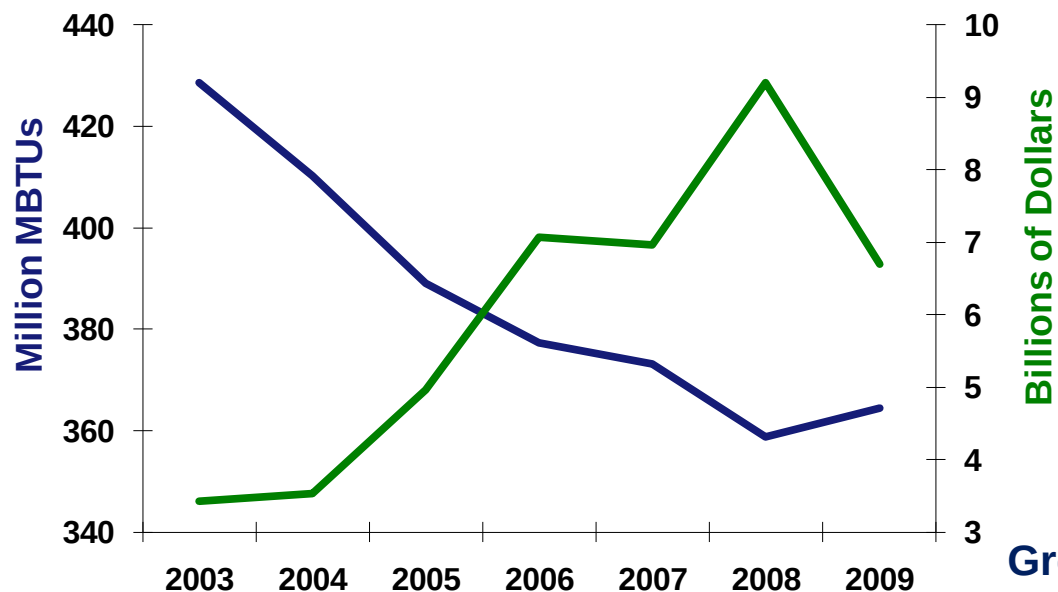
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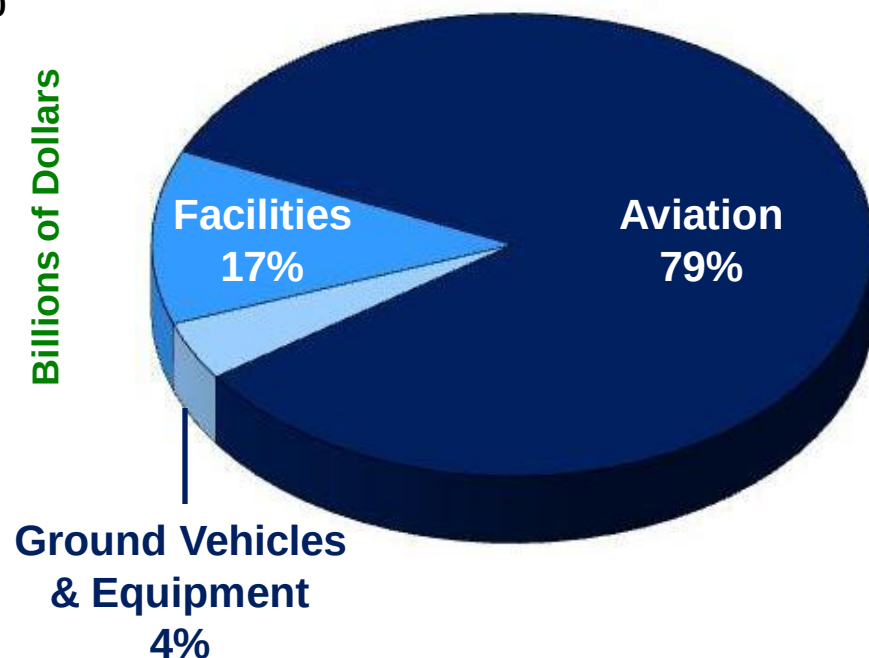


Background: AF Energy Demand in 2009

Energy Cost and Consumption Trends



Energy Cost Breakdown



***DoD is largest user in USG, AF is largest user in DoD...
Air Force spent \$6.7 billion for energy in 2009***



Need for Energy Creates Risk

- **Strategic Risk**

- National reliance on fossil fuels from unfriendly regimes

- **Fiscal Risk**

- Costs dependent on supply/demand for finite global commodity

- **Operational Risk**

- Joint combat power reliant on lengthy energy supply chain
- Disrupted energy supply decisively affects combat power

***Even if energy was free of cost, still desirable to
increase energy performance and decrease risk of disruption***



What is Operational Energy?

