AF UAS Flight Plan Vision

- An Air Force where unmanned aircraft systems are considered as viable alternatives to a range of traditionally manned systems.

- An Air Force that harnesses increasingly automated, modular and sustainable systems resulting in a leaner, more adaptable, tailorable, and efficient force that maximizes combat capabilities to the Joint Force.

- An Air Force that teams with the other Services, our allies, academia and industry to capitalize on the unique unmanned aircraft attributes of persistence, connectivity, flexibility, autonomy, and efficiency.
Assumptions

- Manned and unmanned systems must be integrated to increase capability across the full range of military operations for the Joint Force
- UAS compelling where the human is a limitation to mission success
- Automation is key to increasing effects, while potentially reducing cost, forward footprint and risk
- The desired effect is a product of the “integrated system” (payload, network, and PED); and less the particular platform (truck)
- Modular systems with standardized interfaces enhance adaptability, sustainability and reduce cost
- Robust, agile, redundant C2 enables supervisory control (“man on the loop”)
- DOTMLPF-P solutions are linked and must be synchronized
# Air Force RPA Vision: Evolution of Capabilities

<table>
<thead>
<tr>
<th></th>
<th>WWII</th>
<th>Vietnam</th>
<th>Gulf War</th>
<th>OIF/OEF</th>
<th>Near Future</th>
<th>Distant Future</th>
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</thead>
<tbody>
<tr>
<td><strong>Planes</strong></td>
<td><img src="image" alt="1,000 planes (B-17)" /></td>
<td><img src="image" alt="30 planes (F-4)" /></td>
<td><img src="image" alt="1 plane (F-117)" /></td>
<td><img src="image" alt="1 plane (F-16)" /></td>
<td><img src="image" alt="4 planes (MQ-X)" /></td>
<td><img src="image" alt="Swarm" /></td>
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<tr>
<td><strong>People</strong></td>
<td><img src="image" alt="10,000 crew" /></td>
<td><img src="image" alt="60 crew" /></td>
<td><img src="image" alt="1 crew" /></td>
<td><img src="image" alt="1 crew" /></td>
<td><img src="image" alt="1 crew" /></td>
<td><img src="image" alt="Mission Commander" /></td>
</tr>
<tr>
<td><strong>Targets</strong></td>
<td><img src="image" alt="1 Target" /></td>
<td><img src="image" alt="1 Target" /></td>
<td><img src="image" alt="2 Targets" /></td>
<td><img src="image" alt="6 Targets" /></td>
<td><img src="image" alt="32 Targets" /></td>
<td><img src="image" alt="?? Targets" /></td>
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<tr>
<td><strong>Tech</strong></td>
<td>Mass Aircraft</td>
<td>Tactical Strike</td>
<td>Laser Munitions</td>
<td>GPS Munitions</td>
<td>MAC</td>
<td>Collaboration</td>
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<td><strong>C2</strong></td>
<td>In-the-Loop</td>
<td>In-the-Loop</td>
<td>In-the-Loop</td>
<td>In-the-Loop</td>
<td>On-the-Loop</td>
<td>Out-of-the-Loop</td>
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<tr>
<td><strong>Mgmt</strong></td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Responsive</td>
<td>Passive</td>
</tr>
</tbody>
</table>

*Integrity - Service - Excellence*
Conventional Harbor
- 4 operators per crane
- Manpower-centric system
  - Legacy system
  - Manpower dependant
  - Manual Operation

Multi-Crane Control
- 1 operator per 6 cranes
- 24x increase in efficiency
- Tech-centric system
  - Multi-crane Control
  - Automation (cranes and AGV)
    - DGPS
    - Algorithms
<table>
<thead>
<tr>
<th>Year</th>
<th>System</th>
<th>Details</th>
<th>Pilots Required</th>
<th>Manpower Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Current</td>
<td>50 CAPs, 50 MQ-9 CAPs, +7 aircraft in constant transit, 10 pilots per CAP, 500 pilots required, +70 pilots to transit aircraft</td>
<td>570</td>
<td>64%</td>
</tr>
<tr>
<td>2014</td>
<td>MAC</td>
<td>50 CAPs, 50 MQ-9 CAPs, 2 CAPs per MAC GCS, 1 transit per MAC GCS, 5 pilots per CAP</td>
<td>250</td>
<td>56%</td>
</tr>
<tr>
<td>TBD</td>
<td>MAC + 50% auto</td>
<td>50 CAPs, 50 MQ-9 CAPs on orbit, 25 CAPs automated, 25 CAPs in MAC (5 pilots/CAP)</td>
<td>150</td>
<td>64%</td>
</tr>
</tbody>
</table>

**MAC = 1 pilot can fly up to 4 a/c**
Modularity

Effective

B-52
- Standard Interfaces
- Variable / Tailorable armament set
- JFC Mission Flexibility
  - Conventional/nuclear
  - Stand-off strike, CAS

Affordable

PCs
- Standard interface/bus
- Swappable components
- Promotes vendor competition
- Drives down price, improves quality, allows for tailorability
- $399 PCs are reality

Flexible

C-130
- One platform/truck
- Supports multiple missions
- Swappable modules
Enabling the “Global” in “Global Vigilance, Reach and Power!”

