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SYSTEM SPECIFICATION – SMALL UNIT RIVERINE CRAFT

APPENDIX A

**CRAFT TESTS AND TRIALS**

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**PART II**

5 **TRIALS – This is a generic overview of the types of verifications to be conducted during acceptance of the craft. Each contractor must tailor these items to their respective craft top ensure the specification requirements are verified.**

GENERAL

10 *When construction of the craft is complete, trials shall be conducted to demonstrate the performance of the craft and to prove compliance with the Contract (mainly the specifications, the proposed drawings and the equipment manufacturer's requirements). The trials to be conducted include Speed or Propulsion Trials, and Acceptance Trials.*

15 Prior to the start of trials the craft shall be complete in all respects. All documentation and data shall be complete and up-to-date in accordance with the requirements of the contract. All testing shall have been completed, deficiencies corrected, and tests rerun where necessary. Temporary rigging, industrial equipment, and debris shall be removed. In the event that the Government determines that the craft or documentation is not ready for trials, the trials will be postponed until the deficiencies have been corrected.

The Contractor shall confirm the dates for trials at least 10 days prior to the scheduled date.

All expenses incident to trials shall be borne by the Contractor.

20 Unless otherwise specified, representatives of the Government will not operate the craft, its machinery, equipment, or systems. The Contractor shall provide qualified personnel, as required, to resolve questions arising during trials and to demonstrate equipment operation, maintenance accessibility, removal and installation. Except as otherwise specified the Contractor shall perform tests, record data, and compute trial performance and results. Trial data shall be readily available to Government observers.

25 If any part of the craft or equipment fails to perform satisfactorily during trials the Contractor shall conduct additional trials as directed by the Government. Deficiencies designated by the Government shall be corrected prior to additional trials. The scope of additional trials shall be as directed by the Government.

30 Except as otherwise specified, temporary trial instrumentation and equipment shall be provided by the Contractor. The Contractor shall install all temporary trial instrumentation and equipment regardless of by whom provided. The Contractor shall furnish all necessary fittings and modify systems as required to install trial instrumentation and equipment. Following satisfactory completion of the trials, the Contractor shall remove the temporary equipment and restore all systems to their original condition. Any Government-owned equipment shall be packaged and returned as directed by the Government.

35 A measured course shall be available for conducting speed runs. The measured course shall be a straight course of between one-half and one nautical mile in length. The course shall be marked by a pair of fixed range markers at each end. The depth of water shall be no less than two thirds of the craft's overall length. The course shall have sufficient room at each end to allow test conditions to stabilize before entering the course. Except when a Government-maintained course is used, the length and depth of the course and the bearing between the front marker of each pair of range markers shall be certified by a licensed surveyor from a survey made within 12 months of the trial date. The Contractor shall submit the certification to the Government.

40 For all trials, the craft shall be ballasted to the Combat Load condition. The ballast shall be located to achieve the required longitudinal center of gravity.

SAFETY DURING TRIALS

45 The Contractor is responsible for the supervision and operation of all machinery and equipment and for the safety of the craft and embarked personnel during trials. The craft shall be suitably prepared and equipped for any emergency.

Life jackets for all personnel embarked plus two spares shall be on board and properly distributed in readily accessible areas. First-aid equipment shall be stowed on board and accessible for immediate use. Portable fire extinguishers shall be functioning properly, on board and properly stowed. Ground tackle shall be on board and properly stowed.

PERFORMANCE SPECIFICATION – SMALL UNIT RIVERINE CRAFT APPENDIX A  
**DRAFT**

Alarm systems shall be operative. Gages and safety devices shall be checked and all final adjustments completed.

The Contractor shall provide a chase boat. The chase boat shall be capable of towing the craft undergoing trials and of rendering aid in an emergency; shall have sufficient capacity to accommodate all personnel embarked on the craft undergoing trials; and shall have sea keeping capabilities which will allow it to remain with the craft undergoing trials throughout the underway portions of the trials.

The craft undergoing trials, the chase boat and a manned shore station shall be equipped with two-way radios so that constant communication can be maintained.

