

VisionMaster FT WECDIS

Warship Electronic Chart Display and Information System

FEATURES SPECIFICATION

OVERVIEW

Northrop Grumman Sperry Marine's (NGSM) Warship Electronic Chart Display and Information System (WECDIS), is designed to support the operational requirements of the modern navy. The system complies with the surface ship requirements of NATO Standardisation Agreement STANAG 4564 and is fully Type Approved to the ECDIS requirements of IEC 61174 and IEC62288.

The product has an extensive range of features and capabilities beyond the scope of a conventional ECDIS system to cover the four principal operational requirements of:

- Constabulary Operations
- Peacetime Passage
- War Fighting
- Safety

When used in the optional Total Watch configuration, the system is also a fully Type Approved Client Server Navigational Radar compliant to IEC 62388.

NGSM's WECDIS is designed to operate in both stand-alone configurations or as part of a multiple workstation configuration, networked as an Integrated Bridge System (IBS) or Tactical Bridge System (TBS).

Key Features

System Integration

Multi-node total watch system allows seamless sharing of data among all workstations, a common Human Machine Interface (HMI) between Radar and WECDIS nodes and common hardware for each node.

Developed in close collaboration with Royal Navy

Each feature developed under guidance from, and independently verified by the Royal Navy.

Radar Overlay

With use of Client Server Radar System, distributed radar video is available on all nodes for overlay on charts or in Chart Radar/Radar watch mode.

Multiple Chart Types

Capable of operating with a range of vector charts, including S-57, S-63, PRIMAR. VPF/DNC (MIL-STD-2407). ARCS Raster Scan Charts (RCDS).

Approvals & Compliance

STANAG 4564 compliant and Type Approved to IEC 61174 and IEC62288.

DISPLAY & PRESENTATION FEATURES

Watch Modes

The system can be supplied as WECDIS, WECDIS with Radar Overlay or as part of an integrated Total Watch System incorporating complete Radar capabilities.

WECDIS Watch Mode

The system can be toggled between WECDIS and a fully IMO compliant ECDIS mode with the additional WECDIS capabilities switched off.

WECDIS Watch Mode with Radar Overlay

On Radar enabled nodes, Radar video can be overlaid on the chart display in the WECDIS watch mode.

RADAR Watch Mode

VisionMaster FT Radar top unit is a fully IMO compliant Client Server Radar.

Chart Radar Watch Mode

The system is a fully IMO compliant Chart Radar with WECDIS chart data available.

Conning Information Watch Mode

Full screen display of configurable graphical widgets, typically including such displays as docking, steering/track control, engine monitoring and route monitoring.

Split Screen Capability

Permits two independent charts to be shown simultaneously, or may display two different chart scales for areas of interest.

Movable Picture in Picture

Innovative feature allows viewing in a secondary window of user defined size, a specified chart area and scale on WECDIS display.

Presentation Modes

North Up, Course Up and Stabilised & Unstabilised Head Up. Available in both Radar/Chart Radar and WECDIS watch modes.

Daylight & Night Presentation Modes

The system has five distinct presentation colour modes designed to give optimum usability from bright daylight through dusk to night operation. It facilitates a change colour mode on all nodes simultaneously. The relative brilliance of certain features sets (for example VRM/ERBL) can be individually pre-set and adjusted by the operator.

Electronic Cursor

Readout of range/bearing, reciprocal bearing, lat/long and time to go to cursor position.

iWindow CID (Future Feature for Wide Screen Format Displays)

iWindow* provides concise graphical and numerical conning information that can be viewed in Radar, Chart Radar and ECDIS watch modes.

Seven pre-configured operator selectable side panels featuring Docking, Sea, Environment and a Default are provided. At commissioning, individual panels can be configured to optimise a range of customised data views for specific task or operational requirements.

Data sources can include, but are not limited to:

- Heading
- Position
- Speed
- SOG & COG
- Pitch & roll
- ROT
- Rudder & thruster data
- Wind speed & direction (true & relative)
- Set & drift
- Distance & time to go to next waypoint
- Depth
- Final ETA
- Leg Bearing & next waypoint number

**When released, the iWindow feature will be available on systems with widescreen displays that have been correctly configured to widescreen format.*

Relative Motion Display

Allows the ship position to remain centrally displayed or at the user offset rather than moving across the display. It is available in both Radar/Chart Radar and WECDIS watch modes.

Grouped Objects

Grouped operator-defined drawing objects that can be linked to own platform, ARPA, AIS or Operator Contacts, or geographically fixed.

