



Excellence in
Naval Engineering

Military and naval guidance,
navigation, data and aviation tools.

CERTAINTY AT SEA



LOG SYSTEMS



METEOROLOGICAL



REPEATERS AND DISPLAYS



Aeronautical & General
Instruments Limited

Pride and passion since 1915

AGI is an established British company, manufacturing instruments and systems for the defence and civil markets in over 50 countries worldwide.

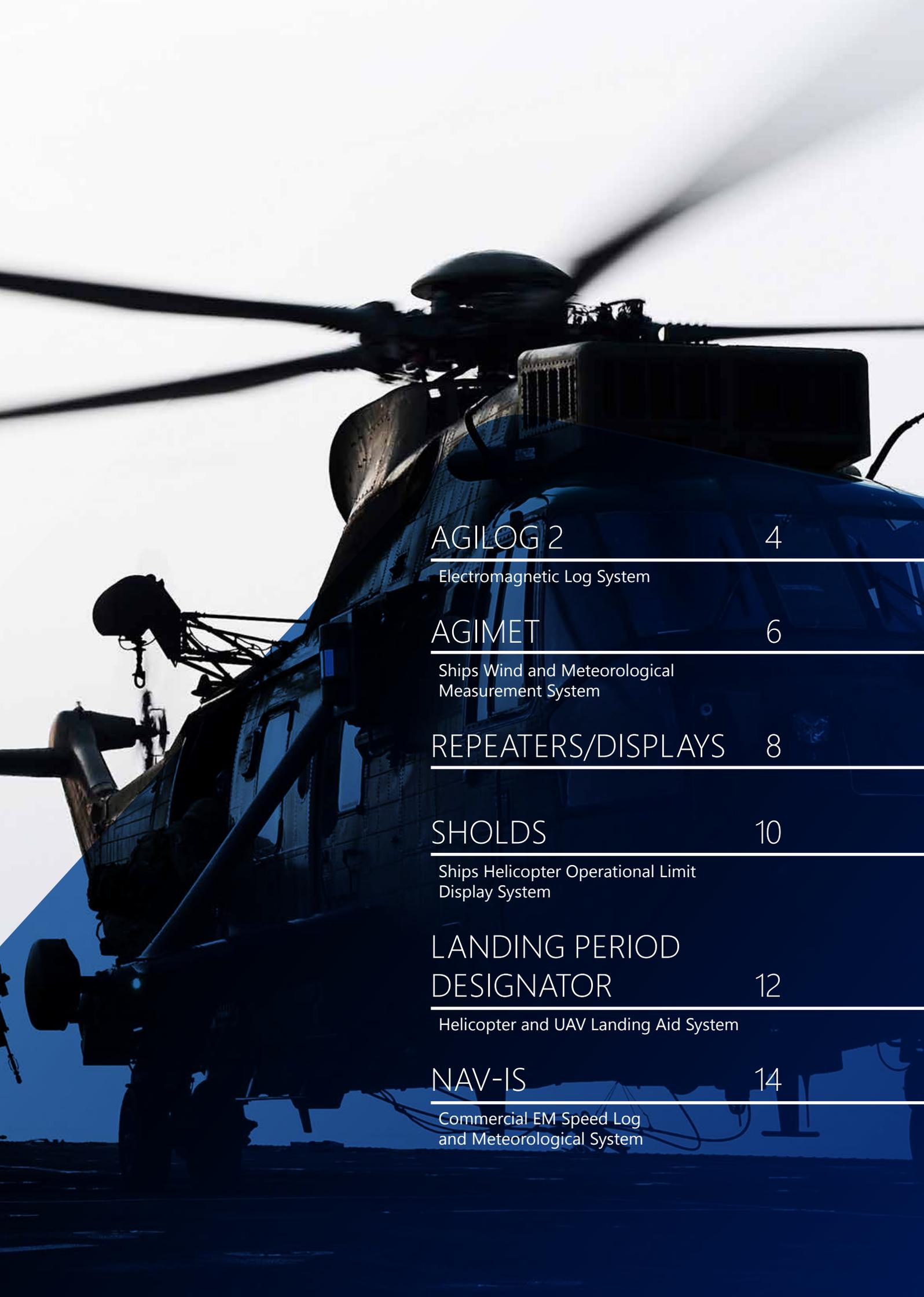
Since its foundation in 1915, AGI has built up a reputation for high quality, well-engineered products, crafting innovative products for technically demanding problems and environments, resulting in highly reliable, low cost of ownership solutions to ISO 9001 standards.

Strong in-house engineering and manufacturing capabilities at our Dorset facility and teams of highly qualified design engineers, technicians and draughtsmen create high technology products and systems to satisfy customer requirements.

AGI products are in use in over 50 countries, often destined for continuous use in harsh environments, where reliable operation is essential. Products include Aircraft Visual Landing Aids, Meteorological Systems, Dynamic LPD and SHOLD Systems, Ship's Speed Logs and Display Solutions.

In a world where cradle-to-grave support and turnkey system solutions are becoming the norm, AGI's team of Customer Support Engineers provides the support services necessary throughout the life of the equipment, such as installation, commissioning, training and repair services.