AMC-X CONCEPT CAPABILITIES STUDY

Common components, similar shape, and same production line

Notional Examples

- Mobility
- Long Range Strike
- Air Refueler

Multi-Mission Aircraft

AMC-X

Common Platforms
Common R&D

M-X

PSAS

KC-X
Methodology

- Identified where we are today
- Examined future scenarios and desired capabilities
- From that future perspective identified actions to get there from today
- Matched compelling requirements to UAS capabilities aligned with AF Core Functions
- Identified and sequenced DOTMLPF-P actions to enable fielding of UAS capabilities and effects
# UAS Growth in AF Core Functions/Capabilities

<table>
<thead>
<tr>
<th>Core Functions (Ways)</th>
<th>Capabilities (Means)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear Deterrence Ops</td>
<td>Ballistic Missile Defense</td>
</tr>
<tr>
<td>Air Superiority</td>
<td>Electronic Warfare</td>
</tr>
<tr>
<td>Suppression of Enemy Air Defenses</td>
<td>Air-to-Air Superiority</td>
</tr>
<tr>
<td>Global Precision Attack</td>
<td>Close Controlled Strike</td>
</tr>
<tr>
<td>Long Range Strike</td>
<td>Intra-theater Strike</td>
</tr>
<tr>
<td>Global Integrated ISR</td>
<td>Collection</td>
</tr>
<tr>
<td>Plan &amp; Direct ISR Activities</td>
<td>Analysis and Production</td>
</tr>
<tr>
<td>Global Precision Attack</td>
<td>Process and Exploitation</td>
</tr>
<tr>
<td>Dissemination</td>
<td></td>
</tr>
<tr>
<td>Rapid Global Mobility</td>
<td>Airlift</td>
</tr>
<tr>
<td>Air Refueling</td>
<td>Aeromedical Evacuation</td>
</tr>
<tr>
<td>Space Superiority</td>
<td>Space Force Enhancement</td>
</tr>
<tr>
<td>Space Force Application</td>
<td></td>
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<tr>
<td>Agile Combat Support</td>
<td>Empowering the Force</td>
</tr>
<tr>
<td>Recovering the Force</td>
<td></td>
</tr>
<tr>
<td>Command and Control</td>
<td>Sustaining the Force</td>
</tr>
<tr>
<td>Preparing the Battlespace</td>
<td></td>
</tr>
<tr>
<td>Cyberspace Superiority</td>
<td>Connectivity</td>
</tr>
<tr>
<td>Forensic Analysis</td>
<td>Information Integration</td>
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<tr>
<td>Special Operations</td>
<td>Network Warfare Operations</td>
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<tr>
<td>Battlefield Air Operations</td>
<td>Network Operations</td>
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<tr>
<td>Specialized ISR</td>
<td>Influence Operations</td>
</tr>
<tr>
<td>Specialized Aerospace Fires</td>
<td>Space Control (Negation)</td>
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<tr>
<td>Building Partnerships</td>
<td>Strengthen Relationships</td>
</tr>
<tr>
<td>Assess</td>
<td>Obtain Support for US Interests</td>
</tr>
<tr>
<td>Personnel Recovery</td>
<td>Humanitarian Assistance Ops</td>
</tr>
</tbody>
</table>
AF UAS Flight Plan:
Mission sets for UAS

Current Capability Shortfalls

NANO/MICRO
WASP III
Raven
Scan Eagle

Small
Medium “fighter size”
MQ-1B
MQ-9
EO/IR/SAR
RQ-4 Blk 10/20
RQ-4 Blk 30
+ASIP

Large “tanker size”
Large Aircraft Recap

Special UAS

RQ-4 Blk 40
MP-RTIP

Indoor recon, indoor lethal/non-lethal, indoor comm, cyber attack, Swarming

Personal ISR, Lethal, SIGINT, Cyber/EW, Counter UAS, Auto-sentry

ISR, Comm Relay, Lethal/Non-lethal, Cyber/EW, SEAD, SIGINT, Low Altitude Pseudo-Sats

