Part VII – Technical Specifications

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Chapter 1 – General Provisions

1.1 Introduction

1.1.1 This document (or "Technical Specifications" (TS)) sets out the requirements of the Government of the Hong Kong Special Administrative Region (HKSAR) of the People's Republic of China (hereinafter referred to as the Government) in relation to **ten (10) Deep Bay High Speed Craft (**"Vessel") for use by the Hong Kong Police Force ("HKPF").

1.1.2 The primary and overriding aim of this procurement exercise is to provide the HKPF with ten (10) high performance Vessels of aluminium alloy hull, powered by twin diesel inboard engines and propelled by twin waterjets. Robustness of construction, ergonomics, seakeeping, high-speed control response, stable and predictable manoeuvrability at high speeds in close proximity to both suspect and bystander craft, and directional stability are of fundamental importance.

1.1.3 The offered Vessel shall be an aluminium alloy-hull, commercially available rigid fast rescue and enforcement craft powered by twin diesel inboard engines and propelled by twin waterjets. [E]

1.1.4 Unless otherwise specified in the TS, all the specifications stated in this Part VII of the Tender Documents are classified and labelled as follows:

(a) Essential Requirements [E] – For those specifications which are labelled as [E], it shall be deemed that the Tenderer commits to comply. During the tendering stage, as part of the tender evaluation (viz., completeness check), the Tenderer shall submit all the information in sufficient detail to substantiate that the product and any services offered meet the Essential Requirements as stipulated in Annex C to the Conditions of Tender. Failure to do for any Requirement will result in the tender not be considered further.

(b) Desirable Specifications [D] – For those specifications which are labelled as [D], it shall be deemed that the Tenderer commits to comply unless "No" is selected in Item 16, Schedule 5 of Part V.

(c) Those specifications which are without any label (viz., [E] or [D]) shall equally form part of the Contract like the specifications labelled as [E], but the Government will not conduct checks at the tendering stage whether the products offered comply with those specifications.

1.1.5 All this Part VII shall form part of the Contract.

1.1.6 All TS, including all Essential Requirements, those Desirable Specifications labelled with [D] (if and to the extent the Contractor has indicated compliance in its tender) and specifications without any label (viz., [E] or [D]) shall form part of the Contract and be of equal materiality and importance upon the award of the Contract. The non-compliance with any specifications set out in these TS shall have the same consequences as specified in the Contract. Save during the tendering stage in the manner as mentioned in Paragraph 1.1.4 (c) above, no differentiation shall be made based on the classification unless otherwise expressly specified.

1.1.7 The Vessel shall be Ready for Use before the Delivery Date and delivered by the Delivery Date as per the schedule stipulated under Schedule 2 – Delivery Schedule of Part V.

1.1.8 Unless otherwise expressly defined in the Contract, all technical terms and expressions used in this Part VII shall be interpreted in accordance with the professional or common usage in naval architecture, marine engineering, nautical navigation and the shipbuilding industry.

1.2 Statement of Purposes of the Vessel

1.2.1 The Vessel shall be safe, fit and suitable for the operational purposes for which it is intended, namely to be navigated by the HKPF anywhere within Hong Kong Waters, including in the shallow north-western water and swamps of Deep Bay, for the purposes of preserving the integrity

of the HKSAR Boundary of Administration, preventing and detecting crime, undertaking independent or radar-vectored target interception to perform law enforcement and observation duties, and undertaking search-and-rescue operations. This role involves considerably more than mere navigation and will include swift manoeuvring during the high-speed pursuit of non-compliant craft, multiple heavy impacts on bow and/or Vessel sides at different angles of heel during opposed and/or non-compliant underway interceptions, cross-decking of personnel from police craft to non-compliant vessels while travelling at high speeds, beach landings and recovery of officers, and such other actions as are required for enforcement purposes. Moreover, the Vessel will also be deployed to convey officers and their equipment to and from areas of operation at sea, from police operational bases, and from barge operating platforms.