User Settings

The multiple individual user preferences for display, such as custom chart settings and safety depths, can be stored locally and transferred to other systems by use of USB or network. This function is useful at the change of watch keepers.

Display Chart Scales

Manual, automatic and compilation display scales ranging from 1:8,000,000 to 1:500.

Zooming

The custom zooming box allows for quick scale changes to an operator specified area.

Off-Centring

User selectable maximum view ahead, re-centring, panning, offsetting and go to lat/lon positioning.

Conning Information Display Watch Mode (Future Capability)

The system will allow the user to display interactive informative pop-up windows or full screen display of graphical widgets, typically including such displays as docking, steering/track control, engine monitoring and route monitoring.

Secondary Conning Information Display

This feature will enable a secondary monitor to be added to the ECDIS system; whilst the primary display shares the ECDIS information chart page, the secondary monitor enables simultaneously showing of a full conning information page.

CHART CAPABILITIES

Additional Military Layers-AML

Comprehensive support for (AML) products (v1.0) including Maritime Foundation & Facilities (MFF), Routes, Areas & Limits (RAL), Contour Line Bathymetry (CLB), Large Bottom Objects (LBO), Small Bottom Objects (SBO), Environment Seabed & Beach (ESB), Atmospheric & Meteorological Climatology (AMC) and Integrated Water Column (IWC, v2.1) and support for Admiralty Information Overlay (AIO).

Chart Layering/Quilting

When chart database layering is enabled, areas not covered by the selected chart will be filled in by non-selected chart databases in order of their user defined priority.

Support for alternative Coordinate Systems, Datums Grids

- The position can be referred to a number of geodetic datums as well as the standard WGS 84 or WGS 72
- In addition, position can be displayed in other co-ordinate systems such as Military Grid or GeoRef
- Positions can be easily converted between co-ordinate systems to aid Naval Gunfire Support

Mariner Objects Editor

Enables the display of both operator-defined chart data and the creation of user-defined layers.

Furthermore, it permits the user to manually create chart corrections or links to create their own Hydrographic Note from a template. The operator can define a set of parameters for each object including:

- Activity period – the time frame over which the object is active
- Restriction Type – e.g. area objects can be defined as stay-inside or stay-outside, with associated alarms raised as appropriate, to facilitate water space management
- Display properties – outline colour, fill colour etc.
- Associated files – .pdf, .txt, image files etc., can be imported and associated with objects, distributed to other nodes and displayed in future when querying object data

Universal Electronic Chart Manager

The system is designed to operate with a broad range of vector chart formats, including S-57, S-63, Primar and VPF/DNC: MIL STD-2407, as well as ARCS raster scan format (RCDS).

ROUTE PLANNING MONITORING & EXECUTION

Enhanced Naval Route Planning/Monitoring

Features include Advance & Transfer, course and speed adjustments for tide and current flow and Height of Tide at each waypoint (fully integrated with TotalTide). Advance & Transfer allows the user to apply ship specific turning data to determine the wheel over position for course alterations when planning pilotage.

Rich Route Display

Countdown and interim distance marks provide a graphical indication of 'distance to run' to a wheel-over or waypoint marked on each leg up to 1nm before the alteration point in 1 cable intervals.

Enhanced Set and Drift

Set and drift can be entered by the operator using four sub components: tidal stream, ocean currents, leeway (windage) and surface drift. The total set and drift will be computed as the vector sum of these four components. Input of tidal stream data can be achieved either manually or by selecting a TotalTide station. Data for both tidal stream and ocean currents can be entered using a manually created table of values.

Limiting Danger Lines & Clearing Bearings

Allows the construction and management of visual bearings around dangers at an appropriate distance, enabling visual monitoring and automation of alarms when approached.

Safe Depth Areas

To define manual depth contours on the chart display and enhance operational planning by denoting areas for safe submarine modes of dived operation. These include 'No Go,' 'Periscope Depth Only' and 'Periscope Depth and Duck.'

Rapid Position Fixing

Enhanced support for rapid fixing from lines of position: Bearing, Range, Sextant (both horizontal and vertical angles) and Contour Advancing.

Enhanced Lines of Position (LOPs)

Allows the ship's position to be determined using operator-defined position lines/fixes rather than radio navaid.

Own Ship Position Fixing

A single operator action to add an own ship current position fix using current location with associated time of validity.

