



**Australian Government**

# **Assessment Requirements for MARH030**

## **Apply knowledge of core Autonomous Underwater Vehicles (AUV) operations**

**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 and include:

- unpacking an Autonomous Underwater Vehicles (AUV) from storage and preparing for transportation to operational area safely
- completing an AUV ‘walk-around’ identifying key components, including safe lifting points and ‘no-touch’ areas
- initialising an AUV on ‘shore’ power, determining current battery levels and safely completing charging operations
- conducting a ‘seal’ launch and recovery (LAR) from stationary and moving platform safely
- correcting AUV ballast for optimum pose and buoyancy
- surface piloting an AUV in a realistic maritime environment with obstacles that inhibit direct line of sight
- planning, executing and analysing two diagnostic AUV missions in Near Coastal (NC) waters under supervision, including a minimum of:
  - one mission specific to improved navigation using acoustic beacons
  - one mission specific to impact of re-configuring sensor payloads on hydrodynamic performance
  - completing an AUV logbook and post-mission analysis report which includes preliminary post-mission analysis and vehicle performance analysis for each mission
- planning, executing and analysing three operational AUV missions in NC waters under supervision, including a minimum of:
  - one mission specific to an acoustic bathymetry survey
  - one mission specific to an optical camera survey
  - one mission specific to a target acquisition mission
  - completing an AUV logbook and post-mission analysis report which includes preliminary post-mission analysis and vehicle performance analysis for each mission
- using a hydrophone and acoustic modem to track and locate an AUV which does not surface.

## 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:

- application of hydrostatics on AUV ballast, including:
  - AUV behaviour at shallow descent
  - environmental conditions relevant to ballasting
  - optimal AUV pose
  - safe ballasting of AUV
- commonly used mission planning software packages, including processes to:
  - source and load a navigational chart
  - set start and end mission points
  - set waypoints and transects
  - specify depth-control vs altitude-control
  - estimate total mission length and timing
- critical AUV performance parameters, including:
  - maximum dive angle, climb angle, speed and revolutions per minute (RPM)
  - minimum turn radius
- oceanographic and environmental factors for consideration in AUV mission planning, including:
  - obstacles
  - steep terrain
  - strong currents
  - submerged riverbeds
  - uncertain bathymetry
  - wind
- key elements of a pre-mission briefing, including:
  - objective
  - operational timing
  - payload
  - region of interest
  - risk assessment and mitigation
  - team roles
- key elements of a post-mission briefing, including:
  - lessons learnt
  - recap of objectives
  - sensor performance
  - summary of outcomes
  - vehicle performance
- key working components of an AUV, including:
  - ballasting system
  - communication and navigation systems

- data transfer system
- power, control and propulsion systems
- sensor payloads
- optimal mission planning for AUV missions in consideration of:
  - maximum dive and climb angles
  - minimum turning radius
  - surveying over submerged riverbeds, steep terrain, strong currents and maritime infrastructure
- proportional-integral-derivative (PID) control:
  - error
  - gain
  - input
  - Kp, Ki and Kd coefficients
  - output
- safe handling techniques for an AUV, including:
  - process for transferring data of mission and payload data
  - safe lifting points and sensitive ('no touch' areas)
  - safely transitioning an AUV from storage to operational area
- safe launch and recovery (LAR) techniques for AUV operations, including:
  - critical factors for safe LAR operations
  - davit AUV LAR from stationary vessel
  - deck-handling skills and equipment
  - 'seal launch' AUV LAR from stationary platform and moving vessel
- surface piloting techniques, including:
  - adjusting AUV speed and course to negotiate obstacles
- tracking technologies, including:
  - process for using a ranger modem to locate an acoustic beacon
  - strategies for focusing AUV search and rescue operations
  - techniques for using a hydrophone.

## 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, and where this is not appropriate,

assessment must occur in simulated workplace operational situations that replicate workplace conditions.

Simulated workplace may be used to augment real-world operational situations and does not replace real-world operations in prescribed water conditions.

Resources for assessment must include access to:

- applicable documentation such as workplace procedures, regulations, codes of practice, operation manuals, manufacturer instructions and procedures
- tools, equipment, machinery, materials and relevant personal protective equipment (PPE) currently used in industry, including:
  - AUV aligned with the required size and class that a seafarer will need to operate
  - AUV with minimum depth rating of 100 m and inertial navigation system (INS)
  - water conditions consistent with mission requirements as outlined in this unit of competency and must include access to water in excess of 100 m, high energy tidal waters and permanently stratified waters.

## Links

Companion Volume Implementation Guides are found in VETNet -

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