The Predator Unmanned System
From Advanced Concept Demonstrator to Transformational Weapon System

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303d AESW/EN

Developing, Fielding, and Sustaining America’s Aerospace Force
**Report Documentation Page**

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Standard Form 298 (Rev. 8-98)

Proscribed by ANSI Std Z39-18
Why UAS?
Operator Pull

• Advances in Sensor Technology
  – Reduced Size & Weight
  – High Resolution
  – Permit Detection of Fixed and Moving Targets
• Pressure to Minimize Causalities both Civilian and Military
• Requirement for Persistent Surveillance of the Battle space
  – Taxes or Exceeds the Limits of Human Endurance
• High Marks from Combatant Commanders in Serbia, Afghanistan and Iraq
Technology Transition Resistance

1. Culture And Policy
   • Long Standing, Large Organizational Bias Against New, Unproven Technology Or Concepts

2. Competition With Legacy And Other Programs For Funds

3. Program Start Stop Syndrome –
   • Uncertain Requirements
   • Stop Production In Favor Of Next Best UAS

4. Greater Than Expected Costs, Mishap Rates, Survivability Concerns

5. Radio Frequency Bandwidth Concerns And Interoperability

Ref: OSD UAS Roadmap
RSW UAS Size Comparison

- **RQ-4A Global Hawk**
  - Wingspan: 116 ft

- **Raven**
  - Wingspan: 4 ft

- **Weatherscout**
  - Wingspan: 10 ft

- **B737**
  - Wingspan: 94 ft

- **ScanEagle**
  - Wingspan: 10 ft

- **RQ-4B Global Hawk**
  - Wingspan: 131 ft

- **MQ-1 Predator A**
  - Wingspan: 55 ft

- **MQ-9 Predator B**
  - Wingspan: 64 ft
MQ-9A Program Description

• Hunter-killer (Reaper)
  – Find, Fix, Track, Target, Engage And Assess
  – Prosecute Critical Emerging Time Sensitive Targets
  – Radar-based Targeting With Organic Hard-kill Capability
  – Secondary Role Of Intelligence, Surveillance, Reconnaissance

Wingspan: 66 FT
Length: 36 FT
Max Speed: 240 KTAS
Max Endurance: 24 hr
Max Fuel: 4,000 lb
Max Altitude: 50,000 ft
GTOW: 10,500 lbs
External Payload: 3000 lbs (6 wing hard points)
MQ-9A System Description

Forward Operating Base

Intermediate OL
Primary Predator Satellite Link (SATCOM / Beyond Line of Sight)

Main Operating Base
Fixed Ground Control Station

Ground Data Terminal (Line of Sight Link)
Launch & Recovery Ground Control Station
Support Equipment & Ready Spare Parts

MQ-9A Air Vehicles

U.S. AIR FORCE

Dominant Air Power: Design For Tomorrow…Deliver Today
Remote Split Operations (RSO)

Domestic Air Power: Design For Tomorrow…Deliver Today

- CONUS Ops Cell
- Terrestrial Network
- Satellite Relay
- Forward Launch & Recovery Element (LRE)
- ROVER
- Target

Aircraft launched at forward location, missions flown by pilots & sensor operators located in CONUS
Critical Enablers

• MQ-1 Predator With Hellfire (FY2001)
  – Required CSAF Gen Jumper Top Down Leadership
    • Familiar With System Since Bosnia
    • Drove The Weaponization Effort

• Rover (FY 2001)
  – Developed As An Urgent Warfighter Need For AC-130 Gunship (FY 2001)
  – Transitioned To Ground Forces (FY2002)

• These Two Technologies Combined To Create The Perfect Tool For Iraq And Afghanistan
  – Broke Down A Large Number Of Stovepipes
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**Technology Transition**

**Milestone B - Fielding**

**Protootyping**
Dominant Air Power: Design For Tomorrow...Deliver Today

• Originated As Industrial Research And Development (IRAD) Program By GA-ASI In 2000
  – First Flight in Feb 2001

• Post 9-11-01 Accelerated Purchase Of First Two YMQ-9 “Predator B” – Support War On Terror
  – Delivered First “As Is” Configuration To USAF In Feb 02
  – Used DERF (Defense Emergency Response Funding)
  – Expanded Envelope And Payload Capacity (Beyond MQ-1)
  – Early Focus On Agile, Quick Reaction Development/Test