**Builder's Trials**

At the Builders discretion, the Acceptance Trial agenda may be used to conduct Builder's Trials. The Builder's Trials shall serve as a rehearsal for Acceptance Trials to establish that the craft itself is ready for subsequent trials.

PROPULSION TRIALS

For the first craft only, Propulsion Trials will be conducted to ensure the optimum \*(propeller or impeller and nozzle)\* and to document the craft's performance. The Propulsion Trials will be conducted under the supervision of Government personnel.

The Contractor shall provide all equipment and assistance as required to weigh the craft using Government-furnished load cells. A two-point lift shall be used to allow calculation of the longitudinal center of gravity.

The Contractor shall install a Government-furnished torque meter. Installation of the torque meter will require the Contractor to furnish a short shaft and any necessary adaptor flanges. A stub shaft (spool piece) with the same length and flange dimensions as the torque meter shall also be provided to take the place of the torque meter when it is not installed in the craft. This shaft arrangement will not be acceptable in the delivered craft. Dimensional details of the torque meter and advice on its installation will be provided by the Government at the request of the Contractor.

The Contractor shall install Government-furnished flowmeters or other means for measuring fuel consumption. The Contractor shall provide the necessary fittings to accomplish this installation. Details of the flow measuring device to be used and advice on its installation will be provided by the Government at the request of the Contractor.

The manufacturer, model number, serial number, and other identifying information for the installed engine(s) and transmission(s) shall be recorded and provided to the Government at the time of trials.

The maximum engine rpm with the marine gear in neutral shall be recorded.

The trials will consist of running the craft at various speeds on the measured course. Six to ten pairs of runs, consisting of one run in each direction, will usually be required. The number of runs and the speeds will be determined by the Government representative during the trials. Each of the runs will provide data for plotting RPM, fuel consumption, shaft kilowatts, and trim versus speed curves.

The Contractor shall be responsible for taking and recording the following measurements during each run:

- (1) Ambient air temperature;
- (2) Ambient water temperature;
- (3) Barometric pressure;
- (4) Engine compartment temperature;
- (5) Engine compartment pressure;
- (6) Intake manifold pressure;
- (7) Exhaust temperature;
- (8) Exhaust back pressure;
- (9) Time to run the course.
- (10) Engine RPM
- (11) Craft trim

PERFORMANCE SPECIFICATION – SMALL UNIT RIVERINE CRAFT APPENDIX A  
***DRAFT***

5 The Government will determine from the trial data if additional trials will be required to determine the optimum propeller or impeller and nozzle. All expenses incidental to repitching the propeller or changing the impeller and nozzle once, including one additional set of trials, shall be borne by the Contractor. The expense of any additional trials, and trial propellers or impellers, will be borne by the Government. The Contractor shall allow time in his schedule to accommodate additional trials.

SPEED TRIALS

10 For the first craft only, the performance shall be demonstrated with the craft in its normal operating configuration. The maximum engine RPM obtained with the transmission in neutral (no load) shall be determined. The craft shall be run at no less than seven speeds from idle to full power. A pair of runs, one in each direction, shall be made at each speed on the measured course. The following data shall be taken during each run:

- 15 (1) Ambient air temperature;
- (2) Ambient water temperature;
- (3) Barometric pressure;
- (4) Engine compartment temperature;
- (5) Engine compartment pressure;
- (6) Intake manifold pressure;
- (7) Exhaust temperature;
- 20 (8) Exhaust back pressure;
- (9) Time to run the course;
- (10) Engine RPM;
- (11) Craft trim;
- (12) Fuel consumption;
- 25 (13) Hourmeter reading;
- (14) Engine water temperature;
- (15) Engine oil pressure;
- (16) Marine gear oil temperature;
- (17) Voltage reading.

30 The speed, in knots, for each run and the average of the speeds for each pair of runs shall be calculated. RPM and dynamic trim versus speed curves shall be plotted.

