PEO USC PMS406

Unmanned Maritime Autonomy Architecture (UMAA)

Board Charter

Charter Submission

Submitted By:________________________________ **Date:** 14NOV2018

Autonomy Standards Lead PMS406

Charter Approval

Approved:________________________________ **Date:** 11/15/18

Program Manager PMS406

REVISION HISTORY		
Revision	Description of Change	Effective Date
Version 1	Initial Release	9/25/17
Version 2	Alignment with Architecture Design Description	11/30/17

1.0 Purpose

The purpose of this charter is to establish the Program Executive Office Unmanned and Small Combatants (PEO USC) PMS406 Unmanned Maritime Autonomy Architecture Board (UMAAB) and to assign UMAAB responsibilities.

The UMAAB will develop and maintain an architecture standard that reduces autonomous vehicle system life-cycle costs by supporting technology insertion, refresh, and integration for critical maritime autonomy components. The autonomy architecture standard will be developed with the following requirements: support both Unmanned Surface Vehicles (USVs) and Unmanned Unwater Vehicles (UUVs), promote the development of modular and scalable software, minimize specific hardware dependencies, and support the use of both existing and new autonomy implementations.

2.0 Scope

This charter defines the authority, responsibilities, and composition of the UMAAB.

The UMAAB will define an autonomy architecture standard that supports both UUVs and USVs. The architecture standard will define interfaces for common functionality associated with the vehicle system's autonomy architecture, including Mission Management, Vehicle Operations, Payload Operations, Comms Operations, Situational Awareness as well as a variety of other Support Operations. The architecture standard will not address operator Command and Control (C2) system standards, but will identify external interfaces and reference existing standards for interaction with C2 systems. The architecture standard will support implementation of Information Assurance/ Anti-Tamper (IA/AT) approved solutions. The architecture standard will support extension to multi-vehicle operations, but multi-vehicle operations will not be the initial focus of the architecture.

The UMAAB architecture consumers will include acquisition program offices, lead system integrators (government and industry), technology developers, autonomy Test and Evaluation (T&E) engineers, and in service engineering support.

The UMAAB architecture standard will focus on connecting and coordinating the five following ***functional*** areas of autonomy defined in the subsections below.

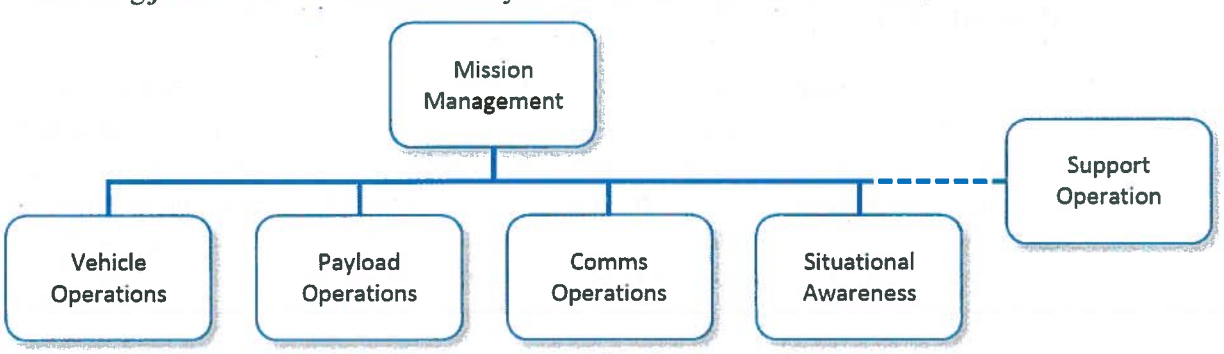

Figure 1: Autonomy Hierarchy

2.1 Mission Management

Mission Management provides the management and execution of the overall mission and governs the overall operation of the system. It provides the reasoning and planning that executes the mission on-board the vehicle. The Mission Management will contain elements that are specific to a particular program and mission. It will be responsible for decomposing the user-provided mission objectives into executable functions for the lower level Vehicle Operations and Payload Operations functions. Where applicable, Mission Management will delegate self-contained operations to lower level components such as letting Vehicle Operations run a loiter pattern. Similarly, lower level components will inform Mission Management of operational state and constraints so that these may be considered in concert for overall mission planning and execution.

2.2 Vehicle Operations

Vehicle Operations is broken out into two major capabilities: Maneuver Operations and Engineering Operations. The Maneuver Operations function manages and controls UMV movement including movements due to mission re-planning and regulating safe movements. Maneuvering must take into account vehicle constraints (e.g. maximum/minimum vehicle speed and accelerations, minimum turning radius, maximum depth, fuel load, etc.) and current status (position, speed, battery level, leak detections, etc.) as well as any configuration parameters (minimum distance to obstacle, minimum waypoint CPA, maximum cross track error, etc.) associated with a particular maneuver. The Engineering Operations function manages and controls subsystems and components associated with the vehicle hardware and software to include optimizing use of the vehicle resources. It is responsible for maintaining all of the HM&E systems on the vessel. Management of these subsystems and components would include managing their configuration and reconfiguration, maintaining and reporting health and status, and providing control.