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Commercial EM Speed Log
and Meteorological System

AGILOG 2

Electromagnetic Log System

TRUSTED BY THE ROYAL NAVY AND NAVIES WORLDWIDE

Developed for use in surface warships and submarines, AGILOG 2 sets the standard for accurate and reliable measurement of ship's speed through the water - an essential element in navigation and weapons system integration.

AGILOG 2 IS FULLY TYPE APPROVED, WITH OVER 530 SYSTEMS OPERATIONAL IN 41 NAVIES WORLDWIDE.



GPS

assisted calibration

AT SEA

sensor replacement

DUAL

axis capabilities

LOW

magnetic signature

CONFIGURATION

Typically the AGILOG 2 system comprises:

- Speed and Distance Transmitter Unit (SDTU)
- Underwater Sensor (or Sensors)
- Multi-Function Displays
- Optional Data Distribution Unit (for system expansion)

COMPLIANCE

- Wheelmarked to meet Marine Directive 2014/90/EU
- EMC - Mil Std 461F
- Shock - Mil Std 901 Grade A
- Vibration - EN60945
- Environmental - EN60945
- Power Supply - Mil Std 1399 and EN60945

PRINCIPLE OF OPERATION

AGILOG 2 is founded on the proven electromagnetic principle that a voltage is induced in a conductor by a moving magnetic field.

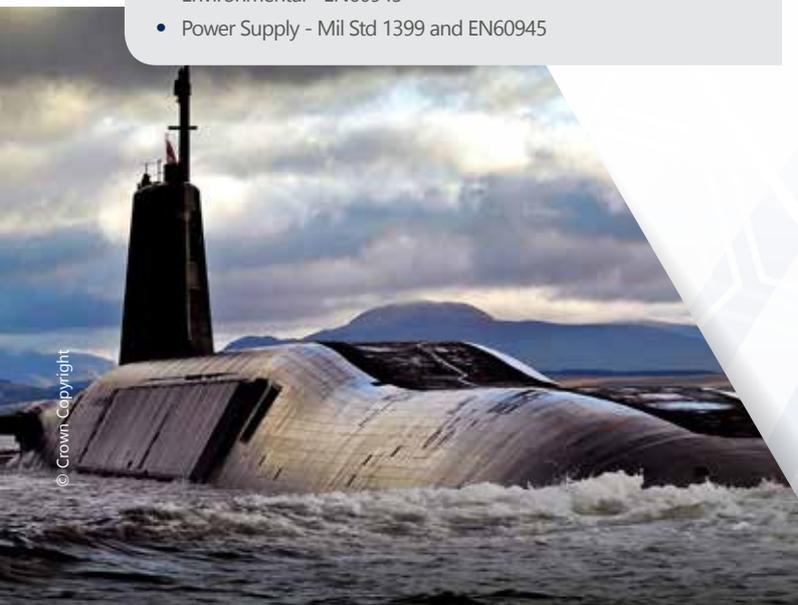
A sensor attached to the hull of the vessel produces an electromagnetic field – by using the water as the conductor an output is generated as the vessel progresses, relative to the ship's speed – a passive operation particularly suitable for use on submarines and warships.

CALIBRATION

The accuracy of any log system depends largely upon the method of calibration.

The underwater sensor signal output is related to the water flow characteristics of the ship's hull which is rarely linear over the speed range of the vessel. In the AGILOG 2 this non-linearity is corrected by entering ship's true speed data against measured log speed data from calibration speed trials. This data is then entered into calibration tables via a simple integrated GUI.

Speed trials are traditionally carried out using land based measured mile transits to determine a vessel's true speed. Using the AGILOG 2 "GPS Assisted Calibration" function, the measured speed can be simultaneously evaluated against GPS ground speed data to determine the necessary calibration values. This method does not depend on accurate distance and time measurements and is therefore easier to accomplish and costly calibration trials are minimised.



SPEED AND DISTANCE TRANSMITTER UNIT (SDTU)

The AGILOG 2 Speed and Distance Transmitter Unit (SDTU) provides a wide range of system interfaces and expansion options.

The basic 2x NMEA outputs can be expanded to include 12 independent channels of NMEA serial data and additional analogue and pulse outputs.

530+
UNITS IN SERVICE
WORLDWIDE
BY 41 NAVIES



SPEED AND DISTANCE/
NAVIGATIONAL DATA
REPEATERS **PG 8**

KEY FEATURES

- GPS Assisted Calibration Facility
- Dual calibration curves for each sensor can be calibrated for two alternative operation conditions. (e.g. changes in water flow caused by a retractable sonar dome, or a submarine surface/dived)
- Dual axis options for forward and athwartships speed/distance.
- Ethernet interfacing built in.
- Dual sensor option for high integrity naval systems.
- Exceeds international specifications EN60945, EN61023, IMO A.824(19) (Certificates pending at time of print).
- Low magnetic signature – contact AGI for specification data.
- Self-test capability AGILOG 2 contains full BITE (built in test equipment) facilities.
- Simulation mode enabling operation in the absence of a signal from the underwater sensor.
- Trip meter for daily/hourly distance.
- User friendly interface.
- Sensor replacement without dry docking.
- Extended warranty options.

UNDERWATER SENSORS



FIXED PROBE

Offering extreme accuracy with protrusion beyond the ship's boundary layer. Also available as low magnetic version for low signature ships.