1.2.2 When configured in accordance with these TS, the Vessel shall meet or exceed the following key performance parameters ("KPP") under load conditions, if any, described in Paragraph 1.7.2(e) in this Part VII:

(a) KPP 1: Sea Keeping

The Vessel shall be designed, engineered and constructed to conduct missions without substantial damage through sea states up to World Meteorological Organisation (WMO) Sea State 5. For these purposes, substantial damage is defined as any damage or structural failure that adversely affects the structural strength, performance, or integrity of the Vessel, thereby rendering it inoperable for HKPF missions. The Vessel shall also be able to survive at WMO Sea State 6 if so required. For details of the WMO Sea State Code, please see Annex 8 of this Part VII.

(b) KPP 2: Patrol Speed

The Vessel shall be capable of performing patrol duties under Light Operational Load Condition (as per Paragraph 1.7.2(e) of this Part VII) maintaining speeds of at least thirty five (35) knots in WMO Sea State 3.

(c) KPP 3: Interception Speed

The Vessel shall be capable of transition from patrol to interception speeds of at least forty (40) knots under Light Operational Load Condition (as per Paragraph 1.7.2(e) of this Part VII) in WMO Sea State 2.

(d) KPP 4: Manoeuvrability

The Vessel shall be capable of safe, stable, predictable high-speed manoeuvrability in interdiction missions which involve the engagement of hostile, highly manoeuvrable and recklessly evasive watercraft.

1.2.3 The Contractor acknowledges and agrees that the Government relies on the professional judgment and skill of the Contractor to ensure that the Vessel is compliant with all of the requirements of this Part VII and warrants that it will alter, modify or otherwise change aspects of the Vessel's fittings, fixtures, user interface as required by the Government in order to ensure the ultimate fitness for purpose of the Vessel before the Acceptance Certificate is issued.

1.3 Authorities

1.3.1 The Government New Construction Section (GNC) of the Marine Department (MD) is the section responsible for the procurement of the Vessel for the Government.

1.3.2 Communications Branch (COMMS) is the technical section within the HKPF, which will oversee the Work to be provided by the Contractor in connection with the Communication Equipment and Electronic Navigational Equipment ("ENE") and carry out technical acceptance of the Communication Equipment and ENE on behalf of the Government.

1.3.3 The HKPF is the ultimate user of the Vessel and will carry out the Technical and Operation Acceptance of the Vessel on behalf of the Government.

1.4 Shipyard

1.4.1 The Contractor's nominated shipyard building the Vessel must have the essential shipbuilding and workshop facilities such as lifting gear, hull construction and calibration equipment, machinery installation, calibration equipment and vessel launching or slipping facilities.

1.4.2 The Contractor shall employ a team of professional staff to carry out the design of the Vessel and also carry out supervision and quality control work in the course of Vessel construction.

1.5 Design and Construction Responsibility

1.5.1 The Vessel shall be designed and constructed for a service life of not less than fifteen (15) years under reasonable maintenance.

1.5.2 It is the SOLE responsibility of the Contractor to supply the Vessel which is safe, fit and suitable for the intended operational purposes of the HKPF as set out in Paragraph 1.2.1 above and which meets all relevant regulations and all specifications in this Part VII, which include without limitation requirements for safety, health, environmental protection, hull form design features, structure, method and materials for construction and fitting out, stability, sub-division and operational efficiency.

1.5.3 The Vessel shall be designed and constructed in accordance with the latest edition of the rules and regulations of the Recognised Organisation (RO) specified in Schedule 9. Unless otherwise expressly stipulated in this Part VII, **(a) references to "RO" in this Part VII shall mean the RO as specified in Schedule 9; and (b) references to "RO Requirements" shall mean the requirement of the rules and regulations of the RO as specified in Schedule 9**. Notwithstanding the foregoing, where it is expressly permitted in this Part VII that in relation to a particular requirement, instead of the RO specified in Schedule 9, another RO which is any one of the ROs listed in Paragraph 2.3.4 (a) to (i) may be designated for compliance with the relevant requirement, references to "RO" shall mean such other RO.

