US Navy Family of Unmanned Aircraft Systems

Presented to

Navy-Industry International Dialogue

8 November 2012

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Guiding Principles for US Navy ISR

- Increasingly sea based & unmanned
- Every platform is a sensor
- Every sensor is networked
- Data is discoverable & accessible by all
- Modular, scalable plug & play sensor payloads
- Common Unmanned Systems (UxS) Control Stations
- Common interfaces, data formats & standards
- Remoted automated sensors

Department of the Navy’s Objectives for 2013 and Beyond:
  - Proliferate Unmanned Systems
    - a. Integrate Unmanned Systems into the DON Culture
    - b. Develop Unmanned Systems in the Air
    - c. Deploy and Establish Unmanned Systems On/Under the Sea
    - d. Field Unmanned Systems on the Ground
PEO(U&W) UAS Experience

MQ-4C Triton BAMS UAS

X47B (Demo)

MQ-281

MQ-8B Fire Scout VTUAV

MQ-8C

RQ-21A STUAS

Unmanned Air Systems
Common Control System

Reaper
Saber Focus

UCLASS

BAMS-D

Cargo UAS A-160

Cargo UAS K-MAX

Raven B

T-Hawk

Wasp

Scan Eagle

Wasp IV

Puma

Group 1

GROUP 2

GROUP 3

GROUP 5

MQ-4C Triton BAMS UAS

UCLASS

BAMS-D

Cargo UAS A-160

Cargo UAS K-MAX

Reaper
Saber Focus

MQ-8B Fire Scout VTUAV

Pma-262

PMA-266

PMA-263

PMA-281

Tactical Control System

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Navy UAS Operations in the Fleet

**Scan Eagle / ISR Services**
- Approaching **245,000 flight hours** in support of forward deployed forces.
- Identification of surface vessels ISO maritime domain awareness
- Surveillance of known smuggling and piracy areas
- Persistent coverage for counter-insurgency operations
- Route Survey Support
- Strike Support
- Surveillance and protection of high value infrastructure
- Battle Damage Assessment
- ScanEagle has been deployed in numerous ground support roles and on 22 different Naval vessels within six (6) different ship classes through Sept 2012 recording in excess of 245,000 flight hours.

**BAMS-D**
- Demonstration program with real world utility
- Provides the Fleet a persistent, high-altitude, multi-INT, maritime ISR capability
- Currently on its 46th month of a 6-month deployment
- > **7,300 flight hours** in CENTCOM AOR (~9,000 total flight hours since 2004)
- Providing direct, actionable intelligence
- Tactics, Techniques, Procedures Development (pathfinder for BAMS/Triton)

**Fire Scout**
- Over **1,330 flight hours** supporting five FFG deployments
- Afghanistan RC(North); direct support to USA – over **3,680 flight hours**
- Counter piracy missions
- SOF and other combat support missions
- TCDL COMM Relay
- Remote Viewing Terminal exercised
- Conduct of dual H-60/VTUAV Ops & Dual VTUAV Ops
- Lessons learned to mature TTP Development
RQ-7B SHADOW

- Serves as Ground Unit Commander’s primary day/night reconnaissance, surveillance, and target acquisition system
- Over 30,500 flight hours and 5,779 sorties in support of OEF from Aug 2009 through Sept 2012
- Supportability delivered via a Performance Based Logistics contract
- Provide situational awareness within the employing unit’s area of operations
• Support tactical maneuver forces ashore (MEU battalions)
• ISR for afloat amphibious forces (LHD, LPD, LSD)
• USMC planned inventory of 32 systems
  – Development/operational testing began in 2012
  – Land and ship-based capability in 2014
• USN rqmts = 25 systems, possible procurement deferral
• 1 system = 5 air vehicles
• 25 lb cargo bay (comm relay, radar, etc)
MQ-8 Component Descriptions

Fully Autonomous Aircraft

- MQ-8C Based on Bell-407 Commercial Helicopter
- MQ-8B Based on Schweizer 333 Commercial Helicopter

Brite Star II EO/IR Laser Designation/Range Finder Payload

- Fully Digital, Dual Redundant Control System
- Collect imagery
- Relative range and LOS to target for precision target coordinates
- Laser designate target on command

Fully Encrypted, Digital Data Links; Land & Sea Ops

- Tactical Control Data Link (TCDL) – L-3
- UCARS-V2 for Ship Launch/Recovery (SNC)
- Harpoon and Grid Ship Deck Restraint