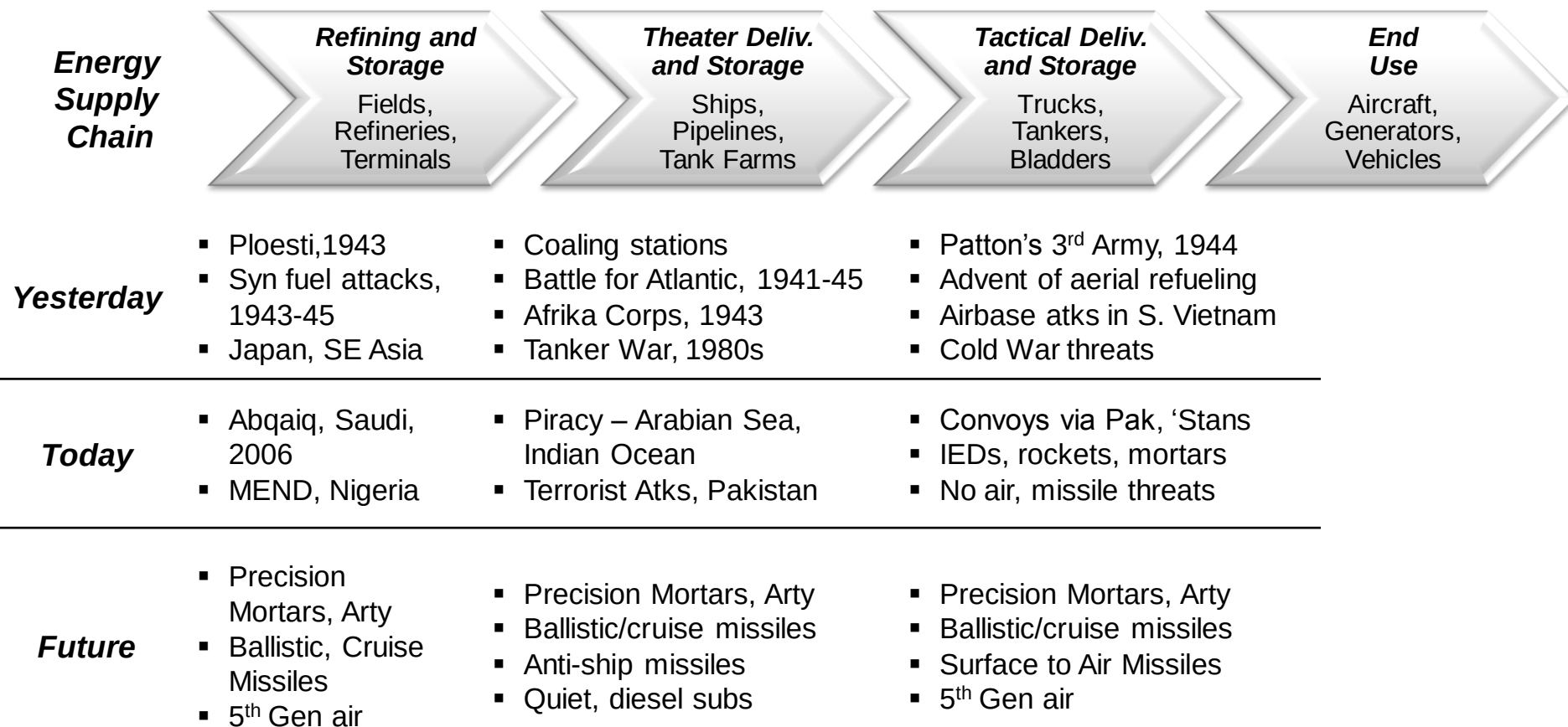
- **Fueling Vigilance, Reach, Power**
 - Intel, Surveillance and Reconnaissance
 - Rapid Global Mobility
 - Global Precision Attack
 - Air Superiority
 - Special Operations
- **Powering the eagle's nest – expeditionary basing**
 - Electrical power generation
 - Force protection



