

# *Air Force Flight Test Center*

---

*War-Winning Capabilities ... On Time, On Cost*



*Test like you  
Train...Train like you  
Fight*

*How Today's Complexity Drives  
Future Range Requirements*

Major General David J. Eichhorn  
AFFTC Commander  
30 Oct 2008

This Briefing is:  
**UNCLASSIFIED**

---

*Testers exert huge (often unseen) influence over weapon systems*

# *The Truth*



*Testers exert huge (often unseen) influence over weapon systems*



# Overview

- Systems Under Test
- Future Systems
- Range Constraints
- Challenges
- Limitations
- Opportunities

*Testers exert huge (often unseen) influence over weapon systems*



# CSAF's Guidance

- Commitment
  - Renew the AF's support to important mission areas
- "Top Acquisition Priorities"
  - Expand UAV efforts
- Training
  - Increase UAV pilots to 1100 by 2009
  - 100 TPS Graduates will be assigned to UAVs

*No Modern War Has Been Won Without Air Superiority.....No Future War Will Be Won Without Air, Space, and Cyberspace*

# AFFTC Systems Under Test



- Hypersonics

FAST



X-51



X-37B



- Unmanned Aerial Systems

UCAV



RQ-4B



MQ-9



*Testers exert huge (often unseen) influence over weapon systems*



# X-37B

## Orbital Test Vehicle



- Cape Canaveral launch onboard a 501 version of the Atlas 5 rocket
- Five-meter payload fairing enclosing the spacecraft and the Centaur upper stage
- Re-entry and conventional landing at Vandenberg – alt Edwards - 2009



*Testers exert huge (often unseen) influence over weapon systems*

# FALCON Blackswift Global Reach



- Reusable Hypersonic Cruise Vehicle (HCV)
- Delivering 12,000 pounds of payload at a distance of 9,000 nautical miles from CONUS in less than two hours
- Mach 6 study
  - Horizontal takeoff and landing – 2011



*Testers exert huge (often unseen) influence over weapon systems*

# X-51A Scramjet Engine Demonstration



- Mach 4-5 - 2008
  - Loaded onto a B-52 Stratofortress
  - Boosted by an Army Tactical Cruise Missile
  - Release altitude 50,000 feet and will soar at hypersonic speed
  - Pt Mugu ocean impact
- Mach 6-7 - 2009
  - Cruise endothermic hydrocarbon fueled
- Environmental assessment underway



*Testers exert huge (often unseen) influence over weapon systems*



# Global Hawk Block 20



- Certification of RQ4B Block 20 variant with EO/IR/SAR sensor suite tested at Benfield Anechoic Facility - Jun 2008
- IOT&E – Aug/Sep 09



*Testers exert huge (often unseen) influence over weapon systems*

# Block 30 Global Hawk Airborne Signals Intelligence Payload (ASIP)



- ASIP calibration on U-2 completed at Palmdale Mar 2008
- Global Hawk calibration of the ASIP sensor with the Enhanced Integrated Sensor Suite (EISS) testing underway



U2 Flying Test Bed



***Testers exert huge (often unseen) influence over weapon systems***

# Global Hawk Block 40 Multi-Platform Radar Technology Insertion Program (MP-RTIP)



Proteus Flying Test Bed

- Operational Assessment – Mojave 2008
- Global Hawk air vehicle arrives 2009



*Testers exert huge (often unseen) influence over weapon systems*





# Predator/Reaper



## MQ-9 Reaper

- **Combat Hours Flown:** 4,000 + **Inventory:** 110
- **Wingspan:** 66 feet (20.1 meters)
- **Maximum takeoff weight:** 10,500 pounds
- **Payload:** 3,750 pounds
- **Speed:** cruise speed around 230 miles per hour (200 knots)
- **Range:** 3,682 miles (3,200 nautical miles)
- **Ceiling:** up to 50,000 feet (15,240 meters)
- **Stores**
  - AGM-114 Hellfire missiles
  - GBU-12 Paveway II
  - GBU-38 Joint Direct Attack Munitions

## MQ-1 Predator

- **Combat Hours Flown:** 400,000+ **Inventory:** 10
- **Wingspan:** 48.7 feet (14.8 meters)
- **Maximum takeoff weight:** 2,250 pounds
- **Fuel Capacity:** 665 pounds (100 gallons)
- **Speed:** Cruise speed around 84 mph (70 knots), up to 135 mph
- **Range:** up to 400 nautical miles (454 miles)
- **Ceiling:** up to 25,000 feet (7,620 meters)
- **Stores**
  - 2 laser-guided AGM-114 Hellfire anti-tank missiles