VisionMaster FT Heading Control

The system interfaces to various autopilots to maintain a manual heading control ordered from the ECDIS and has an optional joystick heading control through which an autopilot can be controlled. The joystick is used to adjust heading and radius orders, enter simple temporary routes and provides a graphical representation of the orders.

Route Execution

Readouts are available of cross track distance, time to waypoint, true bearing of leg and distance to wheel over position. Additionally, cross track alarm and wheel over position notification alarm and leg change alarm are available with operator selectable limits.

Track Control

The NAVIPILOT 4000 autopilot system can be interfaced to the WECDIS enabling maintenance of own ships' heading along a planned route. Track control system is approved to IEC 62065 industry standard.

OWN SHIPS FEATURES

Own Ship Position

Provides maintenance of position plots for multiple sensor inputs even in the event of GPS denial. Alarms are raised for discrepancies between sensor positions with displays of Most Probable Position (MPP), Position Probability Area (PPA) and generation of an aggregated MPP calculated from the weighted inputs from the various nav aids installed on the vessel. Additional functionality includes independent maintenance of Dead Reckoning (DR), Estimated Position (EP) and ownship position (OP).

Consistent Common Reference Point (CCRP)

The system makes use of a CCRP reference for sensor position and navigation data.

Own Ship Presentation

Allows for realistic representation of the subject vessel at the appropriate scale and is displayed as a fully scaled profile on short ranges and a circle on long ranges. CCRP is marked on the profile.

Own Ship History Tracks

Plots of selected and non-selected position sensors on the chart simultaneously to show own ship past position and sensor error.

Heading Line & Beam Line

HL is shown from CCRP to edge of video display. It can also be shown as either stern line or beam line.

Own Ship Vector (course over ground)

Arrow indicating own ship vector with length corresponding to distance based upon current speed and current vector time. Vector tick marks can be shown at one minute intervals.

Predicted Vector

On screen planning and monitoring of constant radius turn. The feature is available in all motion modes and stabilisation modes.

Predicted Ship & Path

Predicted own ship profile and swept area displayed for planning and monitoring purposes based on constant radius turn.

Safety Checking

Own ship safety checking and alarming is available based on operator variable limits.

Custom Ship Box

The system allows the operator to create an area on the screen where the own ship will be maintained, changing the centring point on the ECDIS. This allows for the true motion of the own ship to be limited to this area if other areas of the chart display are being used for planning or monitoring.

USERS, USER GROUPS & SECURITY

User Management

The system runs an enhanced operator management system allowing user groups to have assigned associated permissions. User groups include Commanding Officer, Navigating Officer, Officer of the Watch, Navigators Yeoman, Seaman etc. Each group can have a defined set of features for which they have access – e.g. route editing, define geo reference points, edit target alarm settings.

iHelp

The system incorporates an extensive context-sensitive on-screen help facility. The system shows tool tip help facilities. Other than in Radar transmit mode (where the active screen always remains free of windowed dialogue) the extended help facility includes access to the operator manuals.

Security

VisionMaster FT WECDIS has safeguards built into the systems' architecture and configuration that reduces vulnerability to viruses. Mariners are restricted from accessing the underlying operating system, thus preventing users from browsing through directories or running/copying files from a USB device or CD/DVD. When the VisionMaster FT application reads data from these devices - such as loading a radar map or installing chart data – the specific feature checks the data for validity.

TACTICAL AND TARGET FEATURES

Operator Contacts

This feature enables the operator to display user defined contacts and allocate ID, Course Speed and warning ranges. Compilation of Surface Picture/General Ops Plot on the Navigation system is allowed together with the creation, management and integration of operator contacts (moving reference points) within the target management system. Furthest On Circle (FOC) facilitates the tracking of possible target position when the target's heading is unavailable. This is shown as a circle expanding at a defined rate and centred upon the last known position of the target.

Target Symbolology

WECDIS includes support for MIL-STD 2525B tactical symbolology including integration with ARPA and AIS target management.

Weapon ARC Overlays

This facility can be tailored to the user requirements and allows for the display of safety arcs for weapons ensuring practice firings clear of other contacts. Additionally, the splash points and ricochet dangers for medium/large calibre weapons can be displayed.

Tactical Grids

The construction and management of tactical and 4 Whiskey (4W) grids and associated sectors enable the user to construct and display Tactical and 4 Whiskey (4W) grids in a defined position, size and orientation.

Tracked Target Input

The system allows for multiple targets to be displayed on the ECDIS from various target sources.