ISR, Comm Relay, Lethal, SIGINT

Close-in ISR, Lethal, SIGINT/DF

Fighter Recap

Counterair, Missile Defense

Hypersonic

Low Observable

Interoperable UAS C2

High Altitude Long Endurance

ISR/EA

LQ/E-X C/KC-X NGLRS

MQ-La MQ-Lb MQ-Lc

MQ-Ma MQ-Mb MQ-Mc

MQ-4 Blk 10/20
Large “System”

RQ-4 (Blk 20/30/40)
- Collection:
  - Block 20
    - Enh SAR
    - Enh EO/IR
  - Block 30
    - Adv SIGINT
  - Block 40
    - MP-RTIP Radar
    - GMTI and concurrent SAR
    - High Range Resolution
    - No EO/IR or SIGINT

RQ-4 (Blk 10)
- Collection – ISR
  - Basic SAR
  - Basic EO/IR

MQ-Lc
- EW
- ISR
- Command and Control
- Airborne Moving Target Indicator
- Ground Moving Target Indicator
- Information Integration
- AAR-R & T
- Airlift
- Humanitarian Assistance
- Strategic Attack
- Global Strike
- CAS
- Air Mobility
- Airlift

MQ-Lb
- EW
- ISR
- Command and Control
- Airborne Moving Target Indicator
- Ground Moving Target Indicator
- Information Integration
- AAR-R & T
- Airlift
- Humanitarian Assistance

MQ-La
- EW
- ISR
- Command and Control
- Airborne Moving Target Indicator
- Ground Moving Target Indicator
- Information Integration
- AAR-R

Now

Future

Modular/Interoperable Payloads
**MCO Architecture**

**Future**

- **MQ-LE**
  - Collection/Info Ops
  - Connectivity

- **MQ-L**
  - Collection/Info Ops
  - (AWACS/JSTARS)

- **MQ-Hyper Sonic**
  - Strategic Attack/Prompt Global Strike

- **MQ-Ls**
  - EW/Collection/Info Ops
  - CAS/Air Interdiction/Airlift

- **B-2/MQ-L Teaming**
  - Strategic Attack/CAS/Air Interdiction
  - Kinetic & Non-kinetic Wpns

- **F-22/MQ-X Teaming**
  - Counterair/Missile Defense
  - Kinetic & Non-kinetic Wpns

- **JSF/Multi Msn MQ-X Teaming**
  - Air Interdiction, CAS --
  - Kinetic & Non-kinetic Wpns

- **Multi Msn MQ-L/X, SUAS - FOS Teaming**
  - ISR/EW/SEAD – Kinetic & Non-kinetic Wpns

- **MQ-L – JSF/MQ-X**
  - Aerial Refueling/Connectivity

- **NAT’L (JCS, NSA, NGA, DIA, etc.)**
  - JTF HQ, CAOC
  - MCEs, DCGS

- **SOF, ALO, TAC-P**
DOTMLPF-P Synchronization:
Institutionalizing UAS – Things we need to do today

- Employ Multi-Aircraft Control
- Define interoperable architecture
- Define Chain of Command for RSO
- Establish organizational and training models
- Establish UAS National Airspace Policy
 DOTMLPF-P Synchronization
Institutionalizing UAS - Streamline Development and Fielding

- Develop modularity (MQ-X)
- Establish long-lead tech efforts
- Develop Joint requirements/teaming
- Team with Industry and Academia
- Optimize UAS acquisition
DOTMLPF-P Synchronization
Institutionalizing UAS - UAS Cornerstone of AF Capability

- Integrated “auto” formations
- Full airspace access worldwide
- Automated maintenance
- International legalities/liabilities

I n t e g r i t y  -  S e r v i c e  -  E x c e l l e n c e
Sense and Avoid

DOTMLPF-P Impact

**Doctrine**
- CCDR allocation
- J2/J3

**Organization**
- SUAS Sqdn
- MAC Ops Sqdn
- MAC Logistics Sqdn
- UAS Beta Test
- 100% Sim Training
- Common GCS
- Assured Comm
- Auto T/O
- Hi-Fi Sim
- Land

**Training**
- Auto Tgt Engage
- RSO Basing
- Mechanical/Technical payloads
- Modular Payloads
- CBM+UAS
- SWARMING
- Alt Energy
- Auto MX
- Command of Autonomy
- Bldg the “New” AF Leader

