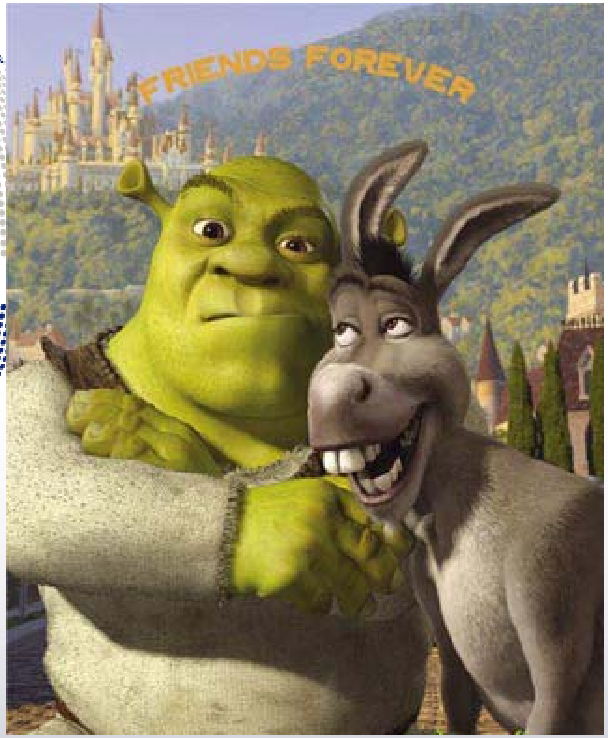
Cleared for PA release per WPAFB-08-4335, 11 Jul 08

THE AIR FORCE RESEARCH LABORATORY

LEAD | DISCOVER | DEVELOP | DELIVER



PACOM + AFRL: You Gotta Have Friends!

16 July 2008

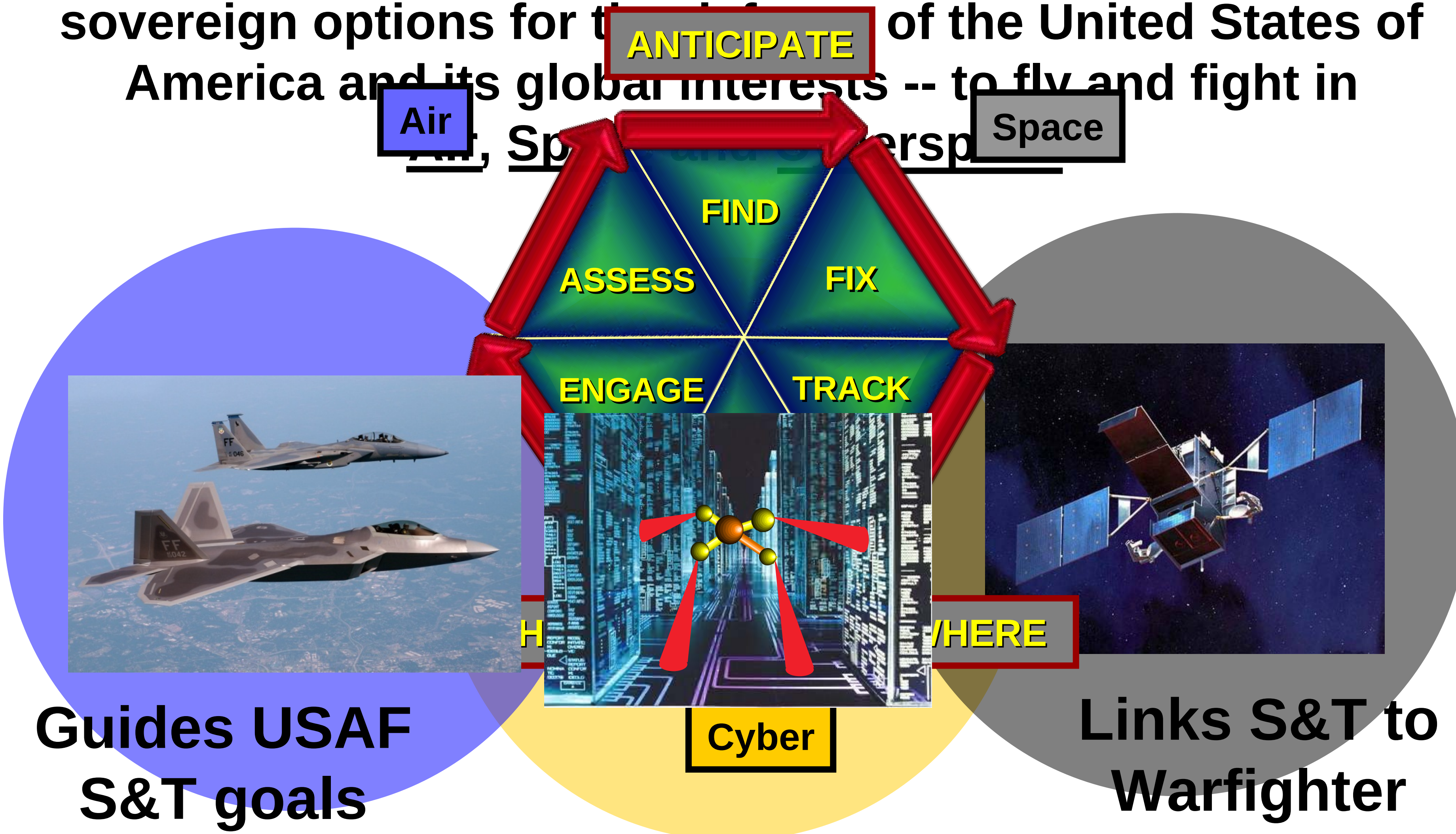
Maj Gen Curtis M. Bedke

Commander

Air Force Research Laboratory

USAF S&T Vision
USAF Mission

The mission of the United States Air Force is to deliver sovereign options for the defense of the United States of America and its global interests -- to fly and fight in Air, Space, and Cyberspace



