

# Department of Defense Report to Congress on Addressing Challenges for Unmanned Aircraft Systems



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Under Secretary of Defense  
for Acquisition, Technology and Logistics

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## **REPORTING REQUIREMENT**

On pages 426 and 427 of the Report of the Committee on Armed Services of the House of Representatives, House Report 110-652, accompanying H.R. 5658, the Duncan Hunter National Defense Authorization Act for FY 2009, the committee requests an annual report containing at least the following information:

“...[I]nformation on the issues being addressed by the Task Force, progress made in coordinating UAS issues within UAS programs, between UAS and ISR [Intelligence, Surveillance, and Reconnaissance]-related manned and unmanned capabilities, and its recommendations to address existing issues. In addition, the report shall describe the actions that the Department has taken to implement the Task Force’s recommendations and milestones for completing any unresolved recommendations.”

## INTRODUCTION

The Unmanned Aircraft Systems Task Force (UAS TF) is addressing a variety of challenging issues impacting current and future Department of Defense (DoD) unmanned capabilities. The UAS TF leadership adjusted the UAS TF structure to accommodate the growing need for new capabilities and improvements in unmanned operating efficiencies.

A cargo UAS Working Group was added to investigate the growing interest in a cargo UAS requirement and to transfer responsibility for this activity from the Joint UAS Center of Excellence (JUAS COE), which was disestablished. Additionally, the Office of the Assistant Secretary of Defense for Logistics and Material Readiness partnered with the UAS TF to establish a Logistics and Sustainment Integrated Product Team (IPT) to coordinate among ongoing UAS sustainment activities with the ultimate goal of developing capabilities consistent with regulations, Military Department-specific missions, and product-support strategies to meet readiness objectives. The inaugural effort of the IPT was to conduct a study on unmanned aircraft depot maintenance efficiency strategies across the Department. It is expected this study will result in efficiencies as the Military Departments find consolidation solutions in depot maintenance strategies and implement those strategies for new programs.

Other structural changes include the shift of expertise from the JUAS COE to the Joint Staff as a result of the U.S. Joint Forces Command (USJFCOM) disestablishment. The change resulted in some of the JUAS COE responsibilities being reassigned to the Joint Staff and the UAS TF. Also, the UAS TF has fostered an interoperability partnership between its members and United States delegates from the NATO Joint Capability Group for Unmanned Aerial Vehicles, which has responsibility for Standardized Agreement 4586.