AIS Targets

Allows for AIS targets to be displayed on the chart and for AIS alarms to be displayed and acknowledged from the ECDIS. AIS safety message processing and display is incorporated in this feature together with the display of ATONs, SAR craft and base stations.

Target Correlation

The system will correlate targets from local and external sources and correlate tracked targets with AIS targets.

NAVIGATION & SAFETY TOOLS

Station in Control

Nodes in the system can be grouped into a 'Station in Control' group but only one is considered 'Node in Control' at any given time and allowed to make changes to navigational plans, sensor selections, acknowledgement of alarms etc. Individual nodes can also be defined as 'Always in Control' or 'Never in Control.'

Enhanced Man Overboard (MOB)

When a man overboard event is initiated, the system will make use of tidal stream information from the closest tidal station to compute associated set and drift. Using this information, the current man overboard position is then updated. Manual values for set and drift can also be entered by the user.

Moving Havens

A moving haven is a designated body of water within which a submarine must remain at all times. It moves at a designated speed along the assigned nav track. Construction of a Moving Haven, to define the limit of a vessel's area of operation relative to the Position of Intended Movement (PIM), allows the display and management of Moving Havens for Submarine Waterspace Management and deconfliction.

Chart Depth Compare

Allows comparison of echo sounder depth values with chart data. An alarm will be raised if the difference between these exceeds an operator defined value.

Head and Stern Marks

Landmarks, chart features or identifiable locations can be used to help define a route leg by using part of the marks track. The heading for the leg will either be towards (Head Mark) or away from (Stern Mark) the object in use. Transit marks can also be defined that use a second mark to lock a bearing (i.e. the line along which two object align).

Astronomical Ephemeris (Sunrise/Sunset)

Allows the operator to select a location and view the calculated sunrise and sunset times for that location. Sunrise and sunset times can be extrapolated along the planned route and indicate the points along the route at which these will occur.

Navigation Marks

Up to 100 adjustable position marks for highlighting points of interest can be added to chart. These can be either carried with own ship or dropped at a fixed position.

Variable Range Markers (VRM)

Two provided variable from 0.0nm to 96nm displayed on screen. Accuracy better than 1% of range scale in use or 25m, whichever is greater. Both may be off-centred and dropped or carried in stabilized modes.

Electronic Bearing Line (EBL)

Two provided, variable in 0.1° increments, accuracy $\pm 1^\circ$. Both may be off-centred, dropped or carried.

Electronic Range & Bearing Line (ERBL)

VRM function merged with the EBL function.

Routes

Can be created, edited, safety checked and monitored. This information can be shared between other VisionMaster FT systems on same network or exported to other VisionMaster FT systems via a USB memory device.

The following types of routes plan are available:

- Temporary plan - these can be created and executed at any time; temporary plans are not saved to the database
- External Route Plans
- Internal Route Plans

Range Rings

0.025nm to 16nm with accuracy of 1% or 25m whichever greater.

Lat Long Grid

In all motion modes and stabilisation modes.

Parallel Index Lines

Index lines can be created, displayed and stored in sets of up to five lines. The lines are fully adjustable in range and bearing and can be stored internally. The lines can be transferred for use on other VMFT systems.

Parallel Cursor

Two types provided - full cursor and half cursor. Both types are centred on CCRP and are available on all presentation modes, all motion modes and on all range scales.

Units

The unit used for display of long distances/ranges is fixed in normal operation (and can be modified by a service engineer) to nautical miles while other units such as depth, short distance and temperature are available to be changed by the operator.

Search and Rescue Patterns

The search and rescue (SAR) patterns can be used to facilitate search and rescue exercises at sea. The operator is able to select one of eight recognised patterns as provided by International Authorities. Once the selected SAR pattern is displayed on screen the operator has the ability to customise the pattern as required.

SENSORS & SENSOR FEATURES

Sensors

- Sensors must be compatible with IEC 61162-1 & IEC 61162-2
- Serial Inputs RS232 RS422
- Network multicast sensor acquisition
- Accepts the majority of gyro and serial compass inputs
- An alternative “special compass” option is available for 1:1, 36:1, 90:1, 180:1 compasses
- Serial Compass inputs must be better than 50Hz message rate for radar overlay
- Pulse Log Input

Sensor Errors

Sensor errors allow the position of the vessel to be shown with a level of uncertainty based on the errors associated with the source data being used to provide the given position. The simple linear errors provided by the source sensors such as speed through water and ships heading may be used to calculate complex area errors as the vessel moves.