AFRL Mission

Leading **the discovery, development, and integration of affordable warfighting technologies for our air, space and cyberspace force.**

It’s not just about the science…
…it’s about *leadership* in S&T

Technical Directorates

Air Force Vision 2020

Global

Vigilance	Reach	Power

AFRL Strategic Vectors

Strategic Vectors

- Universal Situational Awareness
- Access and Survive in the Battlespace
- Deliver Precision Effects

Julius Caesar's Vision

Julius Caesar - 47 BC

Veni	Vidi	Vici
I came	I saw	I conquered

Restatement of Concepts

AFRL Strategic Vectors

- Universal Situational Awareness
- Access and Survive in the Battlespace
- Deliver Precision Effects

Air Force Vision

- Global Vigilance
- Global Reach
- Global Power

Julius Caesar - 47 BC

- Veni (I came)
- Vidi (I saw)
- Vici (I conquered)

Focused Long Term Challenges

FLTC #1	Anticipatory Command, Control & Intelligence (C2I)
FLTC #2	Unprecedented Proactive Intelligence, Surveillance and Reconnaissance (ISR)
FLTC #3	Dominant Difficult Surface Target Engagement/Defeat
FLTC #4	Persistent & Responsive Precision Engagement
FLTC #5	Assured Operations in High Threat Environments
FLTC #6	Dominant Offensive Cyber Engagement
FLTC #7	On-demand Force Projection, Anywhere
FLTC #8	Affordable Mission Generation & Sustainment

AFRL S&T Strategy

AF S&T Vision

Anticipate, find, fix, track, target, engage, and assess – anything, anywhere, anytime

Universal Situational Awareness

- Multi-layer sensing architecture – with fused knowledge delivery, forensics and technical efforts
- Cyber Situational Awareness
- Space Situational Awareness
- Psycho-cultural Situational Awareness

FLTC 1 – Anticipatory Command, Control & Intelligence

FLTC 2 – Unprecedented Proactive Intelligence, Surveillance & Reconnaissance

Deliver Precision Effects

- Low-collateral-damage weapons
- Ubiquitous Swarming Sensors & Shooters
- Rapid global engagement

FLTC 3 – Dominant Difficult Surface Target Engagement/Defeat

FLTC 4 – Persistent & Responsive Precision Engagement

FLTC 6 – Dominant Offensive Cyber Engagement

Access and Survive in the Battlespace

- On demand access and mission effectiveness in space
- Cyber security, forensics, and assured battlespace networks
- Self Protection
- Sustaining Warfighter Capabilities

FLTC 5 – Assured Operations in High Threat Environments

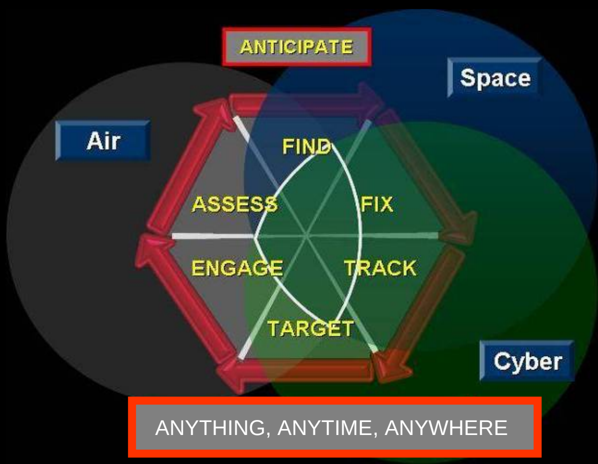
FLTC 7 – On-demand Force Projection, Anywhere