35 OPERATIONAL / LOGISTICS DEMONSTRATION

The Operational Demonstration will verify that the craft will meet the missions needs and operational performance requirements of the user. The Operational Demonstration will be done on the first craft only. The Operational Demonstration will include an assessment of the craft maintainability, supportability and deployability, using the Contractor provided support package and commercial sources as required. The Operational Demonstration will also include an evaluation of logistics support that will include review of supply and maintenance concepts and plans, the allocation of maintenance manpower, and personnel skill requirements. System safety and health hazard design requirements will be verified as having been met. The Operational Demonstration will include system testing under operationally realistic conditions using personnel deemed to be typical users. As such, all Operational Demonstration testing will be performed by service Marine Corps personnel. The Contractor shall make provisions in the construction schedule for a two-week service Marine Corps conducted and performed Operational Demonstration.

PERFORMANCE SPECIFICATION – SMALL UNIT RIVERINE CRAFT APPENDIX A  
**DRAFT**

ACCEPTANCE TRIALS

5 General - Acceptance Trials shall be performed on each craft. All other trials shall have been satisfactorily completed and deficiencies corrected. All compartments and accessible voids shall be available for inspection. The craft shall be clean. All equipment and outfit shall be on board and properly stowed. The bilges shall be dry. Craft that do not meet these criteria shall not be presented for Acceptance Trials.

A written certification by the Contractor, that Builder's Trials have been completed and that deficiencies have been corrected, shall be prerequisite to conducting Acceptance Trials.

10 *The Contractor shall provide space for use by Government personnel reviewing the drawings and other documentation required to be assembled at the time of trials. The space provided shall be sheltered (enclosed) and suitable for laying out drawings and writing. Where it is not practical to provide such a space aboard the craft, the space shall be located to allow convenient access to the craft undergoing trials.*

15 Deficiencies - Deficiencies are defined as items which require corrective action to bring the material condition of the craft into compliance with these specifications and applicable regulations. These include:

- (1) Failure of equipment or of the craft as a whole to meet performance requirements;
- (2) Requirement for excessive maintenance resources;
- (3) Incomplete or unsatisfactorily completed installations, equipment, repair parts, publications, or drawings;
- 20 (4) Incomplete or unsatisfactorily completed inspections, certifications, or tests;
- (5) Conditions which are in violation of current environmental pollution standards;
- (6) Conditions which significantly degrade the craft's capability to perform its intended mission;
- (7) Conditions which adversely effect the general safety, navigational safety, security, fire fighting, habitability, or maintainability of the craft;
- 25 (8) Conditions which are likely to cause injury to personnel;
- (9) Deficiencies still outstanding from previous trials;
- (10) Any other failure to comply with the requirements of the contract, these specifications, or the drawings.

30 Documentation - The Contractor shall assemble the following reports, data and publications and make them available at the time of trials:

- (1) The contract, as amended;
- (2) The specifications, as modified;
- (3) Prints of the final construction drawings;
- 35 (4) Correspondence concerning deviations and waivers;
- (5) Preliminary or final Craft Information Book;
- (6) Preliminary or final NAVSEA Technical Manuals or commercial manuals, as applicable, for each equipment installed on the craft;
- (7) Allowance Parts Lists (APL), Boat Allowance List (BAL), as applicable;
- 40 (8) Complete set of test reports properly filled in and signed;
- (9) Approved trial agenda and procedures;
- (10) Trial displacement and longitudinal center of gravity data;
- (11) Results of certification inspections on all equipment requiring certification;
- (12) List of representative tanks and voids recommended to be opened for inspection;
- 45 (13) List of recommended equipment to be opened for inspection;
- (14) List of all material shortages broken down by Contractor furnished and Government furnished;
- (15) List of all missing reports, data, and publications broken down by Contractor-furnished and Government-furnished.

PERFORMANCE SPECIFICATION – SMALL UNIT RIVERINE CRAFT APPENDIX A  
**DRAFT**

5 Phases - Acceptance Trials will be conducted in three phases: pre-underway; underway; and post-underway (open and inspect). The list of events which follows provides a sample of the demonstrations and inspections which will generally be acceptable for conducting Acceptance Trials. The sample is not all inclusive; rather it is a guide to indicate to the Contractor the general scope and depth of trials. The Contractor shall develop a trial agenda and test procedures which take into account the particular requirements of the craft and the equipment to be demonstrated, services required, and other applicable conditions. The trials shall include demonstrations of all hull, machinery, electrical, electronic, interior communications, fire control and weapons systems on board. In addition to performance demonstrations, the construction of the craft and all equipment installations will be examined to determine operational practicability, maintenance accessibility, and safety.