1.5.4 The Vessel is required to be issued with a certificate of class with notations, or with a hull construction certificate, by the RO as specified in Schedule 9. All plans, particulars and documentation which are required for the classification of the Vessel, or are required for the issuance of a hull construction certificate, by the RO, in addition to those listed in Annex 3 to this Part VII shall be approved by the RO before submission to MD for endorsement and final approval prior to commencement of work. Any subsequent modifications or additions shall be treated in the same manner. Those drawings which are not required for ship classification approval or for facilitating the issuance of hull construction certificate shall be submitted to MD for approval before work is carried out.

1.5.5 Notwithstanding the submission of the preliminary plans and drawings by the Contractor as part of its tender for the Contract, all plans and drawings of the Vessel except the design stresses and scantling, shall be submitted to GNC for approval before completion of the Vessel design. The design stresses and scantling including internal structural members shall be determined according to the RO Requirements.

1.5.6 The Contractor shall design, build and supply the Vessel in full compliance with the requirements given in this Part VII which, to that extent, may be over and above what is normally required by any statutory and RO's rules and regulations. Should there be any contradiction between the rules and regulations of the RO and this Part VII, this Part VII shall prevail unless GNC stipulates or agrees otherwise.

1.6 Survey and Inspection

1.6.1 Tenderers shall note that the unit price per Vessel quoted in Schedule 1 – Price Schedule in Part V shall be deemed to have included the cost of surveys to be carried out by the relevant RO in respect of that Vessel (if required to be arranged by the Contractor under the Contract).

1.6.2 All electronic items and their installation shall be approved and inspected by COMMS or COMMS representatives as part of the Technical and Operation Acceptance.

1.6.3 Subject to Paragraph 1.6.7 of this Chapter, an advance written notice of not less than ten (10) working days must be given to GNC before the representatives of GNC and other Government officers are invited to conduct a survey visit of the Vessel. The Contractor shall be fully responsible for any delay if the Contractor fails to give adequate notice as aforesaid.

1.6.4 The Contactor shall provide:

(a) an Implementation Timetable, in the form set out in Annex 2 to this Part VII, setting out the major milestones and their scheduled completion dates and incorporating the Delivery Dates specified in Schedule 2 of Part V;
(b) the Drawing Submissions Timetable in the form set out in Annex 3 to this Part VII; and
(c) the Main Items Inspection Timetable in the form set out in Annex 4 to this Part VII.

Each one of the above shall be submitted to GNC for approval upon commencement of the Contract Period.

The Delivery Date(s) for the Vessel as stated in the Implementation Timetable shall be no later than those set out in Schedule 2 of Part V.

Notwithstanding anything in the Contract to the contrary, the Government may suspend payment of any instalment specified in Schedule 3 of Part V of the Contract if any of the timetables required herein has not been submitted for GNC's approval or GNC does not approve any of them or if the progress of work does not comply with any of them as approved by GNC.

1.6.5 A weekly work progress report with photographs evidencing the progress with sufficient details agreed by MD is required to be submitted to MD during the construction of the Vessel. The weekly report shall be submitted before noon of every Monday.

1.6.6 MD may designate consultant(s) from the private sector who will be authorised to represent the GNC in all technical matters including plan approval related to the construction of the Vessel. The Contractor shall cooperate with the consultant(s) and afford unhindered access to the Vessel at all times during working hours, and shall furnish current copies of all drawings, sketches, correspondence, change notices, change orders, test agendas, schedules and other necessary documents where applicable.