FLTC 8 – Affordable Mission Generation & Sustainment

Core Technical Competencies

AFRL's Core Processes Aligned to Customer Needs

Core Process 1



<u>Achieve AF S&T Vision</u>

Long-Term Focus

Lead / Discover

Core Process 2

<u>Deliver Needed Technology Options</u>

Mid-Term Focus

Develop / Deliver

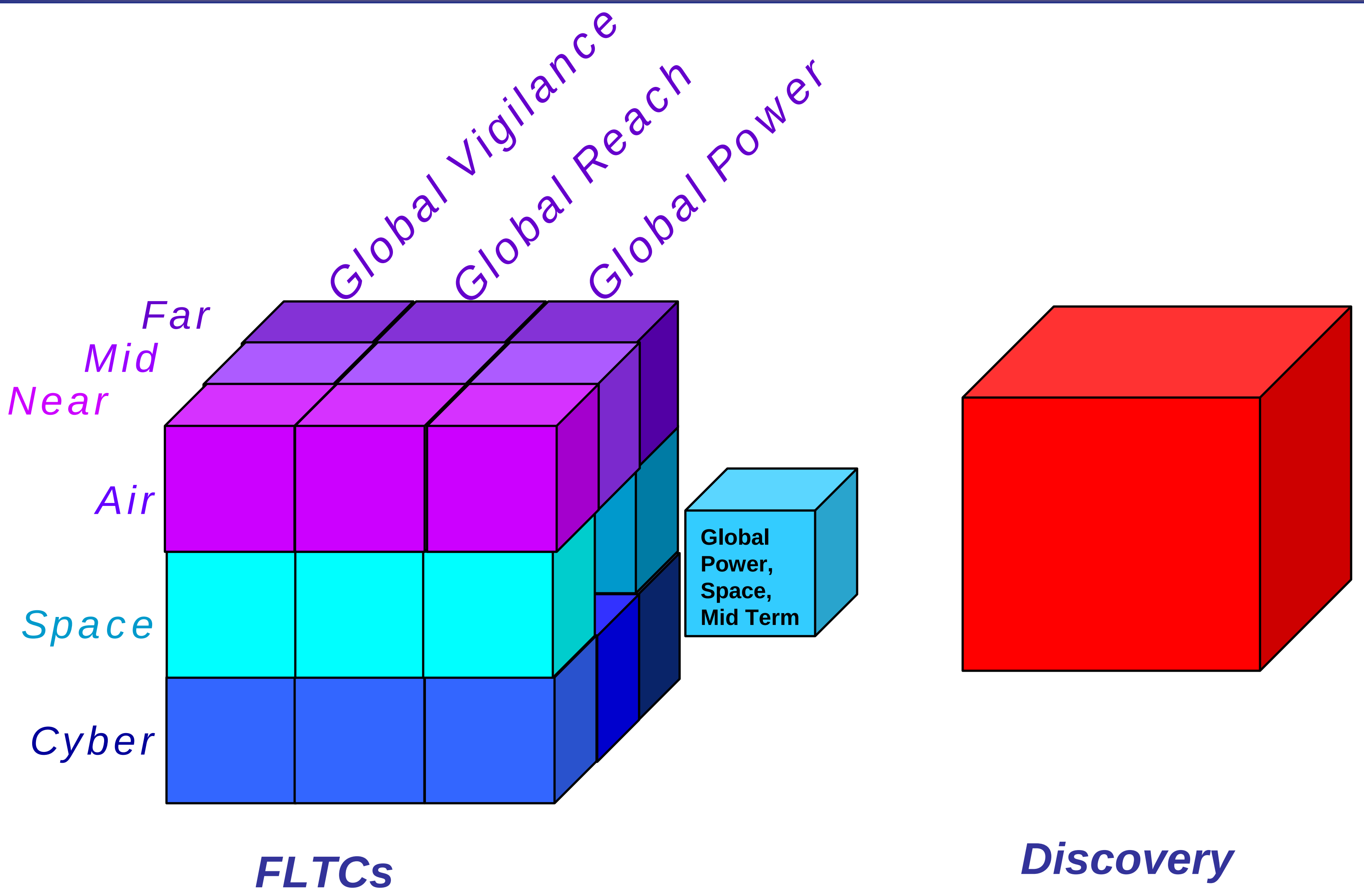
Core Process 3

<u>Deliver Rapid Response and Tech Support</u>

Near-Term Focus

Solve / Deliver

Depicting a Balanced Portfolio

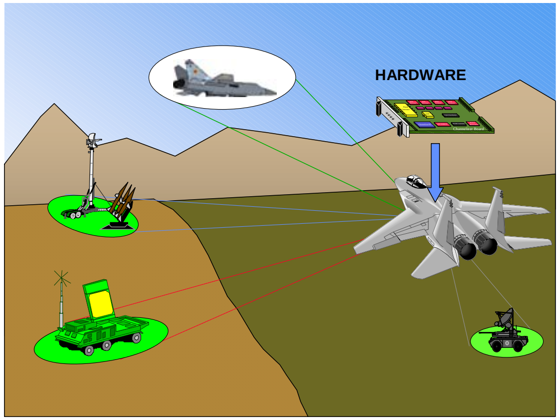


AFRL Manages Portfolio Using Multiple Frames of Reference

Air Domain: Near-term Technologies

UAS Operations Center

24/7 Operational Effectiveness



Digital Receiver Upgrade

Stealth Aircraft Field Repair

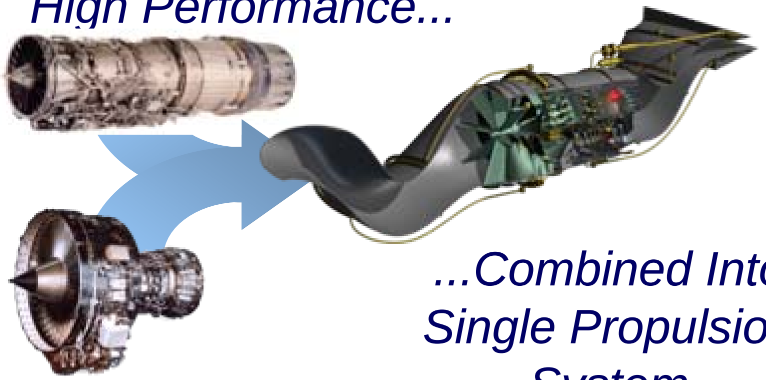
Focused Lethality Munition

Air Domain: Mid-term Technologies

Target ID/cueing

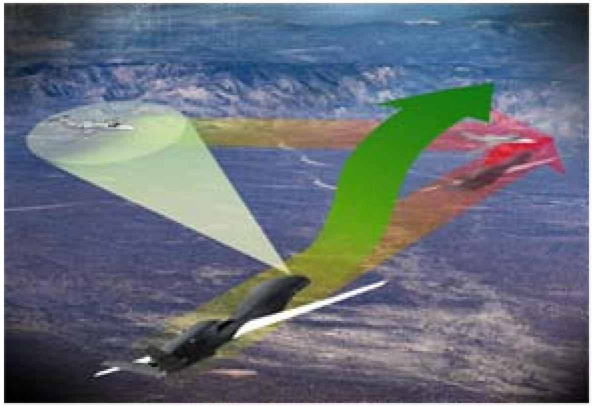
Composite Cargo Aircraft

High Performance...



Fuel Efficiency...

