Test like you Train... Train like you Fight
How Today’s Complexity Drives Future Range Requirements

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This Briefing is: UNCLASSIFIED

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Overview

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

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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

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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

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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

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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

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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

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

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

Proteus Flying Test Bed
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

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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
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)

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Success – Corridor for X-33 Defined

Malmstrom coverage

Mountain Home coverage

Dryden/Edwards coverage

Dugway coverage, mid range flight

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Flight Test to the Edge of Space Area

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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

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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

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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

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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

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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
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