**Materiel**
- MAC
- AFSC
- MAC in NAS
- Acq Excellence
- MAC-in-NAS
- Force Structure Reform

**Leadership**
- CC’s
- SAF/PA Outreach
- PME
- Career Pyramids
- Teaming w/ Schools
- Recruiting Focus
- Force Structure Reform
- Outreach
- Rated?
- Force Structure Reform

**Personnel**
- SUAS Operator
- UAS LNOs

**Facilities**
- C2 Facility
- CFACC Facility

**Policy**
- NAS
- ILAs
- Acq Excellence
- MAC-in-NAS
- Treaties
- Autonomy
- Auto Tgt Engage

**Long-term**
- FY25-47
- Long-term
- FY15-25
- Mid-term
- FY10-15
- Near-term
- FY09-10

**Sense and Avoid**
- Autonomous Fight
- Autonomy
- Autonomy
Able to get some critical FY10 funding for initiatives

- Key short-term enablers: Sense and Avoid, Interoperable C2, Multi-Aircraft Control and enhanced Human-System Interface, Auto Takeoff/Land, Hi-fidelity Simulation, “loyal wingman”

- Thought signed Flight Plan was enough….was wrong…
  - Submitted RPA FP RSR brief – Nov 09
  - Working with ACC on modifying MQ-X ICD
  - Ready to submit Sense and Avoid RSR brief
  - Building interactive, e-version of FP; target: Mar 10

- MQ-X, Third Generation RPA is the embodiment of the Flight Plan
  - Modular, Automated…”payload agnostic”
  - DOTMLPF-P forcing function
  - Target: FY14 POM
Implementation

- Able to get some critical FY10 funding for initiatives
  - Key short term enablers: Sense and Avoid, Interoperable C2, Multi-Aircraft Control and enhanced Human-System Interface, Auto Takeoff/Land, Hi-fidelity Simulation, “loyal wingman”

- Thought signed Flight Plan was enough….was wrong…
  - Writing Flight Plan Initial Capabilities Doc; JROC target: Mar 10
  - Writing MQ-X ICD; JROC target: Mar 10
  - Building interactive, e-version of FP; target: Mar 10

- MQ-X, Third Generation RPA is the **embodiment** of the Flight Plan
  - Modular, Automated…”payload agnostic”
  - DOTMLPF-P forcing function
  - Target: FY14 POM

- Other Key short term
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- An Air Force that teams with the other Services, our allies, academia and industry to capitalize on the unique unmanned aircraft attributes of persistence, connectivity, flexibility, autonomy, and efficiency.
MQ-X: Aircraft Performance
Key Concepts

- Deeply modular and upgradable
  - Support future roles and mission needs

- Size, Weight and Power
  - Maximize sensor & weapons flexibility

- High subsonic dash
  - Force packaging and responsiveness

- Target area persistence

- Survivable in contested environment
Theater UAS Concept Overview

Common Positive and Procedural controls provide for dynamic re-tasking, airspace coordination, levels of interoperability and C2.
<table>
<thead>
<tr>
<th>UAS FP Initiative / Unfunded requirement</th>
<th>Funding Requested</th>
<th>Program Status</th>
<th>Funding Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MQ-X AoA and MS A development planning</td>
<td>FY10: $8.3M</td>
<td>MQ-X ICD on hold</td>
<td>PARTIAL: SAF/AQX/FM funded FY10 $8.3M AoA effort</td>
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<td></td>
<td>FY11: $3.84M</td>
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<tr>
<td>*Improved-Multi-Aircraft Control (MAC) GCS (MQ-9)</td>
<td>FY10: $4M</td>
<td>Unfunded requirement for MQ-1/9</td>
<td>UNFUNDED:</td>
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<td></td>
<td>FY11: $6.5M</td>
<td>Not in the FY11 POR</td>
<td>- SAF/AQX/FM identify sources to fund priority UAS efforts in FY10/11</td>
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<tr>
<td></td>
<td>FY12: $8.5M</td>
<td></td>
<td>- HAF/A8 and SAF/FMB ensure UAS FP initiatives are included in FY12POM funding priority</td>
</tr>
<tr>
<td></td>
<td>FY13: $27M</td>
<td></td>
<td></td>
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<tr>
<td>TOTAL: $46M</td>
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</tr>
<tr>
<td>*High-Fidelity Simulator (MQ-9) - provide high fidelity, realistic training</td>
<td>FY09: $21M</td>
<td>Unfunded requirement for MQ-1/9</td>
<td>UNFUNDED:</td>
</tr>
<tr>
<td></td>
<td>FY10: $8M</td>
<td>Not in the FY11 POR</td>
<td>- SAF/AQX/FM identify sources to fund priority UAS efforts in FY09-10</td>
</tr>
<tr>
<td></td>
<td>TOTAL: $29M</td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>*Sense &amp; Avoid (SAA) (MQ-1/9) - PDM III-directed: Develop a common, autonomous airborne SAA system for GH/BAMS that is scalable to medium-altitude UAS</td>
<td>FY09: $4.5M TOTAL: FYDP (TBD)</td>
<td>Unfunded requirement for MQ-1/9 FY11 POR</td>
<td>UNFUNDED:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- SAF/AQX/FM identify sources to fund priority UAS efforts in FY09-10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- AF should request funding be returned from OSD: PDM III reprogrammed $29.4M from MQ-1/9 program (FY10-15)</td>
</tr>
</tbody>
</table>