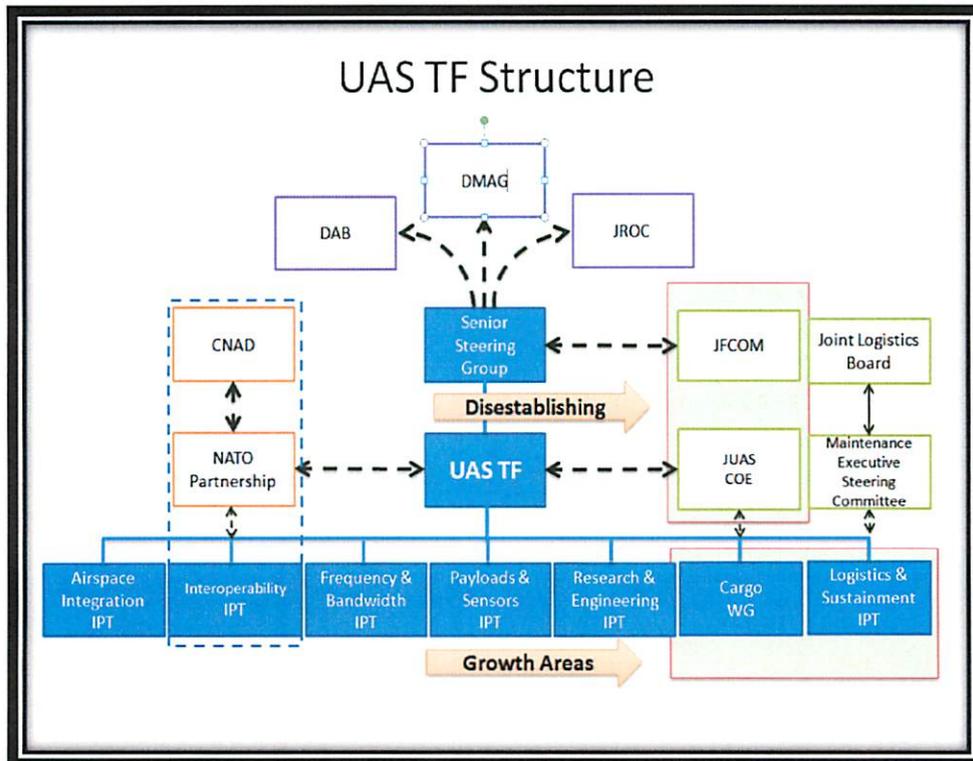


Figure 1: DoD UAS Task Force Organization

## **SECTION 1 – KEY ISSUES BEING ADDRESSED BY THE UAS TASK FORCE**

The UAS TF is addressing a number of key issues to improve the Department's unmanned capabilities. These key issues include an airspace integration capability allowing UAS access to both the National Airspace System (NAS) and international airspace, and improvements in both program interoperability and efficiency.

### **Airspace Integration – UAS Access to National Airspace System**

As tasked in its charter, the UAS TF leads the Department's efforts to Integrate UAS in the NAS by shaping policy, procedures, certification standards, and technology development. Working closely with the Military Departments and the DoD Policy Board on Federal Aviation, the UAS TF has been able to identify joint requirements, capability gaps, and issues that need to be resolved to increase access of UAS in the NAS. The UAS TF has made solid progress by developing and raising DoD NAS integration issues to the UAS Executive Committee described below. The UAS TF has also completed the DoD UAS Airspace Integration (AI) Plan, the Joint Concept of Operations (CONOPS) for UAS AI, and documented the DoD FY 2011 – FY 2017 UAS NAS access needs, based on the six profiles identified in the AI plan and CONOPS.

#### UAS Executive Committee (ExCom)

The UAS ExCom is a joint committee composed of senior executives from four member organizations: DoD, the Federal Aviation Administration (FAA), the Department of Homeland Security (DHS), and NASA. The mission of the UAS ExCom is “to enable increased and ultimately routine access of Federal UAS engaged in public aircraft operations into the NAS to support operational, training, development and research requirements of the FAA, DoD, DHS and NASA.”<sup>1</sup> The initial focus of the UAS ExCom is on those efforts that will provide near-term access for UAS operated by Federal agencies.

The UAS ExCom senior executives are supported by a Senior Steering Group (SSG) that consists of officials who can commit their agency to action and Working Groups (WGs) that are organized and chartered as needed to address specific tasks as directed by the SSG. The Chairman of the DoD UAS TF SSG serves as the DoD representative to the UAS ExCom alongside the Executive Director of the Policy Board on Federal Aviation (PBFA), and the DoD UAS TF Chairman serves as the UAS ExCom SSG Chairman. The UAS TF cooperates with the PBFA UAS Subgroup to support and insert DoD issues to the ExCom. It is important to note that the multi-agency ExCom SSG is a management-oriented body subordinate to the ExCom. However, within the Department, the DoD UAS TF is a managing body and subordinate to the DoD UAS TF SSG.

In October 2010, the UAS NAS Access Plan, which was developed by a SSG WG, was approved by the UAS ExCom and forwarded to Congress in response to section 935(c) of the National Defense Authorization Act (NDAA) for FY 2010. The NAS Access Plan addressed the milestones, policy recommendations, flight standards, and operating procedures necessary to provide a path for UAS integration into the NAS.

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<sup>1</sup> UAS Executive Committee Charter, October 20, 2010

This year, the SSG and WGs have been focused on more challenging policy and procedure issues with the Certificate of Waiver or Authority (COA) process that can produce significant improvement in UAS NAS access, while reducing workloads for COA applications and safety reviews. The SSG identified to the ExCom six specific issues that would have the greatest impact. Of the six, three items are being actively worked: extend COA expiration dates from 12 to 24 months; develop process and procedures to allow multiple unmanned and manned operations in Class D airspace; and simplify the process and procedures for transition from Class D airspace to adjacent Restricted or Warning areas.