DUAL AXIS FIXED OR INBOARD RETRACTABLE FLUSH SENSOR

With the advantage of the absence of underwater protrusion for shallow water operations and avoidance of floating debris or ice.

Available in a surface mounted or inboard retractable form.



HIGH SPEED PROBE

For speeds of up to 60 knots

AGIMET

Ships Wind and Meteorological Measurement System

THE COMPLETE ADVANCED METEOROLOGICAL SYSTEM

Designed and tested to full military standards specifically for use in surface warships and naval auxiliaries, AGIMET employs the latest proven and in-service solid state sensor technology to provide accurate measurement of wind-speed and direction, temperature, pressure, humidity and other local environment parameters.

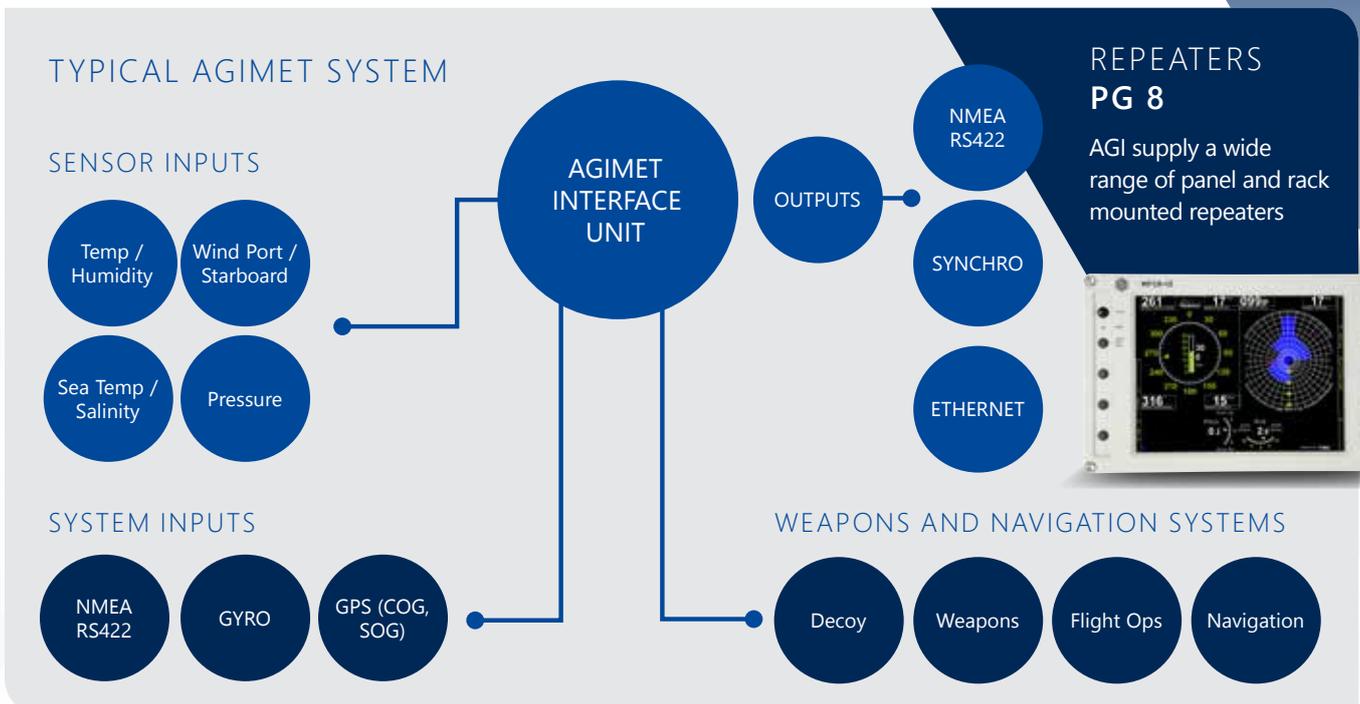
MORE THAN 240 SYSTEMS IN OPERATION WITH 13 NAVIES WORLDWIDE.



A typical ships system will comprise two solid state wind sensors - mounted port and starboard together with additional meteorological sensor options, each sending data via an interface unit to solid state displays and other systems. Information is transmitted digitally, simplifying data handling and alleviating the need for dedicated re-transmission. Wind outputs from the windward sensor are monitored continually by the AGIMET Interface Unit

By accepting inputs from the ships navigation system (ie log and gyro compass), both true and relative wind speed and direction maybe displayed and given as an output.

To meet individual requirements, various sensors are available, ranging from ultrasonic anemometers, to ambient air humidity, temperature and barometric pressure, sea water temperature and salinity.



AGIMET INTERFACE UNIT

The Meteorological Interface Unit (MIU) can be operated with two wind sensors, additional meteorological sensors are optional. The MIU provides power to all sensors and offers filtering/damping facilities as well as correction facilities for each individual wind sensor to compensate for structural interference.

FEATURES

- Port / Stbd wind sensor auto-changeover
- True and relative wind data
- Barometric Air Pressure, Temperature and Humidity, Sea Water Temperature outputs
- Data Correction
- Built in test

240+
UNITS IN SERVICE
WORLDWIDE
BY 13 NAVIES

SENSOR INPUTS

The MIU collects data from the wind sensors, meteorological sensors and other ship's navigation systems and distributes data to repeaters and other ship systems.