1.6.7 After arriving at the site for a survey visit, if the MD officer / consultant considers it is unsafe to carry out the test or inspection, the test / inspection will not be carried out. The Contractor shall arrange another additional survey visit at the Contractor's expense. The Government shall not be responsible for any delay arising from any postponement in conducting the survey visit due to any safety issues as specified in this Paragraph.

1.6.8 Where any fee charge and associated expenses are payable for the services of an RO which are necessary in order to fulfil any obligation of the Contractor under the Contract, the Contractor is responsible for paying the RO all such fees, charges and associated expenses. Such fees shall include charges for drawing approval, surveys (if deemed necessary), issue of certificates, and any other expenses payable to the RO.

1.6.9 The Contractor shall provide office space for MD officers or consultants and representatives of the HKPF during their survey visits and construction progress visits to the Vessel at the shipyard where the Vessel is constructed. The office space shall include, but not be limited to, two (2) desks, four (4) chairs, power supply and one (1) cupboard for storage of documents and working

clothes. The space provided by the Contractor shall also be fitted with air conditioning, have Internet access. Cleaning of the space shall be carried out every working day.

1.6.10 The hours of work of MD officers or consultants and representatives of the HKPF will be arranged to coincide with those of the shipyard, in so far as it is practicable to do so. It is intended that all reasonable steps be taken so that the duties of the MD officers and consultants and representatives of the HKPF can be carried out effectively.

1.6.11 The final survey and inspection visit will be the Pre-Shipment Construction and Handling Inspection as specified in Paragraph 1.6.12 of this Part VII, the purpose of which will be for the Government to satisfy itself that the Vessel is, in all respects, ready for shipment to Hong Kong (if constructed in a place outside the HKSAR) to undergo the Official Sea Trial. This inspection visit may have been preceded by one or more similar visits following which necessary modification work, if required, was completed. The Contractor shall provide GNC with one (1) month's advanced written notice of its readiness to invite the Government to conduct the Pre-Shipment Construction and Handling Inspection or, otherwise, as agreed by the Government.

1.6.12 A Pre-Shipment Construction and Handling Inspection of the Vessel, as detailed in Paragraph 1.7.1 of this Part VII, shall be conducted at sea in the country in which the Contractor has built the Vessel (if the Contractor has built the Vessel in a place outside the HKSAR) to confirm that the construction of the Vessel conforms with the requirements of Clause 2.5 of Part IV, that any outstanding modification work required to be performed under Clause 2.7 of Part IV, Paragraph 1.2.3 of this Part VII or under any provision of the Contract Documents has been completed satisfactorily and that the Vessel does not exhibit any of the characteristics specified at Paragraph 2.10.3 of this Part VII. To mitigate the commercial risk which would result from shipment of the Vessel to Hong Kong and possible subsequent failure of the Official Sea Trial specified in Paragraph 1.7.2 of this Part VII, this Pre-Shipment Construction and Handling Inspection shall include but not be limited to a speed trial conducted by the Contractor under the same conditions as set for the official speed trial specified at Paragraph 1.7.2(f) of this Part VII and also the assessments stipulated in Paragraph 2 in Annex 7 of this Part VII. The purpose is to enable early identification and rectification of undesirable performance, including but not limited to that stated in Paragraph 2.10.3 of this Part VII, before shipment.

1.7 Procedures for Vessel Acceptance

1.7.1 Stage 1 - Pre-shipment Construction and Handling Inspection

(a) Safety of Vessel for Pre-shipment Construction and Handling Inspection

Prior to conducting the Pre-shipment Construction and Handling Inspection, an Inclining Experiment as specified in Paragraph 3.2.4 of this Part VII shall have been carried out and the final lightship weight and centre of gravity shall have been determined and approved by the RO and the GNC. All loading conditions used during the Pre-shipment Construction and Handling Inspection shall be compiled using the approved final lightship weight and centre of gravity and shall meet the intact and damage stability criteria as specified in Paragraphs 3.2.6 and 3.2.7 respectively. Other documentary evidence acceptable to the Government showing that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted.