In conjunction with the UAS ExCom activity, the Department is updating the current DoD-FAA UAS Operations Memorandum of Agreement (MOA) to reflect the proposed policy and procedure changes enabling the Department to further develop and refine the policies and procedures prior to their full implementation. Additionally, the Department and the FAA signed a UAS Safety Mishap Data Sharing MOA to provide the FAA with data from the five previous years and annual mishap data updates, which will allow the FAA to have a better understanding of UAS safety to support increased NAS access.

#### DoD Airspace Integration Activity

The AI IPT, under the DoD UAS TF, completed the “DoD UAS Airspace Integration Plan,” which was signed by the Deputy Secretary of Defense in April 2011. The plan forms the basis for DoD input to the NAS access strategy. The UAS AI Plan presents incremental capability solutions that can be leveraged, improved, and utilized in both the continental United States and locations outside the continental United States. The plan provides guidance to the Military Departments and UAS AI stakeholders for developing their Future Years Defense Plans (FYDPs). It also updates four core precepts: (1) apply our world-leading aviation expertise to UAS; (2) conform where possible, create where needed; (3) leverage DoD authorities and equities; and (4) engage as one. Incremental capability described within this document includes Ground Based Sense and Avoid, Airborne Sense and Avoid, airworthiness certification, operational policies and procedures, and the development of technical standards.

#### **Program Interoperability and Efficiency**

The UAS TF is chartered with improving joint interoperability strategies and increasing the efficiency of UAS developments. The tasks to complete these activities are assigned to the Interoperability IPT (I-IPT). The IPT completes a variety of tasks and initiatives in this regard.

#### UAS Control Segment Open Architecture

The UAS Control Segment Working Group (UCS WG) is a combined DoD/Industry effort to develop a common, open and scalable architecture for command and control of Unmanned Aircraft Systems Group 2 through Group 5. In FY 2011, the UCS WG completed release of version 2.0 of the “core” architecture. The UCS-WG focused this past year on further standardizing the domain architecture model; defining use cases; developing common interfaces and data representations; preparing program migration plans in cooperation with the Military Departments; demonstrating cross-vendor capability integration and work packages; and holding

an industry day presentation for senior leadership to ensure industry and Military Department consistency. The UCS WG also held a UCS training track at the August 2011 Association for Unmanned Vehicle Systems International conference. Architecture documentation was delivered in addition to standard contracting language and an open business model to assist program contracting offices in UCS migration. The effort has grown to include more than 100 industry partners and participants. The UCS-WG Web site is <http://ucsarchitecture.org/page/home>.

### Unmanned Interoperability Initiative

The Department chartered the UAS TF Interoperability IPT to lead the UAS Interoperability Initiative (UI2) in 2011 and to move DoD UAS toward capabilities that are more interoperable across the Joint Force. UI2 is conducting a DoD UAS Interoperability Capabilities Based Assessment to identify gaps throughout the UAS community using the UI2 study profiles. Future plans based upon the gaps will assess what interoperability enhancements are required to improve UAS operations within the current and future range of military operations and will provide time-phased actions to influence the requirements and acquisition enterprise with the goal of improving end-to-end UAS interoperability. The study will prioritize joint interoperability deficiencies and result in recommended interoperability profiles to resolve those deficiencies.

## **SECTION 2 – PROGRESS COORDINATING ISSUES ACROSS UAS AND INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE (ISR) MANNED AND UNMANNED PROGRAMS**

Improvements in coordination across UAS issues abound. These improvements occurred in the both the Interoperability and Logistics and Sustainment IPTs and involve not only coordination across ISR programs but across the Military Departments' aviation programs as well.

### **Interoperability IPT**

#### Horizontal Integration Working Group (HIWG)

The Horizontal Integration Working Group (HIWG) was established to develop a Joint Integrated UAS Architecture and taxonomy to conduct a capability gap analysis. The scope of the HIWG Spiral One (FY 2010 – FY 2011) examined UAS interoperability amongst Global Hawk, Predator, Reaper, Shadow, Gray Eagle, and Fire Scout platforms conducting the ISR mission in U.S. Central Command (USCENTCOM). The Spiral 1 effort assessed the Tasking and Collection components of the tasking, collection, production, exploitation and dissemination process.