TEMPERATURE AND HUMIDITY SENSOR



ULTRASONIC ANEMOMETER - WIND SPEED AND DIRECTION SENSOR



PRESSURE SENSOR

SEA WATER TEMPERATURE SENSOR



GRAPHIC USER INTERFACE

Customer specific configurations may be set up using this optional GUI programme using a PC running Windows. This same user interface also enables other operational parameters to be selected/varied.



REPEATERS AND DISPLAYS

The AGI solid state repeater range has been developed to provide a remote display of a wide range of information parameters.

Initially designed and manufactured to Military Standards for use in the defence environment, COTS versions are also available for civil applications and have a proven ability to withstand the rigours of in-service life, being in widespread use worldwide.

Available Input options include digital NMEA, RS422 and in some instances Synchro (400 or 60Hz) to suit a majority of applications. Where customisation to suit a particular interface is required AGI have a range of interface protocols readily available or can offer a complete design service.



TAPE HEADING REPEATER

The AGI Tape Heading Repeater is based on the moving tape principle. A large format array of light emitting diodes (LEDs) is used to simulate a moving compass card image past a fixed pointer. This type of display, with over 1500 pixels, provides excellent rate of change data to the user in a clear, unambiguous format. The display also includes a separate digital representation of the data, using 4 seven-segment characters. A feature of the unit is the inclusion of audible rate of turn.

A master/slave repeater can be used to minimise system cost on platforms which have synchro heading data. Both master and slave serial repeaters have a dual input capability for interfacing to one or two separate sources of gyro data. The user controls allow the display of either gyro 1 or gyro 2 data.



LCD MONOCHROME REPEATER

High reliability transfective liquid crystal displays with fully dimmable backlighting ensuring maximum readability in a wide range of ambient conditions, including bright sunlight.

All LCD repeater variants manufactured by AGI use common hardware. The displays are configured to suit the particular application by adjustment of firmware and the addition of an alternative printed scale.

The data may be displayed in either digital or both analogue and digital formats; analogue providing an 'at a glance' trend information, with the digital providing precise information.

The fully solid state design ensures the units are free from the inherent disadvantages of electromechanical devices, making them particularly suitable where ruggedness and reliability are a major criteria.

2000+

UNITS IN SERVICE
WORLDWIDE
BY 15 NAVIES



MULTIFUNCTION COLOUR REPEATERS (MFCR)

The Multifunction Colour Repeater (MFCR) provides a high resolution colour display suitable for complex graphics data, with designs available for both military and civil applications.

The MFCR is available in three sizes, 8.4, 10.4 and 15 inch industry standards.

The MFCR is configurable during installation to operate with either a fixed display (single page) of data or a multiple page display where a number of preset 'pages' of data are available for selection.

This flexibility allows a common repeater to fulfil different roles at different positions on board ship or other vehicles. The number of repeaters required is therefore greatly decreased also reducing the spares requirements. A single MFCR is able to replace up to 20 traditional dedicated repeaters, leading to major cost savings.

Whilst a range of standard pages are available from AGI, a customisation service is also available.

SUBMARINE BRIDGE REPEATER

The Submarine Bridge Repeater is capable of withstanding extreme pressures and can therefore be left permanently in the submarine conning tower. The repeater is able to display up to three parameters in digital format as well as one in analogue.

The unit consists of a modified AGI LCD Repeater mounted in a robust stainless steel housing. The front window is made from toughened soda lime glass.

The red backlight is provided for night-time viewing and can be dimmed using the operator's control knob on the side of the housing.

The repeater is a solid-state digital design, with no significant maintenance or calibration required. The Repeater has no at-sea serviceable components, and should be considered as a Line Replaceable Unit (LRU). No special tools or test equipment are required.

The LCD repeater within the enclosure has been tested to military standards for climatic, shock, vibration and EMC conditions. In addition the complete Repeater is pressure tested during production to 45 Bar.

SHOLDS

Ships Helicopter Operational Limit Display System

STAND-ALONE OR AS
AN EXTENSION OF AGI'S
AGIMET AND MORIAH NAVAL
METEOROLOGICAL SYSTEMS

AUTOMATED PLOTTING FOR REDUCED WORKLOAD

SHOLDS provides real-time, dynamic display of the relative wind measured by the ship's on-board meteorological system. This removes the need of manually plotting relative wind information onto a printed paper SHOL envelope thus minimising ship's crew's workload and keeping manning levels to a minimum.



PRINCIPLE OF OPERATION

SHOLDS provides the crew with a real-time dynamic display of the relative wind measured by the ship's on-board meteorological system, superimposed onto a digitised SHOL envelope. A green 'GO' status spot is displayed in the envelope if the conditions are within the pre-defined limits for wind, pitch and roll or a red 'NO-GO' status spot is displayed if the wind and/or ship motion is outside the specified limits.

SHOLDS also incorporates an FC mode, known as Fox Corpen or Flying Course, whereby if wind parameters are outside the specified limits, the system will calculate and display the course and speed that the vessel needs to head in order to achieve the required wind parameters for a safe operation.

Multiple SHOL envelopes can be stored on the displays with the desired SHOL envelope selected via the soft keys on the front of the unit, typically using the following variables: helicopter type, helicopter weight (load), deck spot, day/night operation and approach/take-off direction.