(b) Handling Assessment of Vessel

On completion of construction and prior to shipping to Hong Kong if the building location is outside of Hong Kong, a Handling Assessment for the Vessel shall be carried out as per requirements and procedures as given in Annex 7 to this Part VII at or near the site where the Vessel is constructed.

(c) Pre-shipment speed trial

Pre-shipment speed trial shall be carried out at or near the site where the Vessel is constructed, and shall be carried out in the presence of GNC officers and HKPF representatives or their appointed agents.

(i) The actual mean speed shall be determined by taking arithmetic mean of four (4) runs, with two (2) runs in each direction. No corrections shall be made due to wind, wave tidal current, shallow water effects and weather conditions.

(ii) The pre-shipment speed trial shall be carried out with the engine power at declared maximum (rated) power specified by the manufacturer under the Light Operational Load Condition as specified in Paragraph of 1.7.2(e) of this Part VII. If the Vessel fails to achieve the Contract Speed stated in Paragraph 2.4.1 of this Part VII, the Government will deem that the Vessel has failed to pass Stage 1 - Pre-Shipment Construction and Handling Inspection.

(iii) The instruments used in measuring the Contract Speed for the pre-shipment speed trial shall be provided either by:

- the Contractor on the conditions that the instrument has been calibrated by a certified body acceptable to GNC and the HKPF; or
- the Global Positioning System (GPS) supplied by the Government; or
- the GPS or Differential Global Positioning System (DGPS) which is properly calibrated (with supporting calibration documents) and installed on board the Vessel is acceptable to GNC and the HKPF; or
- other speed measuring methods acceptable to GNC and the HKPF.

(d) Electronic Navigation Equipment (ENE) items

ENE items to be tested as per Chapter 7 of this Part VII relevant to Pre-shipment Construction and Handling Inspection.

(e) Hull bottom inspection

Upon successful completion of the pre-shipment speed trial and Handling Assessment, the Contractor shall arrange for GNC officers to carry out a hull bottom inspection on the Vessel to check for any hull damage before shipping to Hong Kong. Any hull damage found, if any, shall be rectified at or near the site where the Vessel is constructed.

(f) Condition for proceeding to Stage 2

After meeting all the requirements of this Stage 1 - Pre-shipment Construction and Handling Inspection, the Vessel shall then be shipped to Hong Kong and to proceed to Stage 2 - Official Sea Trial.

1.7.2 Stage 2 - Official Sea Trial

(a) Condition and location of carrying out Official Sea Trial

The Official Sea Trail shall be carried out in Hong Kong in the presence of MD's officers or consultants, and HKPF representatives.

(b) Official Sea Trial programme

The Contractor shall submit an Official Sea Trial programme for MD's approval not less than ten (10) working days in advance of the Official Sea Trial, which shall include details of proposed procedures for carrying out the official speed trial, endurance test, manoeuvring test, crash stop test, astern running test, emergency steering test, ENE items, and other tests

as stated in this Paragraph 1.7 and required by MD and HKPF. This submission shall include the RO approved inclining experiment report as mentioned in Paragraph 3.2.4 of this Part VII and other documentary evidence acceptable to the Government showing that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract.

(c) Cost and expenses for carrying out tests and trial

As in all other tests and trials to be conducted for Vessel acceptance, the Contractor is required to carry out the Official Sea Trial in Hong Kong at its own expense (including the expense of fuel, lubrication oil, crew and other necessary expenses). Before the Official Sea Trial, the Contractor shall observe the certificate of competency and third party insurance requirements under the laws of Hong Kong.

