



Australian Government

NWPHYS005 Use alternate positioning systems to gather data

Release: 1

NWPHY005 Use alternate positioning systems to gather data

Modification History

Release 1. This is the first release of this unit of competency in the NWP National Water Training Package.

Application

This unit involves the skills and knowledge required to use alternate positioning systems to gather data.

It includes using the principles of cartography, applying acoustic positioning systems and understanding the difference between inertial motion units (IMU) and inertial navigation systems (INS).

This unit supports the attainment of skills and knowledge required for leaders with responsibility for performing hydrographic surveying and may lead to certification as a hydrographic surveyor.

Pre-requisite Unit

Not applicable.

Competency Field

Hydrographic Surveyor

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Use the principles of cartography from positioning systems to gather data

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

1.1 Analyse the data properties and distortions in projections used in map and chart positioning systems

- 1.2 Analyse the selection of projection types for data gathering and product generation
 - 1.3 Identify, interpret and synthesise historical surveys compared to legacy positioning systems
 - 1.4 Select and apply projection formulae to provide an appropriate graphic representation
 - 1.5 Identify and interpret relevant documentation and product including plans, reports, geographic information system (GIS) and charts, according to workplace procedures
- 2 **Apply acoustic positioning systems**
 - 2.1 Plan, monitor, review and assess the deployment, calibration, signal structure and performance of acoustic positioning devices
 - 2.2 Identify and analyse the principles of integrated underwater positioning systems
 - 2.3 Use underwater positioning systems in the use of remote survey platforms according to workplace procedures
 - 2.4 Apply appropriate statistical formulae to obtain accurately calculated values and represent graphically
- 3 **Use IMU and INS**
 - 3.1 Use inertial motion units and calculate measures to analyse positioning data
 - 3.2 Analyse the concepts of aided inertial navigation systems
 - 3.3 Describe and analyse the sources and magnitude of uncertainties associated with positioning methods and positioning systems

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Unit Mapping Information

This is a new unit. No equivalent unit.

Links

Companion Volume Implementation Guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=26336bc0-04e5-49d9-8c31-46c49b6a0037>

Assessment Requirements for NWPHY005 Use alternate positioning systems to gather data

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Performance Evidence

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

- analysing the sources and magnitude of uncertainties associated with positioning methods and positioning systems
- comparing historical surveys with modern surveys and report
- comparing IMU heading measurements with magnetic compasses and gyrocompasses
- calculating dynamic alignment of inertial navigational systems (INS) and analysing impacts
- analysing distortions in projection types
- monitoring, reviewing and assessing the performance of positioning systems in both relative and absolute terms using appropriate statistical tools analysing the following:
 - accuracy
 - precision
 - repeatability
- performing complex calculations to provide the final solution for a position
- selecting and applying projection formulae to provide an appropriate graphic representation
- selecting the appropriate projection type for product generation
- using acoustic positioning systems in offshore survey operations
- using inertial motion units (IMU) including north finding and heave estimation

Knowledge Evidence

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

- analytical projection formulae and planimetric coordinates
- baseline equipment used for calculating positions including:
 - depth sensors
 - integration with INS and velocity sensors
 - purpose of acoustics for positioning towed vehicles
 - remotely operated underwater vehicles (ROV) and autonomous underwater vehicles (AUV)

- transponders
- characteristics of legacy positioning systems
- complex mathematical calculations relevant to determining position using position system data including total propagated uncertainty in vertical and horizontal
- differences between IMU and INS
- geometrical properties of map projections including:
 - direction associated with different map projections
 - distortions in distance
- inertial measurement units (IMU) of a survey platform including:
 - heave estimation
 - north finding
 - pitch
 - roll
 - yaw
- INS including:
 - procedures for static and dynamic alignment
 - acoustic doppler current profiler (ADCP) and INS
 - Global Navigation Satellite System (GNSS) and INS
 - ultra short baseline (USBL), Depth and INS
- mobile surveys including:
 - GNSS equipment
 - IMU and INS
 - acoustic positioning
- operational procedures for correct installation of gyrocompasses and accelerometers
- positioning methods including:
 - Continuously Operating Reference Stations (CORS) networks
 - intersection
 - post processed GNSS
 - real time kinematic
 - resection
 - satellite corrections
 - static network
- principles of cartography
- principles of integrated underwater positioning systems
- relevant documentation and product including:
 - charts
 - GIS
 - plans
 - reports
- remote survey platforms including:

- autonomous underwater vehicles
- drones
- gliders
- unmanned surface vehicles
- set up procedures for calculating the following baselines:
 - long
 - short
 - ultra-short
- static surveys including:
 - acoustic positioning
 - GNSS observations
 - levelling instruments
 - total stations
- types of projections including:
 - conical
 - cylindrical
 - stereographic
 - Universal Transverse Mercator (UTM) system

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 must occur in suitable workplace operational situations. Where this is not appropriate, assessment must occur in suitable simulated workplace operational situations reflecting actual workplace conditions.

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.

Resources for assessment must include access to:

- relevant and appropriate materials, tools, facilities, equipment and personal protective equipment currently used in industry
- applicable relevant documentation including workplace procedures, industry standards, equipment specifications, regulations, codes of practice, and operation manuals.

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