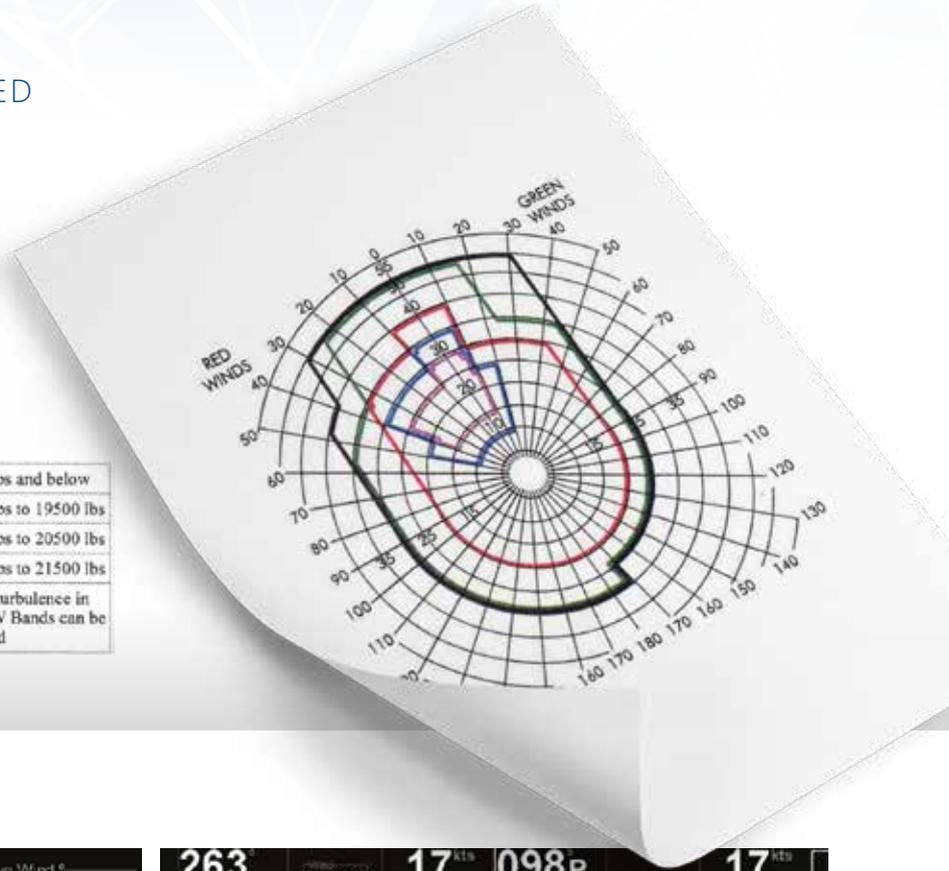
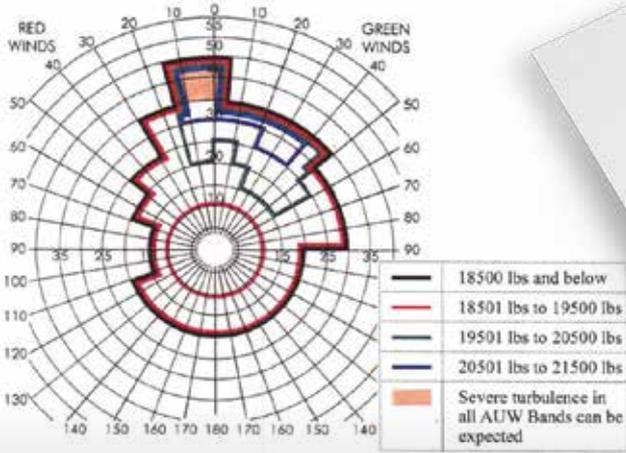
SHOLDS can be operated either as an extension of an existing on-board AGIMET or MORIAH system or independently in its own right where the inputs for the relative wind speed and direction, as well as the vessels pitch and roll are input into the display, typically using the NMEA data protocol.

