TECHNICAL PERFORMANCE SPECIFICATION

FOR

MULTIBEAM BATHYMETRIC ECHO SOUNDER SYSTEM

DEEP TOWED MULTIBEAM BATHYMETRIC SYSTEM REQUIREMENTS

BACKGROUND: The Naval Research Laboratory seeks to expand it's seafloor mapping capability to include the collection of multibeam bathymetric and backscatter imagery data from it's existing deep towed seafloor mapping system. The following document provides the required specifications for this expanded capability.

SYSTEM SPECIFICATIONS:

1. Multibeam Bathymetric Echo Sounder system that meet or exceed the following specifications:

a) 200 kHz center frequency (+/- 5%)
b) Sonar Head and sub-sea electronics package rated to 3000 m depth (minimum)
c) Pulse Length 0.05 to 0.25 ms
d) Range Sampling Rate 10 kHz minimum
e) Maximum Ping Rate 10 times per second
f) 111 Beams per ping (+/- 10 %), roll stabilized (+/- 15 degrees)
g) Maximum Beam Width 2.0 degrees cross track, 1.5 degrees along track
h) Beam spacing equiangular or equidistant. Equidistant capability is critical to required operation in constant swath width mode
i) Coverage sector 120 degree maximum with ability to redistribute all beams over different angular sectors (i.e. 111 beams whether 60 degree or 120 degree sector)
j) Ability to maintain fixed swath width in meters independent of tow vehicle altitude without losing outer beams
k) Measurement accuracy of less than 10 cm RMS independent of beam pointing angle. System capable of meeting International Hydrographic Standards (IHO Order 1) when utilized as stand-alone hull mounted system.
l) Sub-sea electronics and Sonar head will be interfaced (DC power and Ethernet connections) to exiting NRL EdgeTech Deep StarMux sub-sea electronics
m) Multibeam bathymetric echo sounder operation to be compatible with simultaneous operation of existing EdgeTech dual frequency (100/400 KHz) chirp side scan sonar and 2 to 16 KHz chirp sub-bottom profiler systems.
n) System operation compatible with long (5000m) UNOLS COAX tow cables and capable of transmitting multibeam bathymetric and multibeam imagery data without impact on existing EdgeTech dual frequency chirp side scan sonar and chirp sub-bottom profiler data stream.

o) Sonar Head assembly to be installed by vendor within existing NRL EdgeTech Deep Tow vehicle sonar bay with following maximum dimensions (80 cm L x 60 cm W). Sonar Head must be easily removable for testing or stand alone use.
p) Sub-sea Electronics package to be installed, by vendor, within existing NRL Deep Tow vehicle in the available cylindrical pressure vessel bay of the following dimensions (25 cm D x 1.2 m L). Sub-sea Electronics pressure vessel must be easily removable for maintenance, testing or use as a stand-alone system.
q) Multibeam echo sounder system to have interfaces to existing MRU-4 motion and Digi-quartz depth sensors.

2. Topside Multibeam Bathymetric Sonar Data Acquisition and Control System that meet or exceed the following specifications:

a) Software to provide real time operator control of multibeam system operation
b) Software to provide data displays for monitoring of data quality and logging of multibeam bathymetric and backscatter amplitude (imagery) data. Real time displays include, at a minimum: cross-track depth profiles, beam intensities and quality measures, waterfall presentations, coverage plots and planned survey lines. Included in the display capability is the ability to examine data from external sensors of navigation, heave-pitch-roll, gyro, tide and sound velocity information. Real time capability includes merging and display of depth, acoustic backscatter strength and navigation data.
c) NRL will utilize its existing SWATHED software suite developed by the University of New Brunswick Ocean Mapping Group to post-process multibeam and acoustic imagery data collected using this sonar. The Sonar data acquisition system shall have the capability to store and output of raw data files in Standard Simrad telegram (datagram) format accepted by that software suite.
d) System hardware configured to use minimum physical space (laptop preferred) and utilizing Unix or LINUX (preferred) or Windows XP or 2000 operating system environments.
e) The system shall be capable of logging the raw data to both disk and external tape. Preferred tape drive system is SCSI or fire wire interface AIT-2 tape but a DAT (DDS3, or DDS4) format drive is acceptable. The ability to write data to CD or DVD disks is also desirable. All data also must be available on external Ethernet so that it may be input in parallel to the SWATHED software.

