



Australian Government

**Assessment Requirements for MARH035
Demonstrate fundamental knowledge of
Autonomous Maritime Systems (AMS)**

Release: 1

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Modification History

Release 1. This is the first release of this unit of competency in the MAR Maritime Training Package.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria on at least one occasion and include:

- describing how a basic control system works with respect to input/output and feedback/gain
- describing how operators can reduce drag to optimise the hydrodynamics of an Autonomous Maritime System (AMS)
- describing operational advantages and disadvantages of autonomous systems over crewed vessels
- describing the different types of communication systems available to AMS on the surface and underwater
- describing the importance of clear mission objectives with respect to AMS capabilities and sensor payload
- describing the operational advantages and disadvantages of autonomous systems over remotely operated systems
- describing why underwater AMS have limited communications relative to surface AMS
- identifying key changes to the environmental conditions for AMS operations that will impact buoyancy
- outlining an example of optimising mission design to meet capabilities of a key sensor
- outlining basic theory and basic principles of hydrostatics and hydrodynamics in relation to AMS
- outlining how a variety of navigation aids/techniques can be used to build an improved navigation solution
- outlining the basic steps taken to effectively ballast an underwater AMS in terms of optimal trim and buoyancy
- outlining the different levels of autonomy with respect to AMS.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- common digital AMS communication systems through air, including:
 - Inmarsat

- Iridium
- medium frequency (MF)/high frequency (HF), very high frequency (VHF), ultra high frequency (UHF) and radio
- common AMS communication systems through water, including:
 - acoustic modems (AM)
 - acoustic transponders
 - doppler velocity loggers (DVL)
- common AMS missions, including:
 - environmental disaster response
 - hydrography
 - imaging
 - seafloor mapping
 - search and rescue
- common AMS propulsion systems, including:
 - buoyancy engines
 - propellers (open and ducted)
 - sails
 - wave riders
- common AMS power systems, including:
 - battery-based
 - fuel-based
- components of AMS, including:
 - communication
 - logistics
 - mission objectives
 - navigation
 - operations
 - payloads/sensing
- historic development and current examples of AMS used for:
 - industry
 - defence
 - research
- hydrodynamics of AMS, including:
 - balance of forces (buoyancy, gravity, thrust and drag)
 - components of drag
 - control surfaces
 - static and dynamic stability in relation to buoyancy and trim
- launch and recovery (LAR) systems, including:
 - automated docking and recharging systems
 - boat-based

- land-based
- ship-based
- oceanography relating to AMS, including:
 - currents and tides
 - salinity, temperature and density with respect to buoyancy
 - turbidity
- physics of AMS communications through air and water
- principles of AMS autonomy, including:
 - basic control system
 - feedback
 - gain
 - input and output
- principles of AMS navigation, including:
 - dead-reckoning
 - DVL
 - global navigation satellite system (GNSS)
 - inertial navigation systems (INS)
 - inverted ultrashort baseline (iUSBL)
 - localisation
 - long baseline (LBL)
 - RTK-GPS
 - ultrashort baseline (USBL).

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Assessment must occur in workplace operational situations, where this is not appropriate, assessment must occur in simulated workplace operational situations that replicate workplace conditions.

Resources for assessment must include access to:

- applicable documentation such as workplace policies and procedures, regulations, codes of practice, operation manuals and operating procedures
- tools, equipment, machinery, materials and relevant personal protective equipment (PPE) currently used in industry.

Links

Companion Volume Implementation Guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=772efb7b-4cce-47fe-9bbd-ee3b1d1eb4c2>