...Combined Into Single Propulsion System

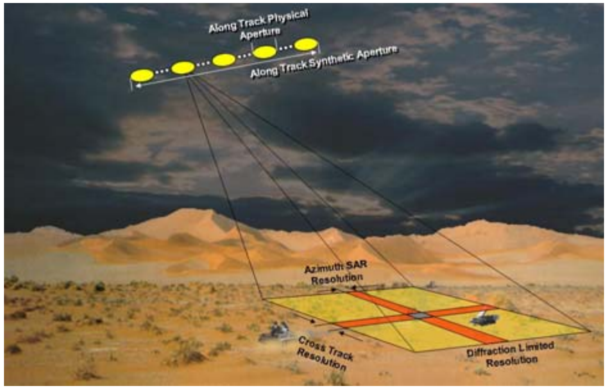


Collision Avoidance

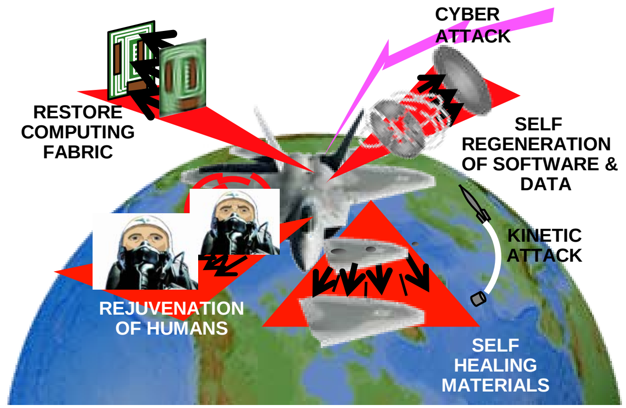
Advanced Tactical Laser

Sensor Hardening

Air Domain: Far-term Technologies



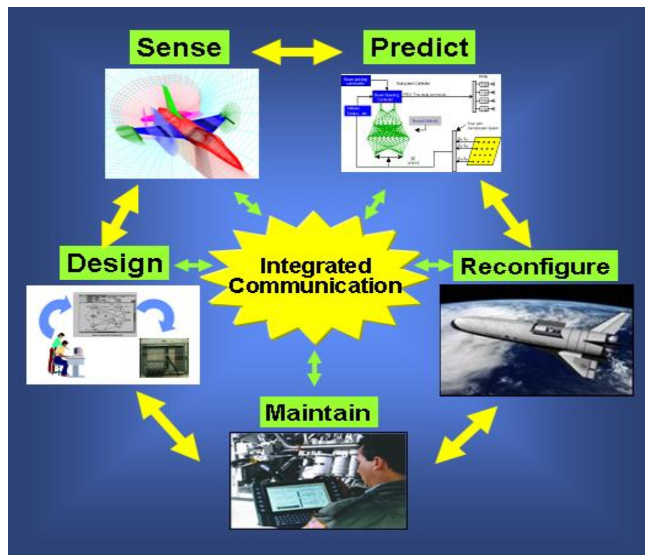
Synthetic Aperture Ladar



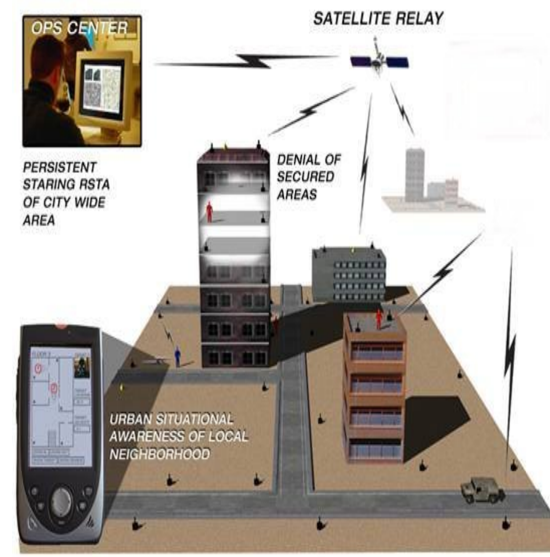