Using the DoD Architecture Framework (DoDAF), the HIWG captured the Family of System structure within each Military Department, assessed commonalities, and developed a generic System of Systems taxonomy for DoD UAS at the operational view (OV) level. A gap analysis report captured capability deficiencies derived from the architecture deliverables, Military Department reference documents, and after-action reports from operators and units participating in USCENTCOM operations. The Gap Analysis report included a future recommendations section and will be more thoroughly examined with further analysis through DoDAF Systems Views Architectures and further research and outreach with Military Department I-IPT and program office representatives. The effort will also support the previously mentioned UI2 study.

#### Unmanned Systems Interoperability Profile (USIP) Working Group

Industry standards help enable end-to-end operational effectiveness; however, commercial standards bodies must address a wide range of business communities with different requirements. Commercial standards bodies address this need by allowing some degree of tailoring of their standards for specific implementation communities, resulting in commercial entities or consortia frequently defining profiles of commercial standards. Due to this flexibility, compliance with a standard does not always guarantee interoperability. The DoD UAS community handles this flexibility by defining profiles of standards. These profiles seek to define proper subsets of standards that serve as points of interoperability. In some cases, additional elements may be added to a standard to meet unique DoD needs. The Army's Project Manager, Unmanned Aircraft Systems, demonstrated advancements in manned-unmanned teaming and interoperability profiles in the Manned Unmanned Systems Integration Capability (MUSIC) exercise held at Dugway Proving Grounds in September 2011. The success of this

exercise highlighted the value of establishing interoperability profiles and showcased advancements made in interoperability among manned and unmanned aviation assets. For example, multiple aircraft were controlled from the same ground station, and this was the first time a One System Remote Video Terminal controlled the sensor ball on an unmanned aircraft in real time. The Hunter was also able to send its video feed into the cockpit of the Kiowa Warrior.

In FY 2011, the USIP WG formalized the management structure and process for USIP nomination, and drafted USIP 2.0 for beyond line-of-sight (LOS) transmission of sensor data for battlespace awareness and Interoperability Profile (IP) 3.0 for managing configurations of satellite communication terminals. The USIP WG also began coordinating a Weapons USIP to generate a profile to enable efficient weapon integration across the Military Departments' UAS fleets and reduce integration risk with standardized interfaces that can be leveraged from manned aviation. The USIP WG is also evaluating a proposal for USIP 4.0 regarding Wide Area Surveillance (WAS) to identify and extract spotlights of information from a full field of a WAS sensor.

### **Logistics and Sustainment IPT**

The current generation of UAS programs was rapidly developed and fielded to meet urgent operational requirements and is relatively immature in terms of reliability and supportability. In the last year, a Logistics and Sustainment IPT was established to provide coordination of UAS sustainment related issues with the goal of developing affordable DoD-wide approaches to support the long-term sustainment of UAS capabilities to meet system readiness objectives. The IPT will assist programs and the Military Departments in the development of UAS sustainment strategies by providing a forum to discuss common issues and opportunities for synergies between programs. It will leverage experience from existing programs, organizations, disciplines, and processes to identify best practices and lessons learned. The IPT includes DoD stakeholders from the requirements, acquisition, and logistics communities.

#### UAS Depot Maintenance Rationalization

The inaugural effort of the logistics and sustainment IPT, the UAS Depot Maintenance Working Group, was established at the direction of the Secretary of Defense to develop cross-Military Department recommendations for the consolidation of UAS depot maintenance activities to minimize cost and eliminate unnecessary duplication. This multifunctional task group includes members from the Office of the Secretary of Defense, the Defense Agencies, the Joint Staff, and the Military Departments, and will be augmented with acquisition subject-matter experts as required. The group operates under the auspices of the UAS TF Senior Steering Group and Joint Logistics Board, and reports through the UAS TF and the Maintenance Executive Steering Committee. Specific recommendations may include major workload consolidation based on type maintenance such as airframe/composite, engine, sub-systems/payload (i.e., communication/navigation, ISR sensors, and targeting), and ground systems maintenance and repair.