*Testers exert huge (often unseen) influence over weapon systems*



# Challenges

- Operating Environment
  - National Airspace System (NAS)
  - Sense & Avoid (SAA)
  - Controlled Airspaces Limits Available Footprint
  - Enhanced Flight Termination System (EFTS)
  - Space based FTS
- Test Readiness
  - Environmental Assessments (EA)
  - Failure Modes and Effects Analysis (FMEA)
  - Risk Assessment

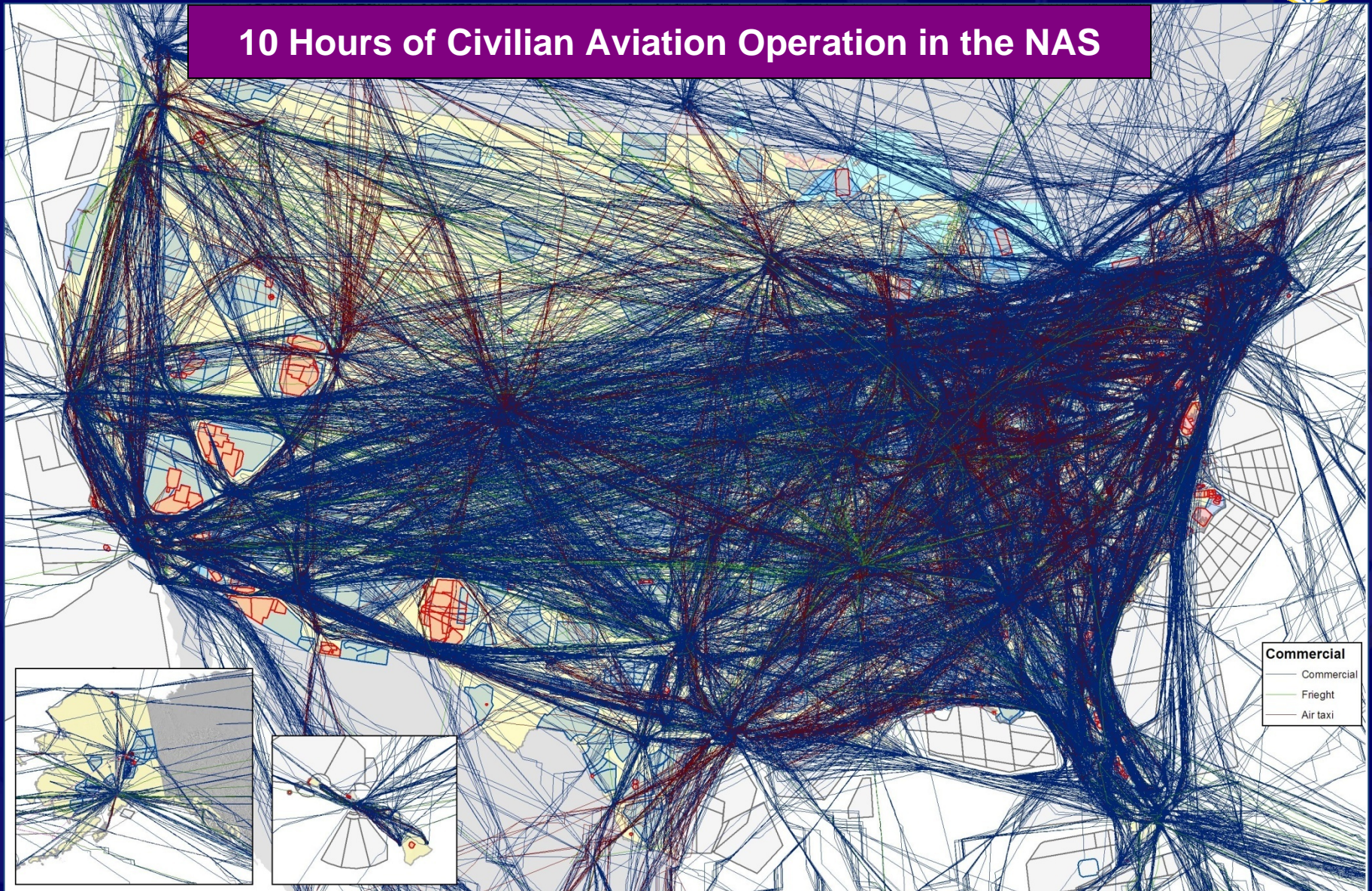
*Testers exert huge (often unseen) influence over weapon systems*