YMQ-9B 001
Technical Transition Phase
Prototyping

 Dominant Air Power: Design For Tomorrow…Deliver Today

• Predator B Tech Review (Dec 2001) Held Prior To Purchasing Two Prototypes

• Findings
  – A/C #1 And #2 - “Development” Aircraft - Not FAR 23 Compliant
    • Limited Flight Testing To Date (Approx. 90 Flight Hrs)
    • Performance Estimates Available - GA Analytical Numbers
    • High Altitude Endurance Flight Test In Progress (Up To 50 K-ft)

  – A/C Capability -- “Fall-out” Of Current Configuration
    • Structural Limitations - Landing Gear & Wing Structure (A/C#1)
      – Both Less Than 10,000 lbs GTOW
    • Similar Electronic System Reliability To Predator A - Single Thread Flight Controls
Task Force Arnold (TFA) Created To Increase Oversight

- Senior USAF Leadership (Secretary Of The Air Force, Chief Of Staff Of The Air Force, Commander Of Air Combat Command)
- Conducted From Feb 03 Thru Jun 05
- Focused On Warfighter Capabilities And Priorities
- Provided Stable Vector, Direction And Objectives

Oversaw Multi-phase Transitional Efforts

- Productionization And Weaponization (P&W) – Jul 03
  - Strengthened Structural Integrity (Expand Payload Capacity)
  - Improved Avionics And Flight Controls (Fully Redundant)
  - Improved Communication, Radar (Lynx SAR) And EO/IR Sensor
- Interim Combat Capability (ICC) – Apr 04 Basic Weapons Capability
  - GBU-12 / AGM-114 HELLFIRE / GBU-38 JDAM (FY08)
  - 45kVA High Capacity Starter-Generator System
  - FAA Certified 1-Box Digital Electronic Engine Control (DEEC)
Technology Transition Phase Results

Dominant Air Power: Design For Tomorrow…Deliver Today

- Air Combat Command Program Direction Approved By JROC (Joint Requirements Oversight Council)
  - Capability Development Document (Inc I) – Dec 04

- Air Force Program Executive Officer Approved Milestone B (LRIP I) – Feb 04
  - Approved 10 Pre-production Prototypes
  - Approved 4 A/C For First Low-rate Initial Production (LRIP I)
  - Continue R&D Efforts To Improve Capabilities

- Congress Added 7 More A/C (FY04)
System Development And Demonstration (SDD) – Mar 05

- Improved Weapons Capability
  - GBU-12 / AGM-114 HELLFIRE / GBU-38
  - Improved BRU-46(SL) Bomb Rack Development/Integration
  - Stores Management System (SMS) Improvements
- Lynx SAR Improvements
- Blue Suit Technical Order Development
- Logistics Management Information (LMI)
- Electromagnetic Interference / Environmental Testing
- Airworthiness Certification

“Normalize But Don’t Slow Down”
Conclusions

• MQ-9 Was Able To Overcome Technology Transition Resistance
  ✔ Culture And Policy - Long Standing, Large Organizational Bias Against New, Unproven Technology Or Concepts
    • Followed MQ-1/Rover Success
  ✔ Competition With Legacy And Other Programs For Funds
    • Aircraft System Is Inexpensive Relative To Other Weapon Systems
  ✔ Program Start Stop Syndrome –
    • Uncertain Requirements
    • Stop Production In Favor Of Next Best UAS
    • High Level Champion In Task Force Arnold
      – Consistent Funding, Requirements
      – Over 22,700 Flight Hours
Conclusions

✓ Greater Than Expected Costs, Mishap Rates, Survivability Concerns
  • MQ-1 Mishap Rates Have Improved Dramatically
    – MQ-9 Leverages MQ-1 Lessons Learned (Ex. Redundant Flight Systems, Planned A/W Certification)
✓ Radio Frequency Bandwidth Concerns And Interoperability
  • Interoperability With MQ-1 Ground Stations, Rover, Video Exploitation, Etc
Summary

• Successful Transitions Require:
  1. High Level Champion
  2. Needs To Integrate With Existing Operator Infrastructure
  3. Early Successes
  4. Operator Needs To Be Involved Early
     • Willingness To Experiment
     • Requirements