Energy is responsible for Joint power projection



Operational Energy: Old Risks...Made New



***“Airpower is a lightning bolt launched from an eggshell,
invisibly tethered to a base”***



War Games Affirm Operational Energy Risk

- **Futures Game 2009**
 - Future ops dependent on high energy demand and robust theater logistics
 - Anti-access capabilities – ballistic missiles, subs, SOF, cyber – degraded BLUE logistics
 - Energy logistics and storage attacked
 - By last “move”, energy began to limit air employment
- **Navy’s “Global 09” war game**
 - Risk initially underappreciated – Seaborne and shore-based logistics
 - Complicated by force dispersion and could constrain maneuver
 - Force Protection requirements
- **Similar risks exist in ground campaigns**



Reducing demand critical to reducing these operational risks



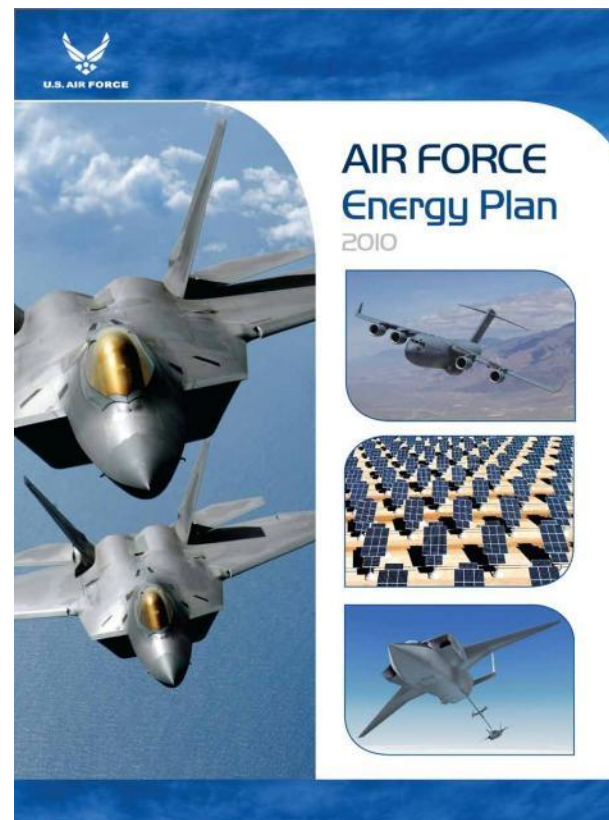
Air Force Energy Plan: Enhancing Energy Performance

3-Part Strategy

Reduce Demand

Increase Supply

Change the Culture



Vision

Make Energy A Consideration In All We Do



Long-Term: Force Planning and R&D

- **Integrate energy into force planning, requirements, acquisition**
 - **Energy in scenarios, war games, campaign models**
 - **Fully Burdened Cost of Fuel in Analyses of Alternatives**
 - **Energy Key Performance Parameter in acquisition**
- **Prioritize energy as focus area for R&D**
 - **Propulsion: Highly Efficient Embedded Turbine Engine, Adaptive Versatile Engine Technology**
 - **Design: Blended Wing Body**
 - **Materials: Composites, morphing structures**

“Upstream” planning and R&D should reflect role of energy performance in enhancing range, persistence, resilience



Mid-Term: Upgrades and Modifications

■ Propulsion

- C-130 T56 Series 3.5 upgrade: 7% savings, more time on wing; 7-year ROI; FY15 to FY22
- KC-135 CFM 56-3 upgrade: 1.5% savings, more time on wing

■ Subsystems: APUs, Actuators/Controls, Navigation

■ Simulators and Distributed Mission Operations



Near-Term: Change the Way We Operate

- **Goal: Reduce aviation operations fuel demand by 10% by 2015**
- **Reduced aviation fuel consumption by 3% since FY06**
- **Major initiatives**
 - Increase use of training simulators
 - Optimize air refueling practices
 - Reduce aircraft weight
 - Direct routing
 - Fuel efficient ground operations
 - Require accountability for fuel use