# Range Constraints Today



10 Hours of Civilian Aviation Operation in the NAS

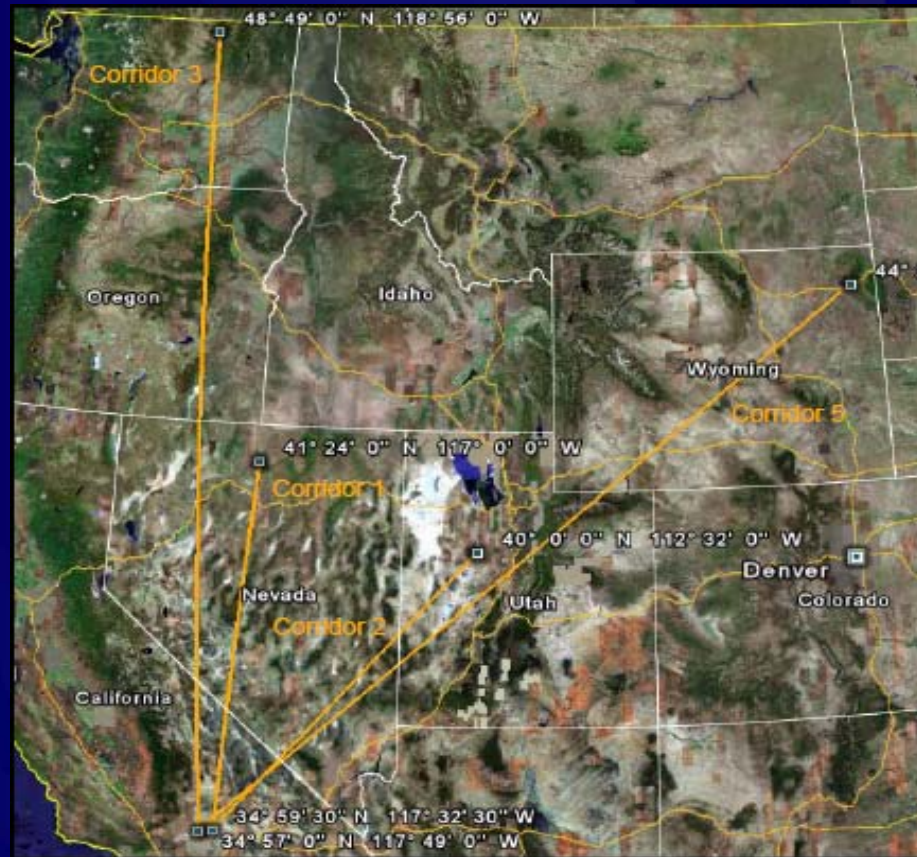




# Success – Hypersonic Corridors Defined



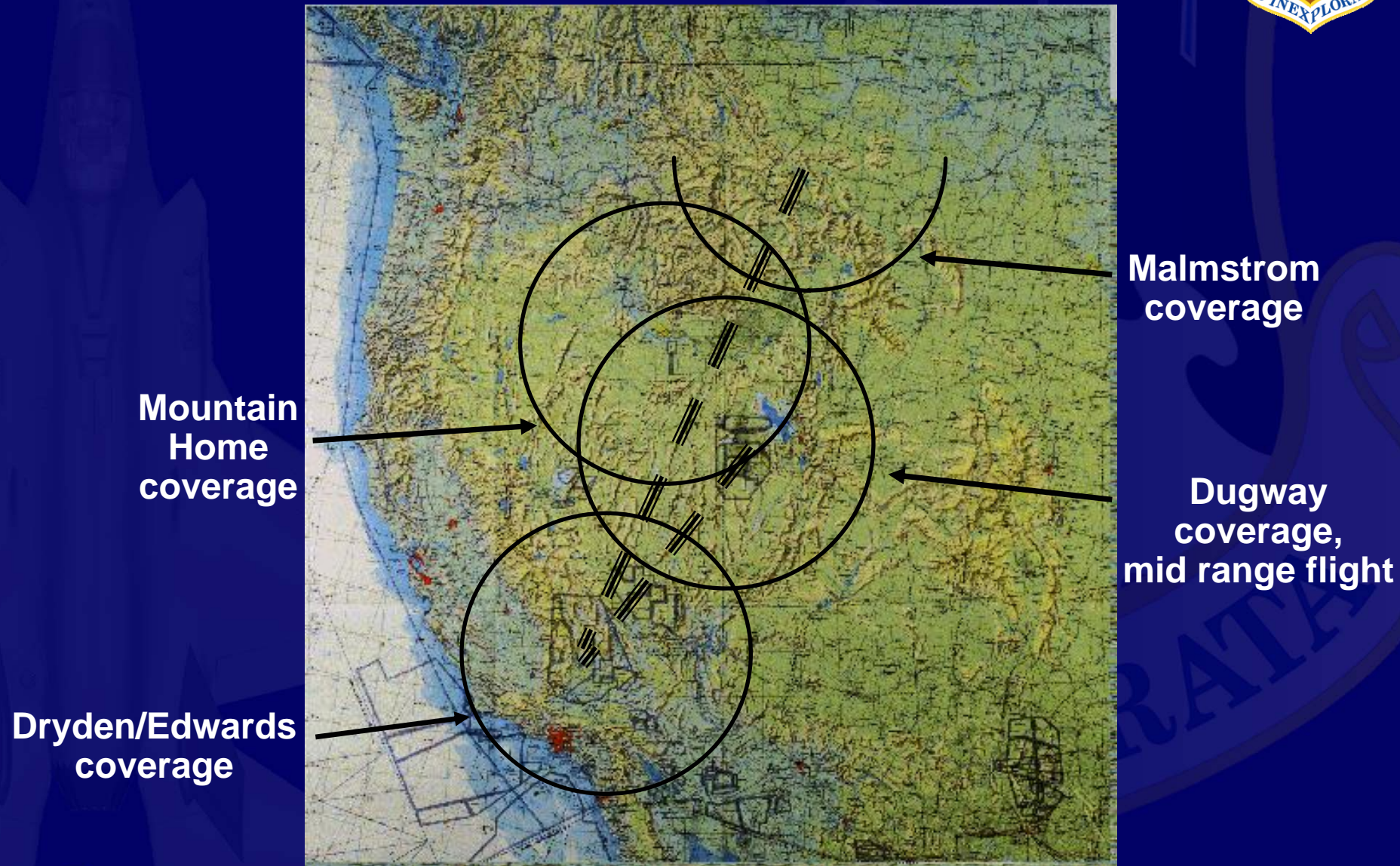
- EA for Corridors for X-43B being used for test concept planning for Ground Takeoff Mach 6 Blackswift Vehicle (400 and 825 nm corridors)