(d) Contractor's staff on board the Vessel during trial

To ensure that the Official Sea Trial can be conducted safely and in accordance with the laws of Hong Kong, the Contractor shall provide the MD with appropriate details about each one of the Contractor's staff who will be on board. These details shall include the name, post, duty, experience and certificate(s) of competency and are to be submitted at the same time as the Official Sea Trial programme specified at Paragraph 1.7.2(b) of this Part VII. The number of persons on board during a particular test or trial shall be agreed by the MD officers and HKPF representative. The location of each person on board (which can affect the centre of gravity of the Vessel under trial) shall also be first agreed by the MD officers and HKPF representative.

(e) Loading conditions for tests and trials

The loading conditions to be used during tests and trials are specified below:

	Operational Load Condition		
	Light	Intermediate	Full
Fuel (minimum)	90%	90%	90%
Crew	2	2	2
Boarding Officers	nil	2	8
Kit	20 kg	40 kg	100 kg
Equipment	20 kg	40 kg	100 kg

All loading conditions being used during the Official Sea Trial shall be compiled by using the approved final lightship weight and centre of gravity, and all such loading conditions shall be meeting intact and damage stability criteria as specified in Paragraphs 3.2.6 and 3.2.7 of this Part VII respectively. Other documentary evidence acceptable to the Government showing that the Vessel is safe to go to sea for the intended tests and trials specified in the Contract shall be submitted.

(f) Official speed trial

As part of the Official Sea Trial, the Contractor shall carry out the official speed trial to determine whether the Contract Speed can be achieved in Hong Kong.

(i) The actual mean speed of the Vessel (i.e. NOT theoretical) shall be measured during the official speed trial runs to determine if the Contract Speed can be achieved. The speed calculations must NOT be corrected by wind, wave, tidal current, shallow water effects and weather condition.

(ii) The actual mean speed shall be calculated as the arithmetic mean of not less than FOUR continuous runs, i.e. TWO runs in each direction. The speed for each run shall be measured by the instruments provided either by:

- the Contractor on the conditions that the instrument has been calibrated by a certified body acceptable to GNC and the HKPF; or
- the Global Positioning System (GPS) supplied by the Government; or
- the GPS or Differential Global Positioning System (DGPS) which is properly calibrated (with supporting calibration documents) and installed on board the Vessel is acceptable to GNC and the HKPF; or
- other speed measuring methods acceptable to GNC and the HKPF.

(iii) The Contract Speed is considered not achieved if the Contract Speed cannot be attained during the official speed trial after a total of FIVE runs in each direction.

(iv) The Contract Speed stated in Paragraph 2.4.1 shall be achieved by the Vessel in the official speed trial with the engine power at the declared maximum (rated) power specified by the manufacturer under Light Operational Load Conditions as specified in Paragraph 1.7.2(e) of this Part VII. If the Vessel fails to achieve the minimum Contract Speed stated in Paragraph 2.4.1 of this Part VII, the Government will deem that the Vessel has failed to pass the Official Sea Trial.

(v) All Equipment shall also be in operation during the Official Sea Trial unless explicitly exempted by MD or the HKPF. This Equipment shall have passed the Pre-shipment Construction and Handling Inspection.

(vi) The information including but not limited to the speed, time of the day, engine running conditions and sea condition shall be properly recorded by the Contractor, and signed as witnessed by the GNC surveyor (or the GNC representatives) and the HKPF during the Official Sea Trial and shall form part of the Official Sea Trial Report. The Official Sea Trial Report shall be submitted to GNC before Delivery Acceptance.

(g) Endurance test

The Endurance Test shall be carried out for different engine loading and speeds to obtain the speed/fuel consumption curves (or tabulated data) for the Vessel, with the engines operating within the manufacturer's recommended engine operating conditions. The test results shall be recorded in accordance with the requirements stipulated in Annex 5 to this Part VII. The report submitted shall include a curve or curves showing ship speed versus propulsion engines' rpm and power, with particulars of the vessel loading and displacement in the test(s).

(h) Manoeuvrability test

Forward turning circle tests to port side, and to be repeated for starboard side, shall be carried out with:

(i) both engines running;
(ii) port engine running; and
(iii) starboard engine running.