Self-healing/Recovery

Scramjet Cruise Missile

Advanced Mobility



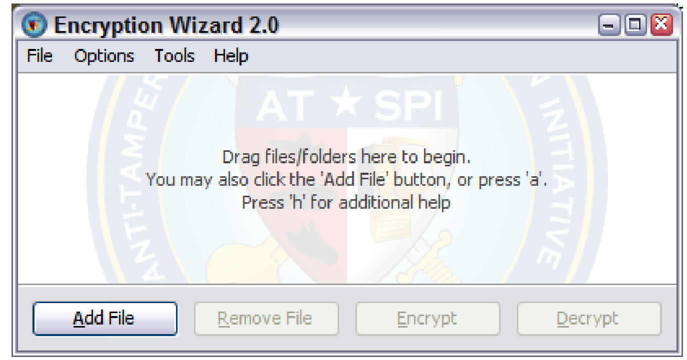
Condition-Based Maintenance



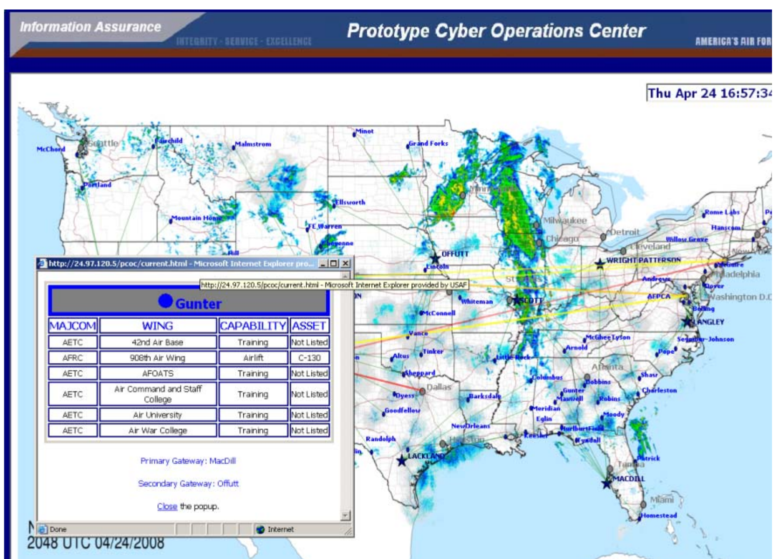
Persistent Layered ISR

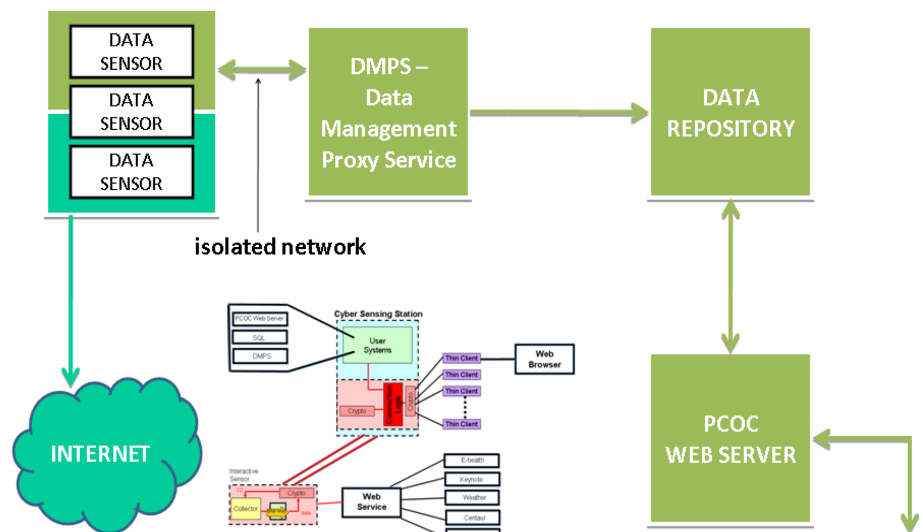
Cyber Domain: Near-term Technologies

Lightweight Portable Security



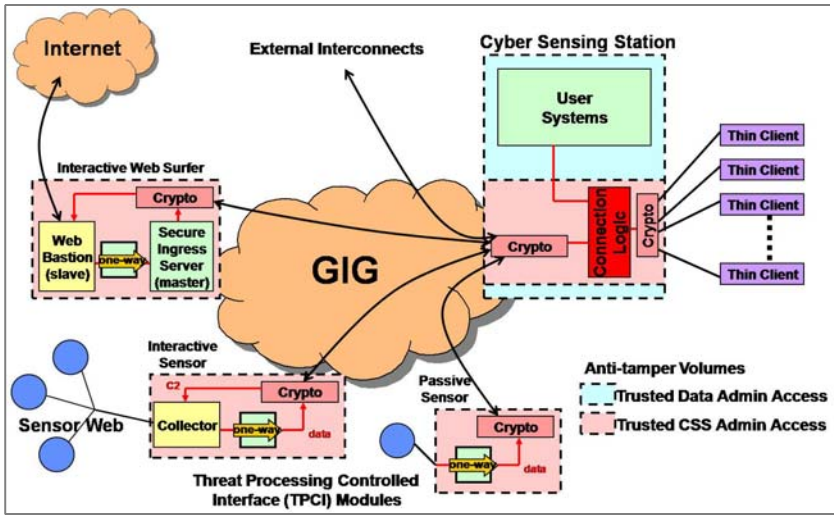