## **Communication and Bandwidth**

### Spectrum for Small Unmanned Aircraft Systems (SUAS)

The Frequency and Bandwidth IPT completed technical interference analysis and developed regulatory guidance to help achieve more efficient and effective utilization of spectrum for UAS operations. With representatives from all the interested stake holders from within the Department, the group focused on improving the DoD development of new communication systems and related operational tactics, techniques, and procedures. This includes methods for improving spectrum access and mitigation of frequency interference during missions within the United States and abroad. Examples of recent accomplishments include: (1) supported the DoD response to the National Telecommunication and Information Administration on the potential SUAS mission impacts and costs for spectrum relocation from the 1755-1850 MHz band to support the President's wireless broadband initiative; (2) developed spectrum guidance for the AI IPT's UAS CONOPS document; (3) Established new spectrum sharing criteria for UAS Common Data Link (CDL) LOS usage within the United States; (4) developed new in-theater UAS CDL LOS spectrum policy to enhance acquisition options and increase operational flexibility; (5) Supported U.S. preparations for the International Telecommunication Union (ITU) World Radio Communication Conference (WRC 12) in Geneva, Switzerland, addressing UAS command and control, sense and avoid, and air traffic control spectrum and bandwidth needs for integrating into civilian airspace. The IPT is expected to take on other challenges as the mission, and subsequent operations, continue to change with Warfighter needs.

### Encryption Status

The UAS TF monitors encryption compliance for UAS. The encryption implementation timeline is maintained by the Spectrum and Communications Policy Directorate under the office of the DoD Chief Information Officer (CIO) and updated twice annually. The timeline has proven to be an effective means for tracking the Military Departments' progress toward implementing the defined interoperable methods of encryption for UAS. The timeline indicates when all fielded units in-theater and all units in the full inventory will be compliant with encryption requirements supporting Combatant Command operations.

## **Coordinating New Capabilities**

### Unmanned Systems Integrated Roadmap and Unmanned Integrated Repository

The Unmanned Systems Integrated Roadmap FY 2011 – FY 2036, released in October 2011, describes a vision for the continued efficient integration of unmanned systems into the DoD joint force structure over the next 25 years, and identifies steps to execute this integration affordably. The Roadmap identifies challenges to acquire improved unmanned systems capabilities and proposes the necessary technological improvements to achieve them. It is available online at the Unmanned Warfare Web site (<http://www.acq.osd.mil/sts/organization/uw.shtml>). Also, the Roadmap proposes a technology timeline to integrate enhanced capability. This year's roadmap makes two major changes: (1) the roadmap made a departure with past roadmaps by providing a functional vision; and (2) the catalog of current systems that had been

contained in previous roadmaps was removed and uploaded online to provide more current and relevant information.

One notable challenge highlighted in the Roadmap is Manned-Unmanned (MUM) Teaming. Due to today's diverse force mix of manned and unmanned systems and the need to achieve the full potential of unmanned systems, the DoD must continue to implement technologies and evolve tactics, techniques, and procedures that improve the teaming of unmanned systems with the manned force. Improving MUM teaming is both a technology challenge (such as interconnecting systems) and a policy challenge (such as establishing the rules of engagement for operating semi-autonomous unmanned with manned systems). Both of these are addressed in the Manned-Unmanned Teaming, Interoperability, and Autonomy sections of the Roadmap.

The Common Access Card-enabled Web site (<https://extranet.acq.osd.mil/uwir>) contains a storehouse of unmanned information and an inventory of unmanned systems in the Department.

#### Cargo WG

Several DoD organizations are addressing and/or evaluating the need for a Cargo UAS capability to support logistic requirements. The Cargo UAS Working Group was established to provide a structured forum for the coordination of these DoD Cargo UAS and logistics-related efforts and the development of Joint Cargo UAS requirements. The DoD Joint Cargo UAS Working Group (WG) coordinates ongoing and planned Cargo UAS activities with the ultimate goal of developing a common, DoD-wide approach toward the development and fielding of a Joint Cargo UAS capability. The Working Group authored a Joint Cargo UAS Concept of Operations that is being staffed through the Joint Staff.

#### Digitally Aided Close Air Support (DACAS)

The UAS TF partnered with AT&L Joint Interoperability office and the Military Departments to take advantage of manned aviation DACAS Engineering Change Proposals. The intended output is to identify Military Department UAS CAS/Time Sensitive Targeting/Strike processes and communications requirements, and to investigate an operational and technical way forward to align the communication architecture from the joint tactical air controller (JTAC) to manned/unmanned strike platforms. This will provide the JTAC flexibility and capability to achieve intended effects with the optimal capability available at the time of need.