KEY FEATURES

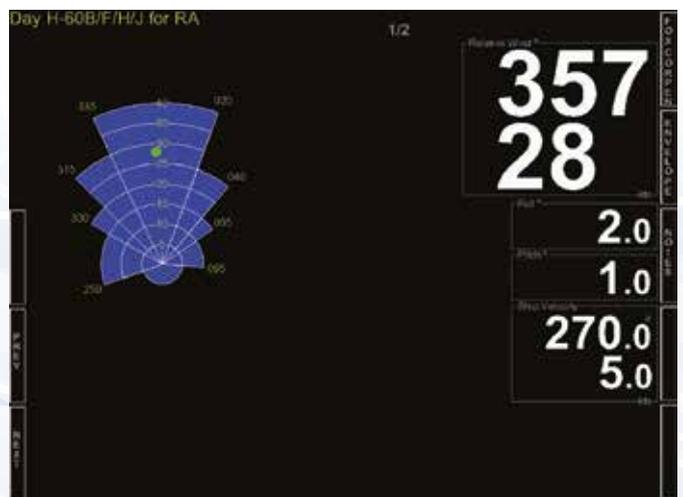
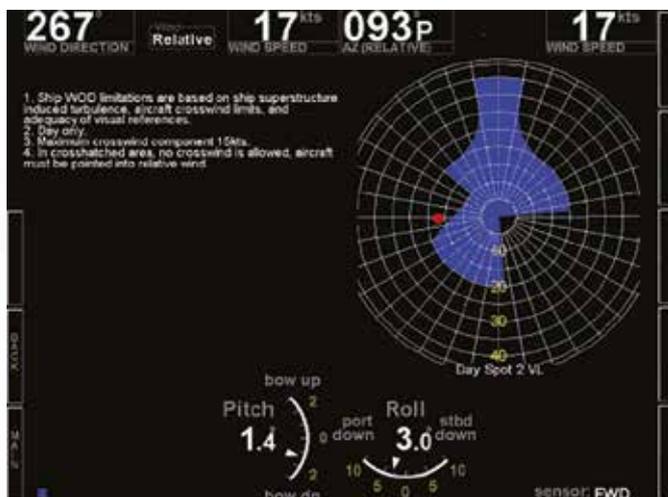
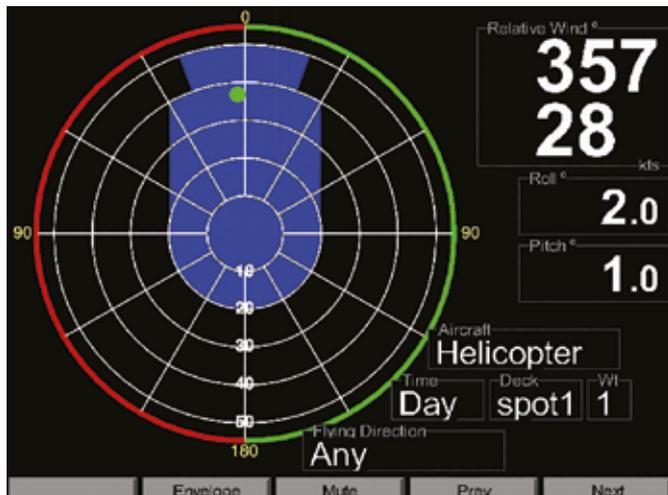
- TFT high resolution dynamic display
- Custom data pages available
- 1 standby and several function 'soft keys'
- Fanless operation
- 2x RS422 Opto-isolated inputs
- Qualified to military specifications
- NMEA / custom interfaces
- High reliability
- Bulkhead or panel mounted versions
- High brightness
- Fully dimmable to zero brightness
- Wide viewing angle
- Multiple SHOL envelopes can be stored
- Proven technology
- Capability to display multiple log, meteorological and own ship's data pages in addition to SHOL data



TRADITIONAL MANUALLY PLOTTED PAPER SHOL ENVELOPES



DIGITISED SHOLDS DISPLAYS



LANDING PERIOD DESIGNATOR (LPD)



MAXIMISE EFFICIENCY AND INCREASE OPERATIONAL SAFETY

The LPD is a solid state landing aid system designed to reduce air and ship crew workload. It increases safety associated with aircraft launch and recovery operations on a moving ship platform by providing a clear, real-time visual indication to the pilot of the optimum time to take-off and land safely (quiescent deck motion period).



SAFETY | **INCREASED** | **REAL TIME**
increased | operating window | motion data

THEORY OF OPERATION

The principle of the LPD is based on the rate at which a vessel can displace fluid due to hydrodynamic forces. The LPD supplies real-time information as a function of aircraft operational limits and measurement of ship's pitch, roll, surge, sway, yaw and heave. This information is expressed as the ship's Energy Index (EI), which relates ships motion:

- 0-4 indicates a safe quiescent deck
- 4-10 a 'caution' deck
- Above 10 signifies an unsafe, 'out of limits' deck.

The deck status is displayed to both crew and pilot in real-time either to the PID on the flight deck or used to aid the automated launch and recovery of an Unmanned Air Vehicle (UAV).

ENERGY INDEX TIME TRACE

In addition to reducing the risk of aircraft undercarriage or structural damage, the LPD offers improved operational safety by minimising over deck hover time and expands the aircraft operating and landing envelope, regardless of the sea condition and time of day or night.

The LPD can be incorporated directly into UAV control systems to ensure automated UAV launch and recovery occurs during the optimum and safest time period.

Working alongside established aircraft landing procedures and extensively trialled by Navies worldwide, the LPD is proven to offer a substantial increase in safety for ship board launch and recovery of both manned and unmanned air vehicles.

TYPICAL SYSTEM AND FEATURES

MOTION REFERENCE UNIT (MRU)

- Mounted directly underneath the flight deck
- Measured data from the MRU is sent directly to the LPD console providing real time information

LPD CONSOLE

- Based on AGI's 15" Multi-Function Colour Repeater with the LPD software
- Contains the LPD algorithms that are used to calculate the Energy Index (EI) figure from the pre-installed aircraft operational limits and the real time information received from the MRU
- EI data sent instantaneously to the Pilot Information Display (PID)

PILOT INFORMATION DISPLAY (PID)

- Mounted on flight deck
- EI displayed in a traffic-light-system
- Signals shown are instantaneous from the LPD Console and updated in real time



GENERAL

- For UAVs, LPD software and MRU data output can be incorporated directly into the UAV control system.
- Offered stand-alone or integrated with MORIAH, AGIMET or HELIVAS

Pilot Information Display (PID)