Encryption Wizard





Prototype Cyber Operations Center - PCOC

Cyber Domain: Mid-term Technologies

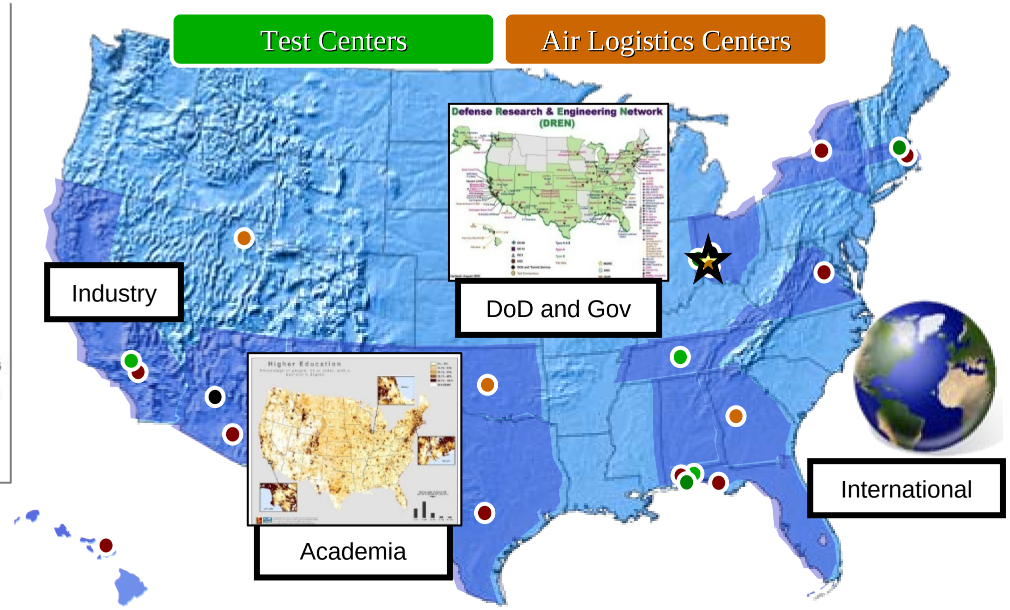


Cyber Sensing Station Network Enclave

AF works with a wide variety of partners domestic & foreign

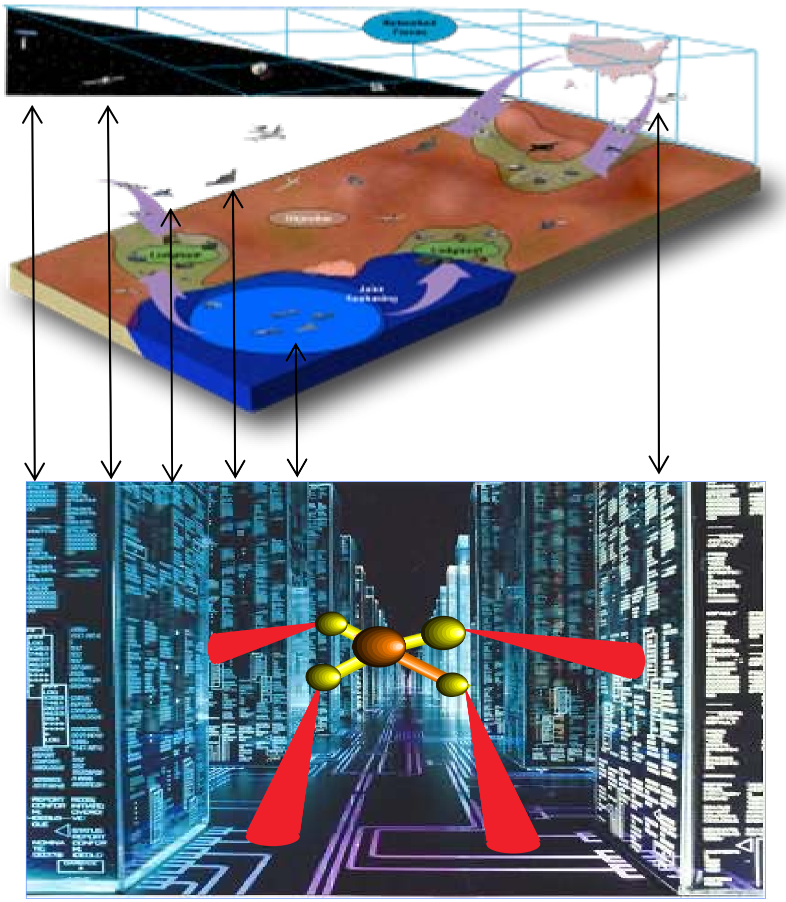
AF Research Lab | Product Centers | Specialized Units