## **SECTION 3 – ACTIONS TAKEN TO IMPLEMENT UAS TF RECOMMENDATIONS**

### **Airspace Integration**

Building on the UAS AI Plan, USJFCOM developed and published the Joint Concept of Operations for UAS Airspace Integration in May 2011. This document implements the approaches and methods identified in the UAS AI Plan and outlines the operational processes for normal and contingency operations in the NAS based on six UAS access profiles. Additionally, the Department is developing an Initial Capabilities Document (ICD) to capture the requirements for material solutions to allow UAS to sense and avoid other aircraft in the NAS. The ICD should be completed in FY 2012.

### **Interoperability**

The UCS WG is actively working with the Military Departments to establish migration plans to phase UCS into Group 2-5 programs of record. Version 2.1 of the architecture will be a buildable architecture that system implementers can use to ensure that their Ground Control Stations are functionally decomposed in a standard manner using common and open interfaces. As the architecture matures, efforts will transition from pure architecture development (2010 – 2012) to Program of Record migration, certification, testing, and information assurance.

### **UAS Depot Maintenance Rationalization**

The UAS Depot Maintenance Working Group (WG) was established to develop cross-Military Department recommendations for the consolidation of UAS depot maintenance activities to minimize cost and eliminate unnecessary duplication. The WG has identified specific commodities associated with UAS depot-level workloads, along with organic locations that perform similar work. Since the programs are still relatively early in the acquisition cycle and little actual maintenance data exists, the WG also developed a process to identify estimated workloads and the funding associated with those workloads.

The UAS Depot Maintenance WG will make consolidated workload depot-level, source-of-repair assignment recommendations based upon such criteria as location and amounts of similar work currently being performed, proximity to test ranges, and designations as Center of Industrial and Technical Excellence. The WG will then apply a jointly developed cost and savings methodology to estimate potential savings for each recommendation. The recommendations will be reported to the UAS TF and to the Joint Logistics Board, which is conducting a broader review of all Military Department Depot Maintenance, as required by Resource Management Decision 700.

## **Spectrum Decision Support**

### Frequency Spectrum

The Frequency and Bandwidth IPT is collaborating with the Military Departments to better understand the specific funding necessary to support courses of action, should current spectrum being used by the Military Departments be auctioned off in support of the Federal Communications Commission National Broadband Plan. A course-of-action chart was developed, showing possible high-dollar expenses to the Military Departments if they must migrate SUAS' and ground controllers/receivers' spectrum access out of their current band into the 2025 – 2110 MHz band. Expenses to the Military Departments should be offset by future spectrum auction charges to the commercial industry users.

In addition, the Frequency and Bandwidth IPT, in coordination with the USCENTCOM, the Under Secretary of Defense for Intelligence, the CDL Executive Agent, and the ISR Task Force, leads the development of extended CDL policy guidance to address bandwidth needs of advanced UAS platforms, which incorporate multiple and wider spectrum sensors.

### UAS Encryption

The UAS TF and Military Departments efforts made toward encrypting unmanned ISR data are best shown by two essential efforts completed this past year. The first is July 27, 2011, DoD Instruction (DoDI) 4660.04, "Encryption of Imagery Transmitted by Airborne Systems and Unmanned Aircraft Control Communications." This DoDI prescribes procedures for the encryption of unmanned aircraft control communications and wireless data transmissions of still and motion imagery from manned and unmanned airborne platforms, pods, and air and ground terminals that receive still and motion imagery from airborne systems. The second is the October 29, 2010, DoD CIO Memorandum, "Unmanned Aircraft System (UAS) Groups Two Through Five and Remote Video Terminals Encryption Implementation Timeline."

## **SUMMARY**

The UAS TF continues to lead initiatives to improve the efficient and effective acquisition of UAS to meet Warfighter capability requirements. The Military Departments continue to provide broad collaboration and support for these efforts. As the Department of Defense faces lean fiscal realities and engagement in overseas efforts draw down, many of the issues being addressed by the UAS TF will become increasingly relevant. The UAS TF will continue to provide a forum for influencing concepts, requirements, and design decisions to provide efficient and affordable combat capability.