The minimum time for turning to port side, and to be repeated for starboard side, at 15°, 90°, 180°, 270° and 360° shall be recorded.

(i) Crash stop test

The minimum time and distance achievable by the Vessel when running from full ahead to stop, and then to full astern shall be determined at the crash stop test without damage to the engines and risk for the crew. The results shall be recorded.

(j) Astern running test

The maximum astern running speed achievable by the Vessel shall be determined by the test. The results shall be recorded.

(k) Emergency steering test

An emergency steering test shall be carried out to ascertain that the Vessel can still be steered satisfactorily when the electrical power supply to the steering system has been disabled. The results shall be recorded.

(l) Electronic Navigation Equipment (ENE) items

ENE items to be tested as per Chapter 7 of this Part VII relevant to Stage 2 - Official Sea Trial.

(m) Hull bottom inspection

Upon successful completion of the Official Speed Trial in Hong Kong, the Contractor shall arrange GNC officers to carry out a hull bottom inspection on the Vessel to check for any hull damage before delivery.

(n) Submission of Official Sea Trial Report

The Contractor shall submit an Official Sea Trial Report to GNC after completion of the tests and trial specified in Paragraph 1.7.2 of this Part VII, the content of which shall include the results of all tests and trials as stated in Paragraph 1.7.2 of this Part VII. The report shall contain information regarding the method of test, engines' running condition, sea, weather and wind conditions, Vessel loading condition, the heeling angles (steady or varying as the case may be) during each forward turning manoeuvre, and any other relevant information as required by GNC or GNC appointed consultant during the tests stated in Paragraph 1.7.2 of this Part VII. Such information shall be prepared in a format to be agreed by GNC.

1.7.3 Stage 3 – Technical and Operation Acceptance

(a) All tests, trials and the experiment as required in this Part VII should all have been conducted as part of the Technical and Operation Acceptance including Pre-Shipment Construction and Handling Inspection of the Vessel as stated in Paragraph 1.7.1 of this Part VII, the Official Sea Trial as stated in Paragraph 1.7.2 of this Part VII, the inclining experiment as mentioned in Paragraph 3.2.4 of this Part VII, the bench acceptance test and on-site commissioning test for ENE as mentioned in Chapter 7 of this Part VII, and all other verification tests to determine whether or not the Vessel including the Equipment has been supplied in accordance with all the specifications set out in these Technical Specifications.

(b) All electronic items and their installations shall be approved and inspected by COMMS as part of the Technical and Operation Acceptance.

(c) The Contractor shall supply all necessary equipment and labour at its own cost for carrying out the tests and trials stated in Paragraphs 1.7.3 (a) and 1.7.3(b) of this Part VII.

(d) If the Vessel cannot pass all of the tests comprising the Technical and Operation Acceptance by the deadline specified in the Contract, the options available to the Government are set out in Clause 12 of the Conditions of Contract and other applicable provisions of the Contract.

1.7.4 Stage 4 – Delivery Acceptance

(a) The Vessel, after its successful completion of Technical and Operation Acceptance shall be delivered at the Contractor's expense to the Government Dockyard.

(b) The RO's certificate of class with notations or the hull construction certificate for the Vessel as specified in Schedule 9 of Part V shall be required before the Acceptance Certificate can be issued by the Government.

(c) The Contractor must demonstrate to MD that all hull construction, outfitting, Vessel stability, machinery, electrical and electronic equipment are in good working order; and must hand over the Vessel, its fixtures and Equipment to MD in good and complete condition.

(d) Documentation required prior to and at Delivery Acceptance shall be in accordance with Paragraphs 8.2.1, 8.2.2 and 8.2.3 of this Part VII.