10 In addition to the scheduled demonstrations, additional tests and demonstrations, as directed by the Government, shall be conducted as necessary to verify satisfactory operation and to pinpoint deficiencies when unsatisfactory or marginal conditions are observed.

15 Pre-underway phase - The pre-underway phase will consist of a review of documentation, and demonstrations and inspections of the craft, its equipment, and systems in order to verify that trials may be conducted safely and that the craft will be capable of performing its intended mission. During the course of the demonstrations, equipment operating parameters (temperatures, pressures, etc.) shall be observed and recorded as necessary to verify satisfactory operation.

20 At the beginning of the pre-underway phase the Contractor shall make provisions for a review by the Government of the reports, data and publications listed above. The Contractor shall provide personnel, as required, to resolve questions arising during the review and to demonstrate equipment operation, maintenance accessibility, removal and installation. In the event the documentation is determined to be unsatisfactory the trials will be postponed until the documentation has been corrected.

The pre-underway phase shall include the following demonstrations and inspections:

- 25 (1) Check for the presence of any fire hazards.  
(2) Check for the presence of any personnel safety hazards.  
(3) Check availability and proper stowage of life jackets.  
(4) Check availability and proper stowage of first-aid equipment.  
(5) Check the availability and proper stowage of portable fire extinguishers.  
30 (6) Ensure that ground tackle is on board and properly stowed.  
(7) Test fire extinguishing system controls, alarms, indicators and cutouts.  
(8) Check the operability of control and alarm systems.  
(9) Review the arrangement, installation, and operation of all equipment and of the craft as a whole to ensure that they will support the intended mission of the craft and that safety, reliability, reasonable economy, and accessibility for  
35 maintenance and operation are provided.  
(10) Check to ensure that labeling is correct and complete and that operating instructions and safety precautions are posted and adequate.  
(11) Inspect all compartments and bilges for dryness, cleanliness, preservation, adequacy of stowage, and freedom from fire and safety hazards.  
40 (12) Check for adequacy of access, ventilation, and lighting, and freedom of normal routes of access and working and operating stations from overcrowding and obstructions.  
(13) Check for proper stowage of hazardous materials, including flammable liquids, pyrotechnics, and ordnance.  
(14) Verify that navigation lights and equipment, including horn, bell, and portable lights and shapes conform with applicable regulations.  
45 (15) Verify visibility from coxswains station, pilot house, flying bridge, etc.  
(16) Demonstrate operation of mechanical handling systems.  
(17) Demonstrate stowage and rigging of collapsible or removable structure or equipment.  
(18) Demonstrate the operation of the steering gear, to include relief valve settings and emergency steering. Check alignment against indicated position on rudder angle indicator.

