

Technology Transition Plan for ONMS Microdrones MD4-1000 Unmanned Aircraft System

DATE: August 25, 2016
FROM: Brendan Bray, Program Manager, ONMS Facilities, Safety, Vessels and Aircraft
TO: Dr. Russell Callender, NOS Assistant Administrator

PURPOSE

To obtain NOS approval to transition the NOAA owned md4- 1000 Vertical Takeoff and Landing (VTOL) Unmanned Aircraft System (UAS) from Technology Readiness Level 8 (system testing and demonstration) to Technology Readiness Level 9 (actual mission operations).

THREE THINGS YOU MUST KNOW

- With support from the NOAA UAS Program Office, the md4-1000 system recently was upgraded and refurbished to current UAS standards, and training was provided to ONMS staff and partner personnel. In addition, a UAS support contractor was engaged to successfully vessel launch an md4-1000 and develop maritime operations procedures. These steps were integral to the decision by ONMS to take possession of the system from OAR and begin field operations in early FY2016.
- Since 2014, ONMS has evaluated multiple UAS platforms and payloads and concluded that the md4-1000 provides a cost effective, capable platform to meet a variety of ONMS and NOAA requirements. Over the past 6 months, the md4-1000 has been successfully field tested at several National Marine Sanctuaries for a variety of missions including living marine resource surveys and habitat mapping.
- ONMS has been working with the NOS Line Office Transition Manager, Dr. Steve Thur, to develop this transition plan in accordance with the DRAFT NOAA NAO on Research and Development Transitions.

BACKGROUND

- Since 2011, ONMS has provided limited funding and in-kind support, and worked in partnership with UASPO, OMAO AOC, and others on a number of successful unmanned system demonstration projects. During this time ONMS has evaluated multiple systems to potentially meet our airborne data collection requirements.
- In 2014, ONMS established the Collaborative Center for Unmanned Technologies (CCUT) at Channel Islands National Marine Sanctuary (CINMS) as an operational hub designed to engage in rigorous testing and evaluation of these technologies, including UAS, autonomous underwater vehicles (AUV), and unmanned surface vehicles (USV) in their application for research and management requirements, and develop the necessary procedures and protocols for successful operations which can be exported across NOAA and with our partners.

field tested at several National Marine Sanctuaries for a variety of missions including living marine resource surveys and habitat mapping. After recent system upgrades, field testing and an operator training class, the Office of National Marine Sanctuaries is ready to transition the system to full operational control under the oversight, guidance, and policies of OMAO AOC.

4. Current Capabilities and Functions

The md4-1000 will be operated by the ONMS CCUT in accordance with the manufacturer's recommendations and OMAO AOC policies and regulations as detailed in the CCUT md4-1000 Flight Operations Manual (attached).

Operation: A minimum of three crewmembers are required for each flight operation and will consist of a Pilot-in-Command (PIC), a System Operator (SO), and a Visual Observer (VO). Required qualifications for each position are detailed in the Flight Operations Manual and conform or exceed AOC Policy 220-1-5 – Unmanned Aircraft Systems Operations. A scientific or research Principal Investigator (PI) may be on scene to ensure collected data meets project requirements and assist in adapting mission parameters to real time conditions in the field. The PI will be responsible for data collection quality and all data storage, processing, and management. In certain circumstances when conditions allow, the PI may act as VO if properly qualified per AOC policy and the Flight Operations Manual. Please refer to the Flight Operations Manual for further details.

Maintenance: The UAS is nearly maintenance free, as it performs automatic pre-flight checks and the failure of any check will prevent take-off. Checks which cannot be done by the system will be performed by a qualified operator prior to each flight and following recovery. Operation crews will conduct only operator level maintenance, servicing, troubleshooting and repairs (e.g., replacing rotors and landing gear on the airframe and software updates and refreshing on the flight control systems). Crew members will ensure that a tool kit and spare parts are available for deployment to allow for remedy of minor issues in the field (troubleshooting and repairs will be made by the operator only where authorized by the manufacturer). All other maintenance, servicing, and repairs of the UAS will be accomplished by Original Equipment Manufacturer (OEM) or in accordance with OEM instructions or procedures. Please refer to the Flight Operations Manual for further details.