Ship Ground Control Segment (SGCS)

Interoperable Control Station with Tactical Control System (TCS) software integrated

- NGC (H/W) Raytheon (S/W)
- Open Architecture
- GCCS-M, JDISS, AFA/TDS, CCTV & JSIPS-N
- NATO STANAG 4586 Compliant
- Multi-Vehicle control
- Federated OSI/AIS capability
Fire Scout VTUAV

Baseline Program of Record (CPD)

MQ-8B

- Provide an organic maritime ISR system to support the host ship’s commanding officer
- Deck Pitch: +/- 3 deg
- Deck Roll: +/- 5 deg
- Target ID: 6km slant range
- Ao: >= 85%
- NR-KPP Compatible
- Integration with GCCS-M
- LCS Mission Module Integration • ASW; SUW; MCM
- 168 aircraft

Maritime ISR Support for SOF RDC

MQ-8B

- Provide an interim solution for a medium-range maritime-based ISR UAS platform in the CENTCOM and AFRICOM AORs.
- Full Motion Video (EO/IR/LDRF)
- ½ ISR orbit / ship
- Integration with SOCOM Payloads / Systems • Vortex • EZTV • AIS Integration • MIRC Chat

MQ-8C

- Provide a medium-range maritime-based ISR UAS platform in the CENTCOM and AFRICOM AORs.
- Maritime Based
- 150 nm range
- 8 hours endurance
- Integration with FMV and Specialty Payloads
- 1 ISR orbit / ship
- Integration with SOCOM Payloads / Systems • Vortex • EZTV • AIS Integration • MIRC Chat • 28 Aircraft

Objectives:

- BLOS Command and Control

Weaponization RDC

MQ-8B

- Provide a laser guided precision munitions capability to baseline VTUAV system
- Sea-based, operate in maritime domain
- Launch & recover from variety of surface combatants
- Weapon certified for shipboard ops
- Low circular probability of error
- Low probability of collateral damage
- High probability of mobility(T), mission (O) kill

RADAR RDC

MQ-8B

- Provide maritime surface search with ISAR capability, Synthetic Aperture and limited MTI
- Integrate and support RADAR on six aircraft
- RDC concept over 18 months
- QRA to assess deployment readiness

QRA Focus

- 1 ISR orbit / ship
- Integration with SOCOM Payloads / Systems • Vortex • EZTV • AIS Integration • MIRC Chat
- 28 Aircraft
- Objectives:
  - BLOS Command and Control
Integrated Maritime Patrol Concept

Transformational Mixed Force: Effective, Efficient Mission Capability Tailored to the Warfighter’s Requirements

Responsive Multi-Mission
Robust Sensor Suite
Cue to Kill
Onboard Fusion
Large Weapons Payload

ASW Kill
ASW Track
ASW Search

SuW Kill
SuW Track
SuW Detect

Maintain Maritime COP

FRP Tripwire

ISR in Support of IPE

Persistent ISR
Long Dwell Sensor Suite
C4I Network Node (FORCEnet)
Combat Info from MCS
Data Available to Intel Centers
High Altitude, Fast, Reliable

Navy Maritime Patrol Missions
MQ-4C Triton Air Vehicle Configuration

**MQ-4C Triton Specs**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>Length</td>
<td>47.6 ft</td>
</tr>
<tr>
<td>Wingspan</td>
<td>130.9 ft</td>
</tr>
<tr>
<td>Max Takeoff Wt</td>
<td>32,250 lb</td>
</tr>
<tr>
<td>Cruise Speed (KTAS)</td>
<td>330 knots</td>
</tr>
<tr>
<td>GTOW Rate of Climb (SL)</td>
<td>2,800 fpm</td>
</tr>
<tr>
<td>Operational Ceiling</td>
<td>60,000 ft</td>
</tr>
<tr>
<td>Max Un-refueled Range</td>
<td>&gt;9,550 nm</td>
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<tr>
<td>Endurance</td>
<td>&gt;24 hr</td>
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**AN/DAS-3 EO/IR**

- 360° Field of Regard
- Auto-Target Tracking
- Hi Res EO/IR at Multiple FOVs
- Multi-Mode Color Video