Test Centers | Air Logistics Centers



Specialized Environments

Cyber Domain: Far-term Technologies

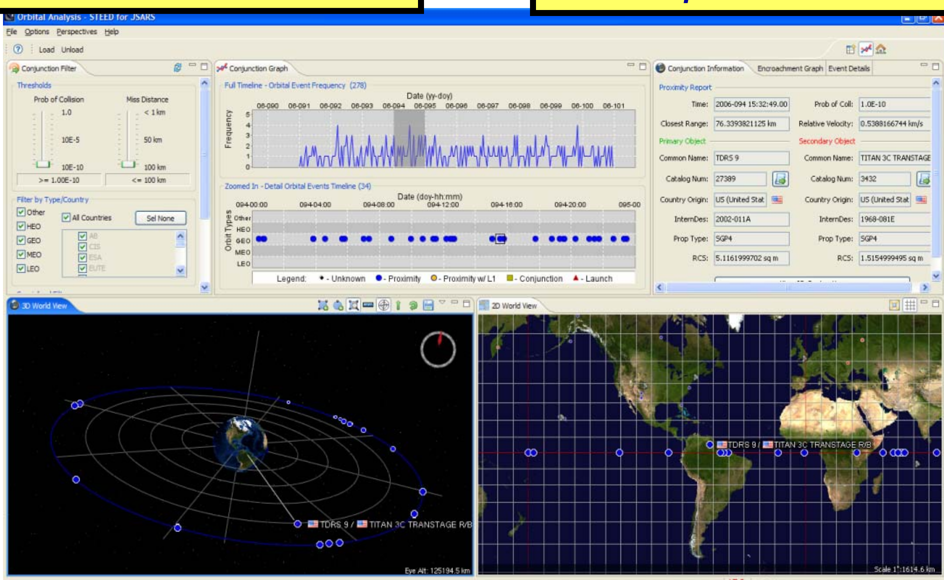


Offensive and Defensive Cyber Operations

Space: Near-term Technologies

All-on-all Conjunction Prediction and Proximity Awareness

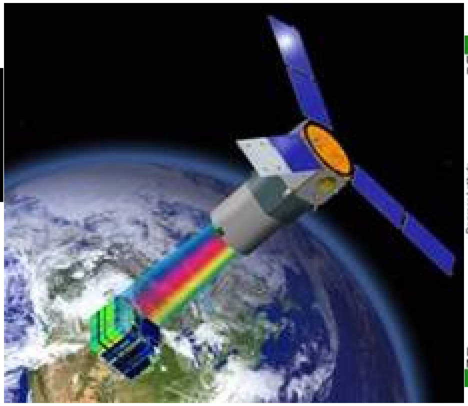
Multi-level Distributed Data Fusion of Satellite Telemetry & Space Weather



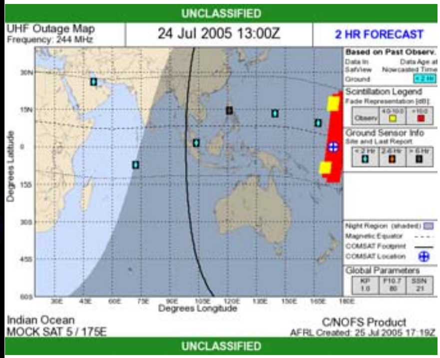
Satellite Information Database, with Net Centric Information

Advanced Visualization System For Intuitive Display And Interface

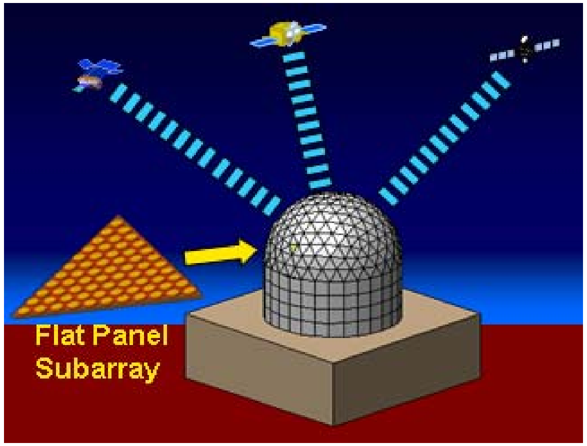
Joint Space Ops Center Situational Awareness Response Systems