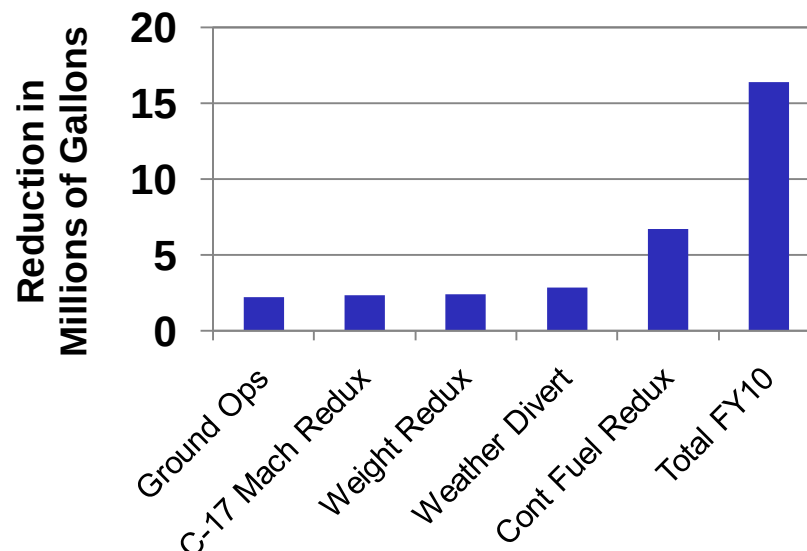
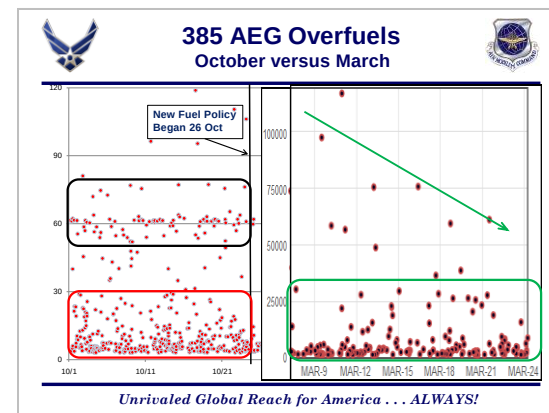




Case Study: Air Mobility Command

- **AMC reduced fuel use by 2.9% from 2006 to 2009**
 - Verified C-17 “Ionized Water” wash, which resulted in increased fuel efficiency and \$4.7M savings; justified plans to perform on all AMC aircraft
 - Conducted successful Altus AFB test of KC-135 radar pattern ‘clean configuration’, resulting in a 3.5% fuel savings during pattern operations (AETC test)
 - Reduced C-17, C-5, C-130 and KC-135 ramp loads to capture fuel savings; = 4.2M Gallons

- **Implementing Web-based Fuel Tracker – Verification tool**





Summary: Risks and Opportunities

- **Dependence on energy and threats to the commons may drive operational risk across the range of military operations**
 - **Increasing threats to energy supply chain**
 - **Experienced in current operations and affirmed in war games**

- **Air Force pursuing a range of policy, technological, and operational options to mitigate energy demand**

- **Not only about risk mitigation...about energy as force multiplier**
 - **Range**
 - **Persistence**
 - **Resilience**
 - **Advantage**