3. GOVERNMENNT FURNISHED INTEGRATION SPECIFICATIONS:

The Government shall provide complete specifications for integration and compatibility requirements for the following:

a) Detailed dimension specifications for integration within existing EdgeTech Deep Towed Vehicle; Vehicle will be provide to the Contractor for installation and acceptance testing at the contractor's facility.
b) Interface electronics specifications for Government owned EdgeTech Deep StarMux
c) Specifications on UNOLS COAX tow cables
d) Interface specifications on MRU-4 motion and Digi-quartz depth sensors

4. DOCUMENTATION

a) Operation Manual: This manual shall describe in detail how to operate and deploy the Multibeam Bathymetric Echo Sounder System. It shall contain procedures to be used for predeployment checkout, hardware and software preparation, and detail the sequence of events for a deployment and recovery. The manual shall describe communications via the wireless LAN, umbilical cable, and the capabilities and limitations of each. It shall also describe the command, status, and data transfer functions.
b) Technical Manual: This manual (or set of manuals) shall describe in detail the design of each system component, its hardware, software, and interconnections. A functional description of all circuitry and software shall be included. A detailed list of all parts and components shall also be included. For each component of software and hardware, the part/model number and vendors' address, telephone number, and web site shall be provided.

c) Software: Software shall be provided that integrates the various functions of the system, including but not limited to the Topside Control System and the Echo Sounder System. Licenses, original media, and owner's manuals shall be provided for all commercial operating system, application, and integration software. It is requested that custom operating system, application, and integration software shall be written in a high-level language such as C and a copy of the source codes provided to NRL. Source codes shall be delivered in hard copy and electronic formats. Offeror shall provide a written procedure to edit, compile, and execute program changes to custom software along with any development software and hardware.
d) Drawings: Assembly, mechanical, block, wiring, schematic, etc. drawings shall be provided for all hardware. Drawings shall be in accordance with acceptable commercial standards. May be included in the Technical Manuals.
e) Documentation Form: Three hard copies of each manual listed above shall be supplied, along with an electronic copy of each manual. Electronic copies shall be provided in Microsoft Word 2000 (or higher) format.

5. TEST PLAN:

a) The offeror shall develop a test plan for system performance and acceptance testing. This plan shall detail system testing at the offeror's manufacturing facility of all performance specifications. The plan shall detail how the manufacturer intends to prove that the system meets the specifications as defined in the RFP.
b) The test plan shall be delivered to the COR for approval no later than 30 days prior to start of the factory test.

6. TRAINING:

The offeror shall provide training on the assembly, disassembly, configuration, and operation of all aspects of the Multibeam Bathymetric Echo Sounder System for up to three (3) end-users at the factory acceptance test site.

7. OPTIONS:

Option 1: Integrate Sonar Head sound velocity measurement sensor that meets of exceeds the following specifications:

a) Direct measurement of sound velocity from 1400 to 1550 m/s with minimum accuracy of +/- 0.05 m/s, minimum resolution of 0.015 m/sec and 145 micro second maximum response time.
b) Direct measurement of temperature from -2 to 32 degrees C, with a minimum accuracy of +/- 0.05 degree C, a minimum resolution of 0.001 degree C and a maximum response time of 1.5 seconds
c) Direct measurement of pressure to 5000 dbar, with a minimum accuracy of +/- 0.15% full scale, a minimum resolution of 0.005% Full scale and a maximum response time of 10 milliseconds.
d) Capable of operation in the depth range of 1 to 3000 meters.
e) Capable of being battery or externally powered (8-12 volts)
f) Digital output - RS-232 port
g) Internal non-volatile 128Kbyte digital memory, expandable to 200 Mbytes
h) Windows XP2000 software compatible
i) Programmable sampling parameters, real time data acquisition, and display capability
j) Maximum weight (in air) of 25 lbs.

Option 2) Integrate Sonar Head Motion sensing package that meets or exceeds the following specifications:

a) Provide digital output of pitch, roll, heading, heave, surge and sway.
b) Minimum resolution all axes 0.01%
c) Noise level all axes 0.03 degrees typical
d) Static accuracy roll, pitch 0.05 degrees typical, Dynamic accuracy roll, pitch 0.1 degrees RMS
e) Static accuracy heading 0.3 degrees typical
f) Dynamic accuracy heave 2% relative error plus sensor noise
g) Heave sensor noise 0.0001 m RMS
h) Digital output RS232, 100 Hz maximum output rate, 50 Hz typical
i) Power requirements 12-30V DC, 5 watt maximum
j) Temperature range -5 to 55 degrees C, temperature compensated
k) Capable of operating to a depth of 3000 meters