PERFORMANCE SPECIFICATION – SMALL UNIT RIVERINE CRAFT APPENDIX A  
**DRAFT**

- (19) Check the availability of sufficient quantities and quality of fuel, lube oil, hydraulic fluid, etc.  
(20) Test overspeed and speed limiting devices on machinery.  
(21) Check to ensure that insulation and lagging are clean and intact.  
(22) Check for significant personnel heat stress conditions.  
5 (23) Check gages, meters, and other instruments for proper installation, operation, and calibration.  
(24) Check integrity of piping systems and components.  
(25) Check stuffing box (if installed) integrity.  
(26) For the propulsion engines:  
10 (a) With the engine stopped, demonstrate remote fuel shutdown from all actuating stations;  
(b) With the engine stopped, demonstrate emergency air shutdown from all actuating stations;  
(c) Demonstrate speed limiting governor;  
(d) Demonstrate low lube oil pressure alarms;  
(e) Demonstrate high temperature alarm;  
15 (f) Check operation of manual and automatic controls;  
(g) Observe temperature and pressure parameters;  
(h) Inspect crankcase oil for fuel dilution and water contamination;  
(i) Inspect lube oil filters;  
(j) Inspect fuel filters and fuel/water separators;  
(k) *Check operation of the transmission.*  
20 (27) Demonstrate sea water service pumps.  
(28) Demonstrate bilge pump operation, taking suction from each compartment.  
(29) Check integrity of wiring and electric cable.  
(30) Check operation of safety radio with chase boat and shore station.  
25 (31) Determine the status of electronic and interior communications equipment with regard to accessibility for maintenance and operation, ventilation, lighting, and safety (e.g., electrical deck matting, shorting probes, warning signs, etc.)  
(32) Check electronic and interior communications equipment installation workmanship, including mounting, bracing, and grounding.  
(33) Check the operability of the bridge-to-bridge radio.  
30 (34) Conduct operational demonstration of UHF, VHF, and HF radios and all voice cryptographic devices. These systems are demonstrated with an assist station arranged for by the Designated Government representative, who must also arrange for frequencies. It is desired that two UHF, one VHF-FM (30-76 MHz), one VHF (115-156 MHz) and one HF (2-30 MHz) frequencies be obtained.  
(35) Check operation and alignment of the radar (if installed).  
35 (36) Check operation of fathometer (if installed).  
(37) Check operation of navigation equipment.  
(38) Check operation of visual signaling equipment.  
(39) Check operation and adequacy of lighting, to include all general and detail illumination, and light traps, door switches, and other darken ship provisions.  
40 (40) Demonstrate hoisting rig(s).  
(41) Demonstrate operation of trailer, including launch and recovery of the craft and towing.  
(42) Verify adequacy of weapon and ammunition stowage, weapon mounts, and ready service lockers.

45 Underway phase. - The underway phase will consist of operational demonstrations and inspections of the craft, its equipment, and systems in order to verify the capability of the craft to perform its intended mission. During the course of the demonstrations, equipment operating parameters (temperatures, pressures, etc.) shall be observed and recorded as necessary to verify satisfactory operation.

The underway phase shall include the following demonstrations and inspections:

PERFORMANCE SPECIFICATION – SMALL UNIT RIVERINE CRAFT APPENDIX A  
**DRAFT**

- (1) Demonstrate anchor handling.
- (2) Demonstrate steering gear.
- (3) Demonstrate emergency steering.
- (4) Demonstrate directional stability.
- 5 (5) Demonstrate maneuvering;
- (6) Demonstrate mechanical handling equipment which is intended to be operated underway.
- (7) Demonstrate stowage and rigging of collapsible or removable structure or equipment which is intended to be stowed or rigged underway.
- (8) Propulsion plant operation will be demonstrated using the following sequence:
  - 10 (a) Full power ahead for at least one hour;
  - (b) Ahead steering demonstration at full power;
  - (c) Quick reversal astern from full power ahead;
  - (d) Maximum safe power astern for a period sufficient to demonstrate astern performance;
  - (e) Astern steering demonstration at maximum safe power;
  - 15 (f) Quick reversal to full power ahead;
  - (g) Speed runs at full power on a measured course to determine the maximum speed of the craft;
- (9) Demonstrate operation with disabled propulsion engine(s).
- (10) Demonstrate operation of trim tabs (if installed).
- (11) Demonstrate towing another craft of similar size.
- 20 (12) Demonstrate being towed by another craft.
- (13) Demonstrate sea water service pumps.
- (14) Demonstrate bilge pumping operation, taking suction from each compartment.
- (15) Inspect operation of ventilation systems.
- (16) Demonstrate operation of the radar (if installed).
- 25 (17) Conduct operational demonstrations of all communications equipment.
- (18) Demonstrate all visual signaling equipment.
- (19) Demonstrate electronic aids to navigation.
- (20) Demonstrate operation of fire control and weapons systems.
- (21) Demonstrate that all electrical and electronic equipment can operate simultaneously without interference.