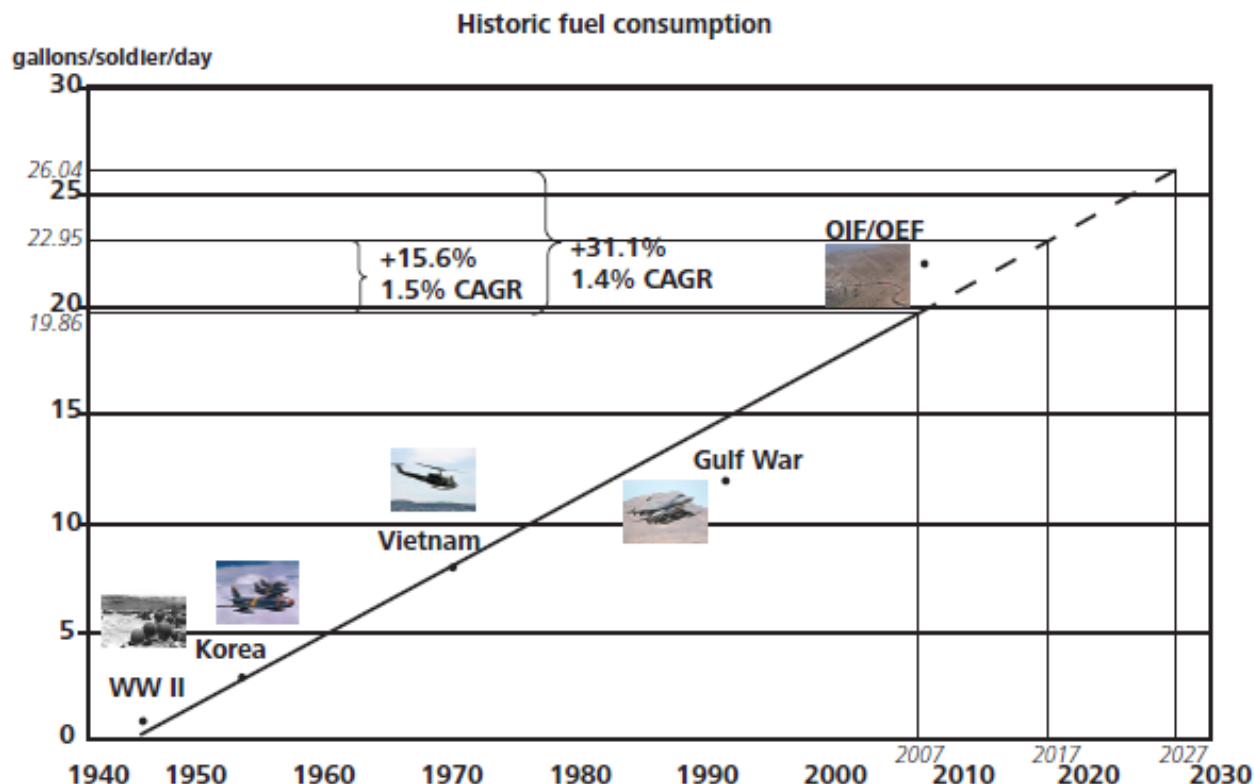


Questions?



Fuel Consumption Increasing

Chart 1: Historic U.S. Department of Defense (DoD) Fuel Consumption



Source: DESC, Rand Corporation, AMSAA, Deloitte Analysis
 $Y=0.3091X-600.51$. R-squared: 0.9517.



Air Mobility Fuel Facts

- Shaving one minute off of every MAF sortie (219,627 sorties in FY09) saves 142,838 barrels or 6.0M gallons of fuel annually (\$16.9M)
- Eliminating overfuels by fueling every aircraft to precisely what is planned will save the MAF 114,762 barrels or 4.82M gallons of fuel annually (\$13.6M)
- Reducing average APU use to from 2.1 to 1.5 hours per sortie will save the MAF 54,138 barrels or 2.2M gallons of fuel annually (\$6.4M)
- Shaving one minute off of every MAF flight hour saves 538,904 barrels or 22.6M gallons of fuel annually (\$63.8M)
- In 2009, the MAF consumed 49.1 barrels or 2,064 gallons of fuel every minute (\$4,438 per minute)
- Removing 1 lb of excess weight from every MAF aircraft saves 108 barrels or 4,554 gallons of fuel annually (\$12,800)
- In 2009, the MAF consumed 52% of all AF fuel and 28% of all DoD fuel
- In 2009, the MAF consumed 34.6M barrels or 1.45B gallons of fuel (\$3.1B actual cost)



Why Consider Energy?

- Assured supplies of energy are fundamental to the Air Force – global vigilance, reach, and power depend on energy
 - Energy is operational access
- Future security environment will reduce likelihood of secure sanctuaries and lines of communication – at home and abroad
 - Attacks on Iraq/Afg supply lines already suggest strains on assured delivery of energy
 - Proliferating precision weapons – ballistic/cruise missiles, rockets, mortars, artillery – will increase threats to operating forces and fuel logistics across spectrum of conflict
 - Beyond kinetics, growing cyber threats to power generation and electrical grid
- Reducing operational risk from AF dependence on energy should be a consideration across planning, requirements, and acquisition
 - Reduce warfighting risk and meet Congressional/OSD mandates related to Fully Burdened Cost of Fuel