RED = unfunded
<table>
<thead>
<tr>
<th>UAS FP Initiative / Unfunded requirement</th>
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</thead>
</table>
| *Sense and Avoid (SAA) (RQ-4/BAMS) - PDM III-directed: Develop a common, autonomous airborne SAA for GH/BAMS that is scalable to medium-altitude UAS | FY10: $26.6M   
FY11: $24.9M  
FY12: $36.3M  
FY13: $34.7M  
FY14: $21.8M  
FY15: $1.1M  
TOTAL: $145.5M | OSD AT&L supporting across FYDP - $66.9M (OSD: $48.3M / Navy: $18.6M) | PARTIAL:  
- SAF/AQX/FM identify sources to fund priority UAS efforts in FY10/11  
- HAF/A8 & SAF/FMB ensure UAS FP initiatives are included in FY12POM funding priority  
- FYDP: (still $78.6M short): AF should request funding be returned from OSD -- PDM III reprogrammed $70.3M from RQ-4 program (FY10-15) |
| *Interoperable UAS C2 - Easier (faster, cheaper) payload integration, enhances ease of “plug and play” designs | FY10: $4.5M  
FY11: $14M  
FY12: $10.5M  
TOTAL: $29M | Unfunded requirement for MQ-1/9 Not in MQ-1/9 FY11 POR, but... OSD-directed UAS Common Ground Station via ADM | UNFUNDED:  
AF requesting funding from the OSD UAS Common Ground Station Demo project ($40M in FY10-11) |
| *Auto Takeoff /Land (MQ-9) | FYDP: $54M | MQ-1: Unfunded requirement MQ-9: FY11 Program of Record (POR) | PARTIAL:  
$10M requested via FY09 Omnibus  
- HAF/A8 & SAF/FMB ensure UAS FP initiatives are included in FY12POM funding priority |

RED = unfunded

* SECAF/CSAF UAS Initiatives

**Integrity - Service - Excellence**
**UAS FP Initiatives**

**Funding Status**

<table>
<thead>
<tr>
<th>UAS FP Initiative / Unfunded requirement</th>
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<th>Program Status</th>
<th>Funding Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>GCS Mod Phase II:</em> Provides rapid insertion of new system capabilities - Enables interoperability with other UAS platforms</td>
<td>FY10: $25.5M&lt;br&gt;TOTAL: FYDP ($232M)</td>
<td>FY11 POM: $200.9M approved</td>
<td>PARTIAL: FY09: $16.5M requested via Omnibus - SAF/AQX/FM identify sources to fund priority UAS efforts in FY10</td>
</tr>
<tr>
<td><em>Small UAS / Spectre FINDER MAC Air-launched Capability for MQ-1</em></td>
<td>FY09: $3.4M</td>
<td>Defense Threat Reduction Agency (DTRA) funded demonstration project</td>
<td>PARTIAL: - SAF/AQX/FM identify sources to fund priority UAS efforts in FY09</td>
</tr>
<tr>
<td><em>6' VADER QRC (MQ-9)</em> Vehicle and Dismount Exploitation Radar</td>
<td>FY10: $8M&lt;br&gt;FY12: $61M&lt;br&gt;FY13: $50M&lt;br&gt;FY14: $25M&lt;br&gt;FY15: $25M&lt;br&gt;TOTAL: FYDP ($169M)</td>
<td>OUSD(I) ISR TF reviewing AF GMTI JUON solution</td>
<td>UNFUNDED: - SAF/AQX/FM identify sources to fund priority UAS efforts in FY10 - HAF/A8 and SAF/FMB ensure UAS FP initiatives are included in FY12POM funding priority</td>
</tr>
</tbody>
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