**AN/ZPY-3 Multi-Function Active Sensor (MFAS) Maritime Radar**

- 360° X-Band 2D AESA Radar
- Maritime and Air/Ground Modes

**Rolls-Royce AE3007H**

- 23+ Million hrs
- 8,500 lb Thrust (SL)

**Due Regard Radar**

- Safe Separation

**AN/ZLQ-1 ESM**

- 360° FOR

**9” CDL Dish Antenna**

(Port and Starboard)

**Hail and Bird Strike Resistance**

- De-icing

**Metallic Fuselage**

- Graphite Empennage

**External Provisions**

- Automatic Identification System (AIS)
- Graphite Wing
- WB Satcom
- Due Regard Radar

**Space, Weight & Power**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>Internal Payload</td>
<td>3,200 lb</td>
</tr>
<tr>
<td>External Payload</td>
<td>2,400 lb</td>
</tr>
<tr>
<td>Power AC</td>
<td>30.0 kVA</td>
</tr>
<tr>
<td>Power DC</td>
<td>400 A</td>
</tr>
<tr>
<td>Pressurized Space</td>
<td>180 cu ft</td>
</tr>
<tr>
<td>Unpressurized Space</td>
<td>45 cu ft</td>
</tr>
<tr>
<td>External Unpressurized Space</td>
<td>132 cu ft</td>
</tr>
<tr>
<td>Backup Battery Power</td>
<td>45 min</td>
</tr>
</tbody>
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Unmanned Combat Air System
Carrier Demonstration (UCAS-D)

Mission:
• Mature technologies for a carrier suitable, low observable relevant, unmanned air system to operate in a carrier environment

Milestones:
• First autonomous carrier landing with F/A-18 surrogate - July 2011
• X-47B flight envelope expansion complete at Edwards AFB – Nov 2011
• Autonomous Aerial Refueling demo with Lear surrogate – January 2012
• X-47B flight operations commenced at NAS Patuxent River - July 2012
• CVN control segment and autonomous operations validated – July 2012
• Shore based carrier suitability testing underway (catapults, arrested landings)
• Carrier launch and recovery operations planned for 2013
• Deliver UCLASS capability in the 2020 timeframe
  – Carrier-based persistent ISR & strike capability
  – Unmanned, CV suitable, with necessary survivability
  – Multi-int sensor capability
  – LOS / BLOS using existing networks

• Tradable requirement
  – Schedule --- Cost --- Performance

• Scope the air vehicle for an enduring, affordable capability

Increasing sea-based capacity across the spectrum of maritime and littoral missions enabling a single CVW to provide continuous 24/7 ISR/Strike capability
C2 subject to platform type and scope of operations

- Short-range, tactical airborne ISR UAS controlled at unit level
  - Launch, recovery and control from local mission control element

- Long-range ISR UAS stationed forward, controlled in rear
  - Launch and recovery from forward base
  - Platform and sensor control from mission control in U.S.

- ISR collection data accessible by all:
  - Unit level, strike group, Task Force Commander, Maritime Operations Center
  - Joint, theater, national, allied, coalition partners

Navy C2 will be flexible and offer different levels of interoperability depending on mission
Focus Is On Capability Since A UCS Compliant Open Architecture Is Used
Achieving a CCS solution will enhance interoperability opportunities but interoperability inherently encompasses a much broader spectrum of issues across combatant forces, networks, customers, etc.
Moving Towards Greater Interoperability

Current

Near Term

Long Term

Dismounted Operations

Dismounted Operations

Autonomous Behaviors

Reach Back
Tasking
Auto-Response

Collaborative Behaviors

Cooperative
Unmanned Systems

Cooperative
Behaviors

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UAS Challenges

• Moving from Automation to Autonomy
• Common Control Systems
• Interoperability
• Tasking, Collection, Processing, Exploitation & Dissemination (TCPED) architecture & management
• Operational ISR integration C2 across all domains
• Airspace Integration

Partnership with industry more important than ever
Navy's intent is to produce a family of capable, effective, and interoperable unmanned systems that integrate with manned platforms and ships to provide situational awareness and warfighting advantage to commanders at all levels.

Summary

• Navy is on glide slope to provide:
  – Persistence via unmanned systems . . . Increasingly from the sea
  – Capacity with more platforms and sensors
  – Capability with automated sensors
  – Flexibility with modular, scalable “plug & play” sensors
  – Timeliness through effective TCPED process
  – Connectivity through secure information sharing
Questions