*Testers exert huge (often unseen) influence over weapon systems*



# Success – Corridor for X-33 Defined



*Testers exert huge (often unseen) influence over weapon systems*



# Flight Test to the Edge of Space Area



*Testers exert huge (often unseen) influence over weapon systems*



# Test Readiness

- Environmental Assessment
  - Impact to Air Quality
  - Noise (mostly sonic booms)
  - Commercial Air Traffic
  - And more
- Risk Assessment
  - Risk to uninvolved public must be acceptable
  - Function of population, flight trajectory, vehicle size and breakup
  - Impacts where to fly and flight test concept
  - Public safety responsibility rests with the Range Commander

*Testers exert huge (often unseen) influence over weapon systems*





# Test Readiness (Cont)

- Air Vehicle Stability & Control
  - Flight Termination System
  - Situation Awareness assessment data from two independent sources
- Failure Modes and Effects Analysis (Contractor Deliverable)
  - *“Potential harm or injury to the user of the end item being designed”*
- Types
  - System - focuses on global system functions
  - Design - focuses on components and subsystems
  - Process - focuses on manufacturing and assembly processes
  - Service - focuses on service functions
    - Software - focuses on software functions

*Testers exert huge (often unseen) influence over weapon systems*



# Limitations

- **Airspace Limitations**
  - Tempo of UAV and Hypersonic testing will continue to increase exponentially in the coming years
- **FAA Partnering**
  - UAV & Hypersonic testing/deployments in the NAS under current conditions requires FAA either Temporary Flight Restriction (TFR) or Certificate of Authorization (COA) Waiver
  - FAA has not codified “standard” for UAV and Hypersonic flight operating in the national airspace (NAS) – platform dependant
- **Range Infrastructure**
  - FTS EFTS & Space Based FTS immature
  - Cognitive learning technologies need to be developed

*Testers exert huge (often unseen) influence over weapon systems*



## Limitations (Cont)

- SAA, Auto Direct Surveillance Beacon (ADS-B) & TCAS
  - Traffic Collision Avoidance System (TCAS) maturation in early development
  - Costs to retrofit existing air vehicles with SAA/TCAS potentially significant

*Testers exert huge (often unseen) influence over weapon systems*



# Opportunities

- SAA, ADS-B, & TCAS technologies
- Accelerate autonomous collision avoidance capabilities in both cooperative and non-cooperative air traffic needs to be developed
- Solution needs to be affordable and portable across multiple UAS platforms
- Develop robust risk assessment/containment tools to
  - Destruct lines, glide footprint, impact prediction tools
  - Partner with FAA for re-consideration of current operational guidance
  - Increase number of launch and recovery sites

*Testers exert huge (often unseen) influence over weapon systems*



*Testers exert huge (often unseen) influence over weapon systems*