40%+
POTENTIAL INCREASE OF GREEN DECK STATUS



-  Optional Wave-Off Light
-  Optional Wave-Off Control Unit
-  Optional Energy Index Trend Display

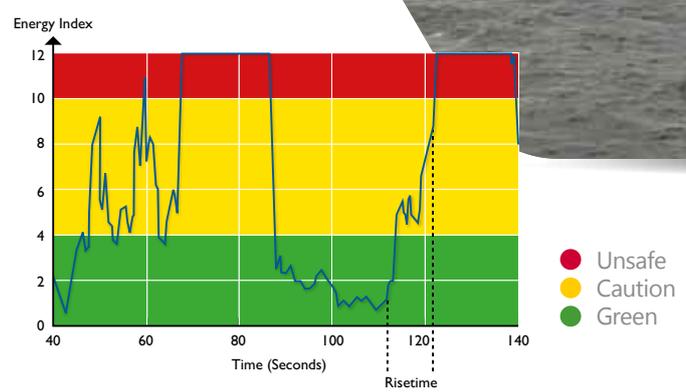
SYSTEM INTEGRATION

AGIMET Ships Wind and Meteorological Measurement System

HELIVAS Naval pilot visual landing aid system

EXAMPLE ENERGY INDEX TIME TRACE

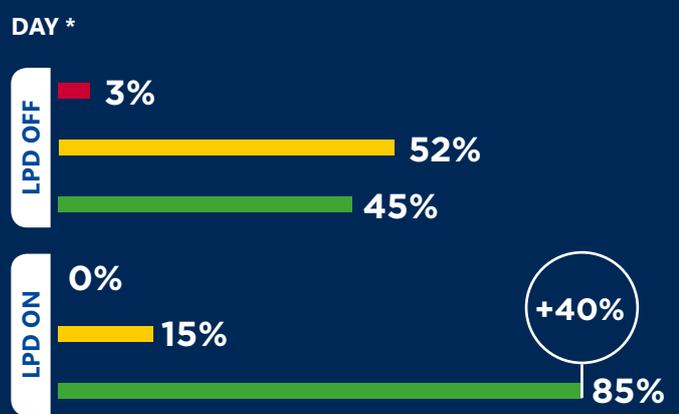
An example of a typical Energy Index time trace, recorded during Lynx RN sea trials at a wave height of 5 metres.



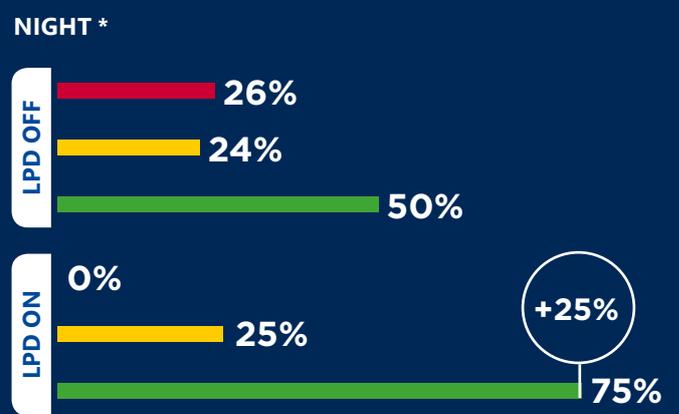
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RESULTS COMPARED:

USN - SH-60B SEAHAWK TRIAL: DECK STATUS ON LAUNCH / RECOVERY ● Unsafe ● Caution ● Green



40% INCREASE IN GREEN DECK STATUS FOR LAUNCH AND RECOVERY RED DECK STATUS **ELIMINATED** FOR LAUNCH AND RECOVERY



25% INCREASE IN GREEN DECK STATUS FOR LAUNCH AND RECOVERY RED DECK STATUS **ELIMINATED** FOR LAUNCH AND RECOVERY

*Results recorded during 'At Sea' trials on Frigates & Destroyers

*Results recorded on US LPD manned Simulator on Frigates & Destroyers

NAV-IS

Commercial EM Speed Log and Meteorological System

INTEGRATED EFFICIENCY

Nav-IS is a cost-effective, reliable and accurate EM Speed Log System with optional Meteorological System capabilities. The system is suitable for all Marine applications, ranging from ocean-going merchant and passenger vessels to coastal patrol craft and naval support ships.

COST EFFECTIVE COMMERCIAL SOLUTION

± 0.2kn | **-10-30kn** | **BAROMETRIC**
accurate 0-10kn | speed ranges | data integration



PRINCIPLE OF OPERATION

Nav-IS combines a single/dual axis EM Log measuring Speed Through Water (STW) with Meteorological System options. It utilises the latest proven and in service solid state sensor technology, based on the time proven principle that

a voltage is induced in a conductor by a moving magnetic field. A sensor attached to the hull of the vessel uses a small magnetic field to induce a voltage in the seawater proportional to the ship's speed through the water.

The Main Electronics Unit (MEU) houses the system electronics, processing and sensor power supplies. Where two anemometers are incorporated into the system the MEU will automatically select the most windward sensor and subject to an RS422 NMEA HDT heading input being received, also calculate the True Wind Speed and Direction. The measured data is then provided in a number of output formats, including RS422 NMEA.