Repairs, Upgrades, Payloads and Configuration: The CCUT currently anticipates a minimum of two years of operation with the current system (barring any major incidents or accidents). After this initial period, ONMS CCUT will perform an analysis of alternatives of existing platforms to reevaluate md4-1000 utility (NLT January 2018).

The current payload onboard the md4-1000 is a Sony NEX-7 24MP mirrorless digital camera with HD video capability. This payload is optimal for the majority of NOAA and ONMS requirements. Other payloads for the md4-1000 are available including: laser scanner, multi-spectral and NIR camera, and a thermal camera. Optional payloads can be purchased or leased as required for specific project requirements. Specialized payloads outside the form, fit, and function of these sensors will require an airworthiness review from AOC as per AOC Policy 220-1-5 – Unmanned Aircraft Systems

1. Roles and Responsibilities for Transition

Program	Roles and Responsibilities	Point of Contact
ONMS	ONMS plans to fund, staff, operate and maintain the NOAA microdrones md4- 1000. ONMS CCUT will implement a concept of operations to ensure a safe, stable, and flexible model for providing md4-1000 support for the entire Sanctuary System, broader NOAA, and our research and management partners.	Chris Mobley, ONMS Chris.mobley@noaa.gov
UASPO	Serve as UAS technology/ research resource to assist with research, development, evaluation and transition of UAS-related technologies, evaluates UAS observing strategies to meet NOAA's requirements	Robbie Hood, UASPO Robbie.Hood@noaa.gov
OMAO AOC	Review and approve UAS operations to ensure safety and compliance with regulations and policy is maintained. Coordinate airspace approval.	CAPT Philip Hall, OMAO Philip.g.Hall@noaa.gov

2. Communications Plan –

The activities and plans outlined in this transition plan have been communicated to and reviewed by ONMS, OMAO and OAR managers and field practitioners. Line Office leadership can be briefed on additional details of this transition upon request.

3. Budget Overview

For several years ONMS has fostered the development of unmanned technologies, including UAS. ONMS provided limited funding and in-kind support, and worked in partnership with UASPO, AOC, and others on a number of successful demonstration projects.

Beginning in 2014, ONMS presented CCUT the challenge to conceive and develop partnerships, pursue grants, and implement a broad range of unmanned technology missions in addition to UAS operations. With operational control of the md4-1000, in FY2016 the ONMS will fund its operation and support a variety of Sanctuary missions.

At some future point, due to the dynamic UAS policy and regulatory environment, and the rapidly evolving technology and marketplace, more capable platforms and sensors will be developed and brought to market at a lower cost making the md4-1000 obsolete or cost prohibitive to continue operations. For any major repairs resulting from an incident or accident, an Analysis of Alternatives

- Reimbursable: The ONMS CCUT is willing to provide the md4-1000 platform and operators for NOAA programs and partner agencies for missions that don't directly conflict with other scheduled projects. For these, a daily rate will be charged for the platform, and any contract operator support and associated travel will be fully funded by the requesting entity. Due to low maintenance costs associated with routine operations, it is expected that the daily rate will be nominal, and will be based on data provided by industry operators and updated as additional operational costs are collected. The reimbursable charge will not include recapitalization costs. A cost estimate, modeled after the AOC spreadsheet, will be provided by CCUT for each requesting partner to ensure transparency and manage expectations.

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Approval Page

The below parties, by providing signatures, are satisfied with and approve of the transition plan outlined in this document, which may be reviewed and updated as needed.

 11/4/2016

John Armor
Director
National Ocean Service
Office of National Marine Sanctuaries

 9 Nov 2016

Robbie Hood
Director
Office of Oceanic and Atmospheric Research
Unmanned Aerial Systems Program Office

 11/04/16

Steven Thur, Ph.D.
Line Office Transition Manager
National Ocean Service

 11-8-16

Gary Matlock, Ph.D.
Line Office Transition Manager
Office of Oceanic and Atmospheric Research

 11/4/16

W. Russell Callender, Ph.D.
Assistant Administrator
National Ocean Service

 11-14-2016

Craig N. McLean
Assistant Administrator
Office of Oceanic and Atmospheric Research