Enhanced Sensor Failover

A sensor selection hierarchy can be defined for each navigation aid by the operator that lists the most-preferred to least-preferred source. Upon failure of any selected source the next logical source will then be used.

Sensor Logging

The system has the ability to log all sensor inputs at a specified rate (up to 1 Hz) for a specified period of time (up to 120 days).

Most Probable Position (MPP)

Most Probable Position (MPP) is the name given to a position calculated on the basis of probability from multiple sensors supplying position data. The MPP gives an indication of the probable position where there are discrepancies in the sensors.

Diagnostics

The system has extensive built in diagnostics to monitor and check the systems across any node in the system. Examples are critical voltages and currents in the transceiver. The system continuously monitors itself for correct system status and will raise an appropriate alarm should a fault condition be detected.

Radar Overlay

Optional radar overlay provides a display of video, target information & target tracking capability, as well as video processing control and adjustment. Radar overlay displays radar video on electronic charts.

NAVTEX Messages

NAVTEX messages can be received and displayed within a popup window while in the ECDIS watch mode. NAVTEX caution messages can also be viewed when the system is in CAM watch mode display.

Weather Fax Web Server Interface

The operator has the capability to view weather fax information on the VisionMaster FT display via an HTML web browser interface. With a click of a button, a new window is opened which automatically connects to the service provider's server on the navigation network. This facility can be accessed during transmission and while in standby.

OTHER FEATURES

Deck Log

The deck log feature allows the operator to create a log entry with the following data:

- Real-time sensor readings including: Position, heading, course over ground, depth, speed over ground and speed through water
- Route information of the currently monitored route including: Route name, ETA, TTG and DTG
- User entered notes to associate with the log

Time Synchronization

The system includes the capability for the time on all nodes to be synchronized to an external time source such as a GPS.

Screen Recording and Playback

The screen recording and playback facility enables the operator to record screen captures in intervals of up to 12 hours. Once recording is complete, the operator is able to playback through the Playback watch mode within VisionMaster FT. Controls such as pause, fast forward and rewind are provided.

iVideo (Future Purchasable Option)

iVideo feature allows the operator to view CCTV or other video feeds in 4 mpeg format on the display. Multiple video feeds can be streamed over the network using industry standard protocols and the operator can select which of these feeds is displayed. Multiple feeds can be displayed simultaneously.*

* Bandwidth and protocol constraints apply.

Data Logging

Provides the ability to record and playback voyage information, such as selected sensors, alarms and charts displayed.

Commissioning

All system parameters set up via full screen display menu. Extensive features are available to the commissioning engineer.

Static Site Features. (Future optional capability)

Static Site is an option that will allow for a stationary installation. This is intended for both small single node installations (e.g. oil rig) and larger multi-node VTS-style installations.

Central Alarm Management (CAM) (Future optional capability)

Central Alarm Management (CAM) will enable VisionMaster FT to serve as a central point for alarm announcements coming from external equipment on the ship.

The CAM uses the VMFT alarm output to forward unacknowledged announcements to all nodes on the system and to other locations of the ship as necessary.

Only nodes configured as a CAM, Total Watch, ECDIS, or ECDIS with Radar Overlay product type support the CAM watch mode.

The CAM watch mode provides a full screen user interface where CAM announcements are displayed and can be acknowledged by the operator.

The system can be interfaced to the Sperry central alarm management system using industry standard IEC 61162-1 messages, as well as discrete signals.

APPROVALS & COMPLIANCE

STANAG

NGSM's VisionMaster FT WECDIS is compliant with STANAG 4564 Edition 2 with the exception of certain aspects of sub surface dived navigation, polar navigation and certain symbology. Full details available on request.

IMO Type Approval Certification

NGSM's VisionMaster FT WECDIS is fully certified to:

- IEC 62288, Presentation of Navigation-Related Information on Shipborne Navigation Displays
- IEC 61174, Electronic Chart Display and Information System (ECDIS)
- IEC 62388, Shipborne Radar (Total Watch Version in Radar or Chart Radar Watch Mode)



Queen Elizabeth Class (QEC) Aircraft Carrier. Photo courtesy of Aircraft Carrier Alliance

Export Approval

The Northrop Grumman Sperry Marine BV, Warship Electronic Chart Display and Information System (WECDIS) is an export controlled product and thereby subject to the International Traffic in Arms Regulations (ITAR) of the United States of America as well as it being subject to the Export Control Act of the United Kingdom.

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