TacSat-3



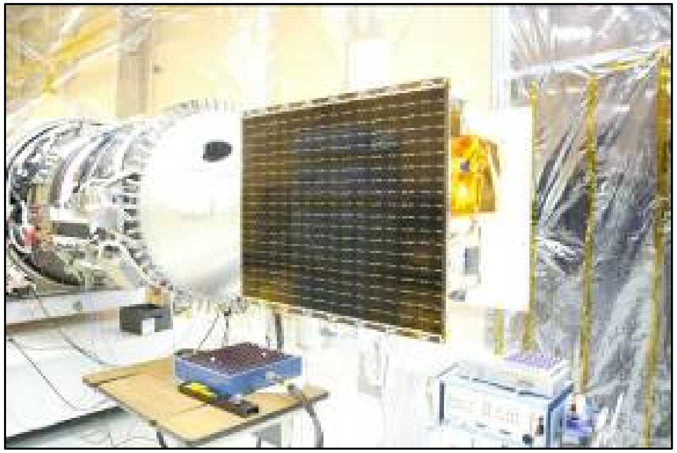
C/NOFS Forecast Map

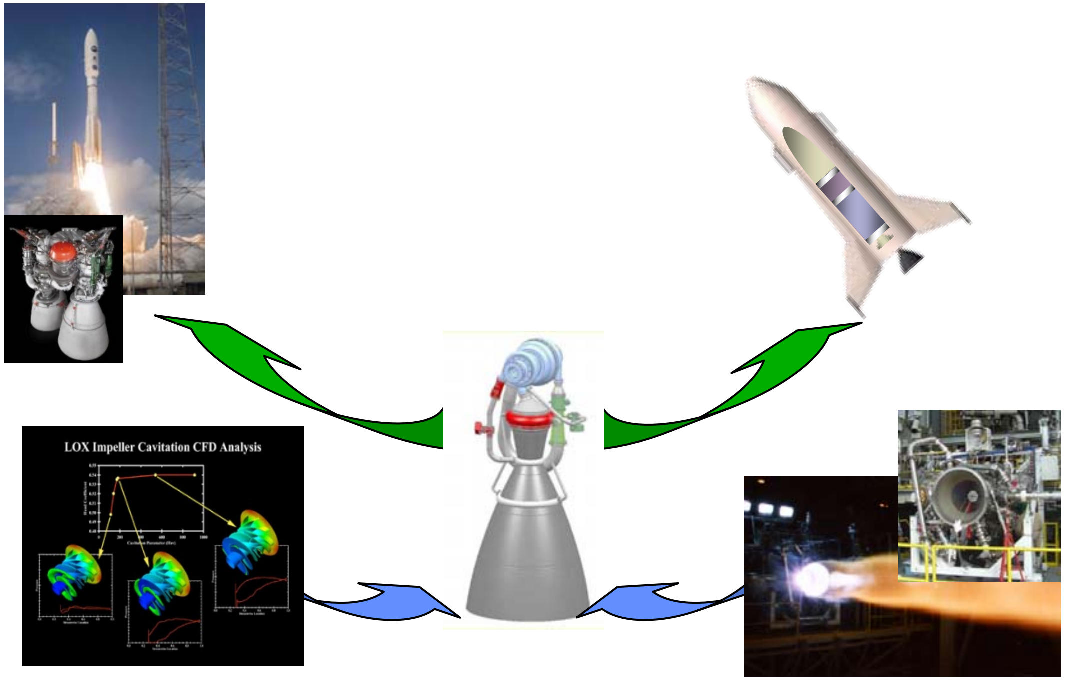


Satellite Control

Space: Mid-term Technologies

Advanced Multi-Junction Solar Cells





Hydrocarbon Boost Demo

Space: Mid-term Technologies

Future Responsive Access to Space Tech (FAST)

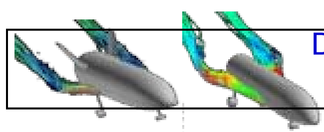
Airframe

- Advanced composite airframe tank structures
- Structure health monitoring
- Thermal protection systems

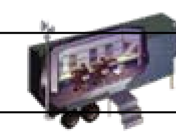
Airframe & Structural Health Mgmt Experiment

Operability

- Rapid operability
- Rapid Mission Planning
- Mate/De-mate
- Propellant loading
- Ground and Mission Ops
- Engine Remove and Replace



Design & Operability Experiment



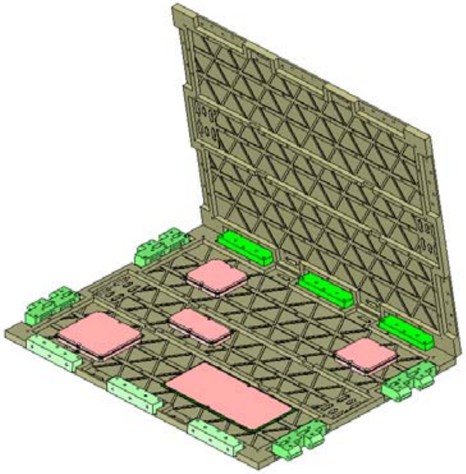
Adaptive Guidance and Control Experiment

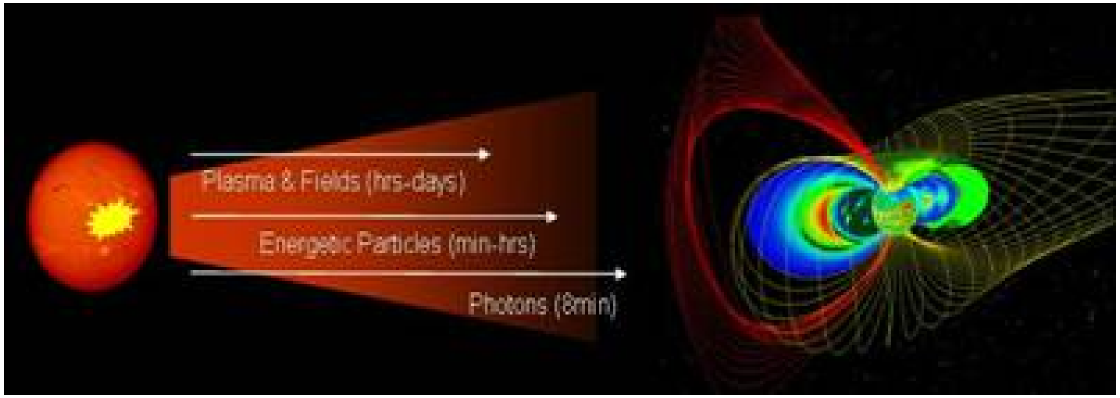
Integrated Adaptive Guidance & Control

- Autonomous & Adaptive Guidance & Control
- Trajectory reshaping
- Mission re-planning in response to subsystem failures
- Integrated systems health monitoring

Space: Far-term Technologies

Space Situational Awareness





Near-real time space environment forecasting

Take Away

- **AFRL's Vision, Strategy & Approach Directly Support PACOM's Needs**

- **Multiple Perspectives**
  - Global Vigilance, Reach, Power
  - Air, Space, Cyber
  - Defend, Engage, Attack
  - Near-, Mid-, Far-term
  - Etc...

Let's Keep the Dialogue Going!

AFRL

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