2.3 Communications Operations

This function manages the bandwidth and packet routing to optimize the use of one or more communication links based on factors including priority, compression, network availability, quality of service, and EMCON (Emissions Control) state. It interfaces with all communication devices onboard the UMV to manage emissions during EMCON and other modes as directed by the Mission Management. Communications may be very intermittent due to physics (in the case of UUVs) or due to mission stealth requirements.

2.4 Payload Operations

This function manages and controls the payload suite which may consist of sensor(s) and/or effector(s) as well as payload-specific data processing on-board the unmanned system. Employment of the payloads will be based on mission objectives and current situational awareness. Management functions will employ the relevant payloads as the mission progresses, adapt payload configuration as the environment changes, and coordinate payload processing and dissemination of data products.

2.5 Situational Awareness

This function maintains the Situational Awareness which is often referred to as the world model for decision-making by Mission Management. This includes knowledge of allocated waterspace (constraints on operational area for blue de-confliction in all four dimensions), the environmental picture (bathymetry, nautical charts, and meteorological and ocean data), contact picture (red, blue, and gray contacts, targets, obstacles, objects of interest), and position, navigation, and timing (PNT). Situational awareness of the environment in proximity to an unmanned vehicle is critical for navigation and mission success. This includes both real-time perception of the environment through sensors and also use of a priori data (current and historical) either loaded pre-mission or updated from external sources in-stride. It encompasses using the processed payload and organic sensor outputs for higher levels of knowledge inferencing such as is done by target motion analysis and data fusion of multiple sensors.

2.6 Support Operations

This function provides support capabilities for services that are shared across all of the other functional areas within UMAA. This support includes standard interfaces for infrastructure services including startup and shutdown, logging of time-stamped event and attribute data, and the ability to support modes of operation (e.g. operational, training, debug and test).

3.0 Deliverables

The UMAAB will deliver a maritime autonomy architecture standard as defined by the Architecture Design Description (ADD), use cases for key stakeholders, and Interface Control Documents (ICDs) to support component interoperability. Additionally, the architecture standard will be supported by a reference implementation and a defined process for architecture sustainment and enhancements.

4.0 Authority

The authority to create this UMAAB is derived from PMS406 with Senior Leadership.

4.1 Scope of Authority

The authority of the UMAAB shall extend to policies that affect the decisions relating to PMS406 unmanned vehicle acquisition programs with a significant on-board autonomy capability. The goal will be to expand the use of the architecture standards to all UUVs and USVs across the Navy.

The scope of the UMAAB's authority shall extend to acquisition programs starting in FY20 and thereafter. These new start programs shall adhere to the Maritime Autonomy Architecture as defined by the UMAAB deliverables. Existing programs should produce a "road to adoption" by FY21.

5.0 Membership

UMAAB meetings shall be attended by the following members or their designated alternates:

- PMS406
- SSC Pacific
- NUWC Newport
- NSWC Panama City
- JHU/APL
- ARL/PSU
- ONR
- NAVSEA O5T
- NAVSEA O5D

Additionally, members may invite technical advisors and other individuals that may be impacted by changes under review at UMAAB meetings.

6.0 Roles & Responsibilities

The following responsibilities are assigned:

6.1 PMS406 Program Manager

The Program Manager shall:

- Provide final approval brought forward on any action
- Provide final approval on all deliverables
- Approve UMAAB membership and chair

6.1 UMAAB Chair

The UMAAB Chair shall:

- Facilitate meetings, organize group, provide final documentation review/assembly
- Prepare and publish the agenda for UMAAB meetings
- Prepare and distribute minutes from UMAAB meetings and maintain documentation of UMAAB actions
- Participate as a UMAAB member

6.2 UMAAB Member

Each member shall:

- Support development of the maritime autonomy architecture standard
- Provide recommendations to the UMAAB
- Call meetings of the UMAAB
- Recommend UMAAB membership (stakeholders) to represent NAVSEA/PEO USC concerns
- Provide input and recommendation to changes to overall architecture and business methodology

6.3 Other Participants

6.4.1 SME Consultants

The UMAAB will require technology consultants during development of the architecture on an as needed basis. For example cyber, communications, test coordination, etc.

6.4.2 Management Representative for Platform

The UMAAB will require the management representative for an affected system to ensure interests and business functions of his/her organization are brought forward and documented

6.4.3 Implementation Lead

An implementation team lead shall lead development of reference implementation, perform tool selection, and COTS evaluation.