The Maritime Panel Computer (MPC) provides testing and calibration as well as graphically displaying measured parameters. The data display pages combine both digital and analogue graphics, simply selected via the soft keys on the front of the unit. The system also has the facility to display multiple pages of differing Own Ship's Data, for instance Roll, Pitch, Rudder Angle, Depth Below Keel etc, provided that the appropriate RS422 NMEA data signals are sent to the Control and Display Unit's spare input.

SYSTEM CONFIGURATION

MEU

The Nav-IS system comprises a Main Electronics Unit (MEU) housing the EM Log electronics, a hull mounted electromagnetic sensor probe and a Marine Panel Computer (MPC) providing control and display functions. The MEU provides the power to and processes the inputs from the EM Speed as well as Wind and Meteorological Sensors, where these optional sensors are integrated.

MPC

The Marine Panel Computer (MPC) is based on AGI's 10.4" MFCRs (see page 8) and will operate autonomously as a multifunction repeater. In the Nav-IS system it also provides the control and display functions for the EM log enabling system calibration in addition to displaying and retransmitting the water speed and distance data.

The MPC is fitted with a set of five soft keys. The function of each key is displayed above it and changes depending on the page selected, or mode of operation.

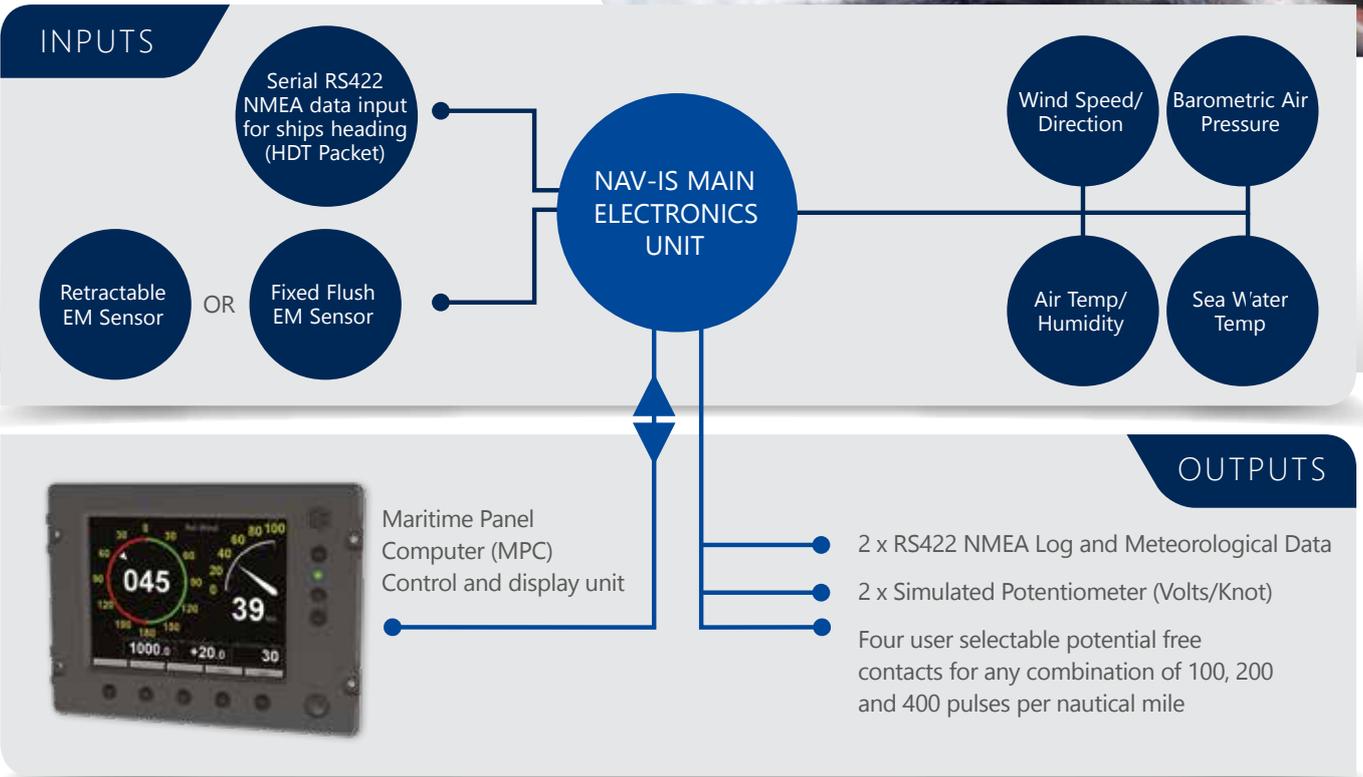
METEOROLOGICAL SENSOR DETAILS

The Nav-IS MEU can be fitted with a Meteorological Input Module to provide power and interface to all connected meteorological sensors. In addition, a Marine Air Pressure Sensor Module can be integrated to provide Barometric Air Pressure.

Nav-IS utilises solid-state ultrasonic anemometers to measure wind speed and direction. The anemometer can be provided with optional heating to avoid ice build up on the transducer arms.

SYSTEM CONFIGURATION

Nav-IS combines a single/dual axis EM Log measuring STW with Meteorological System options utilising the latest proven and in service solid state sensor technology for a low cost, integrated solution.



COMPATIBLE SENSOR INPUTS





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