30 Post-underway phase - The post-underway phase will consist of open and inspect examinations of selected equipment, and additional demonstrations and inspections as required to verify the capability of the craft to perform its intended mission. The Contractor will provide a recommended list of equipment to be opened for inspection. Upon completion of the underway phase the Designated Government representative will designate the equipment and systems to be opened and disassembled for the open and inspect examination. This will include routine inspection of representative equipment and other equipment observed or suspected to be deficient in some way. The Contractor shall provide qualified personnel and the necessary tools and equipment to open and disassemble the designated equipment.

The post-underway phase shall include the following open and inspect examinations:

- 40 (1) Inspect all compartments and examine for watertightness, weathertightness, and marked distortion, unfairness, or evidence of weakness of structure.
- (2) Open and inspect representative tanks and accessible voids. These spaces shall be checked for combustible gas, ventilated, checked for the presence of oxygen, and tagged "SAFE FOR ENTRY" by a certified marine chemist.
- (3) For propulsion engines:
  - 45 (a) Open all strainers and filters and retain in the condition as found, do not clean;
  - (b) Open one crankcase inspection port;
  - (c) Remove valve covers;
- (4) Inspect stuffing box/shaft seal for water flow.
- (5) For hydraulic systems:

PERFORMANCE SPECIFICATION – SMALL UNIT RIVERINE CRAFT APPENDIX A  
***DRAFT***

- (a) Open all strainers and filters and retain in the condition as found, do not clean;
- (b) Drain fluid and open sump for inspection, do not clean.
- (6) Open and inspect sea water strainers for auxiliary systems.
- (7) Open and inspect one sea water service pump.
- 5 (8) Open and inspect electric plant control panel.
- (9) Open and inspect power distribution panels.
- (10) Open and inspect all battery boxes.
- (11) Open and inspect battery charging rectifiers and other power conversion equipment.
- (12) Open and inspect representative motor controllers.
- 10 (13) Inspect mast mounted equipment.
- (14) Inspect the condition of all topside electrical connectors.
- (15) Open and inspect representative electronic equipment.
- (16) Inspect and megger communication antennas.
  
- 15 Following completion of the inspections all affected equipment and systems shall be returned to proper operating condition.

PERFORMANCE SPECIFICATION – SMALL UNIT RIVERINE CRAFT APPENDIX A  
**DRAFT**

**FOR INPUT INTO THE CONTRACT DATA REQUIREMENTS LIST (CDRL)**

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**Test procedures.-** Test procedures shall provide the detailed description of the operations to be performed and the parameters to be measured during the conduct of each test or trial and the pass/fail criteria. Instructions for analysis of raw data shall be provided. Each test procedure shall include procedures required for safety of personnel and equipment. Each test procedure shall contain data sheets which provide spaces for recording the quantitative values determined during the test. Data sheets shall also provide space for recording results of analysis of raw data taken during the test. Each data sheet shall show specified values and tolerance limits for each measured value. Each data sheet shall have a space for recording a test conductor signature, a Government witness signature and test date. Where specified, test procedures shall contain Government data recording forms. Block diagrams, simplified schematics or diagrammatics may be used to clarify the procedure or simplify the test method. Comment sheets shall also be included to record significant events and observations which occur during conduct of the test by either the Government witness or the test conductor.

**Trial Agendas.-** The trial agendas shall describe the general and detailed plans for operation of the craft and scheduling of events for Builder's Trials \*(, Special Trials,)\*\* and Acceptance Trials. The agendas shall cover in detail the procedures to be performed and the data to be recorded.

**Test and trial reports.-** Test reports shall document the overall test or trial results and findings in relation to technical specification requirements. The test reports shall include the test procedure with completed data sheets, and results of analysis of the raw data records taken at the time of test. All performance data shall be provided in tabular form or plotted on graphs as applicable. The Contractor shall prepare a test report for each test conducted during the test program. Test reports shall be numbered with the craft registry number followed by the number for the test. Test reports should further be identified to reflect those tests which are a verification of system design and therefore require accomplishment on only the first craft, or any subsequent craft with design differences, and those which are a verification of installation or construction quality and adequacy and, therefore, must be performed on each craft. A separate test report is required for each test for each craft. Consolidating test results for multiple craft is not acceptable. The Contractor shall assemble all test and trial reports for each craft into a booklet of test reports for installation on each craft prior to delivery.