(e) The Contractor must provide fourteen (14) days advance notice in writing for Vessel delivery when the Vessel is considered to be completed in accordance with the Contract and Ready for Use and to be delivered for the Delivery Acceptance. The Government will not accept delivery if after undergoing the tests and trials in the Technical and Operation Acceptance, the Government does not consider that the Vessel is in Ready to Use condition.

(f) On delivery, the Vessel must be in a clean, tidy and fully fitted and operational condition.

(g) The Delivery Acceptance of the Vessel shall be carried out by GNC in accordance with the terms stipulated in the Contract. The Delivery Acceptance is only completed once the Director of Marine has issued the Acceptance Certificate.

1.8 Warranty Services During the Warranty Period

1.8.1 Notwithstanding and without prejudice to the Contractor's obligation to provide the Warranty Services for the Vessel under the Conditions of Contract, the original copy of the manufacturer's warranty certificates and all related manuals and documents in respect of all the Equipment, valid for twelve (12) months from the date of Acceptance Certificate of the Vessel, shall be delivered to MD upon Delivery Acceptance.

1.8.2 The full scope of the Warranty Services is set out in Annex 1 to this Part.

1.8.3 The Contractor is responsible for arranging the Vessel for Guarantee Slipping commencing at the end of the 12-month Warranty Period. In addition to any defects which the Contractor may be required to fix under Clause 18 of Part IV (Conditions of Contract), the Contractor shall also be responsible for the rectification of any defects found in the course of Guarantee Slipping. The full scope of the Services to be provided as part of the Guarantee Slipping is set out in Annex 1 to this Part.

1.9 Support Services

1.9.1 The Vessel must be designed for through life support and easy maintenance in Hong Kong based on an operation profile and minimum life expectancy as mentioned in this Part VII.

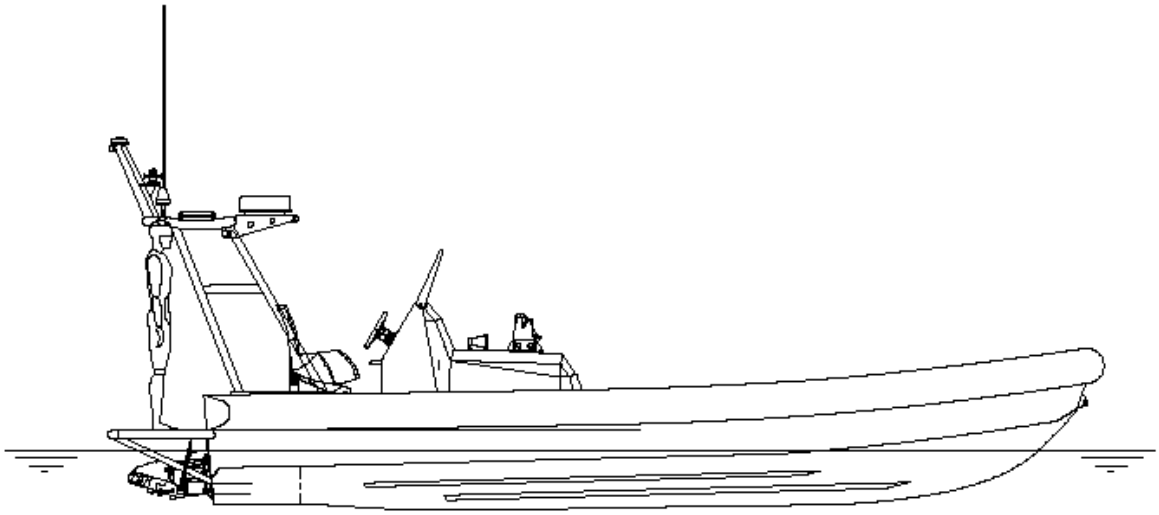
1.9.2 Support and maintenance services must be available (i.e. serviceable) in Hong Kong in respect of all Equipment installed in the Vessel and return of the whole or part of the Equipment to the original place of the manufacturer or supplier shall not be necessary in order to carry out any repair work.

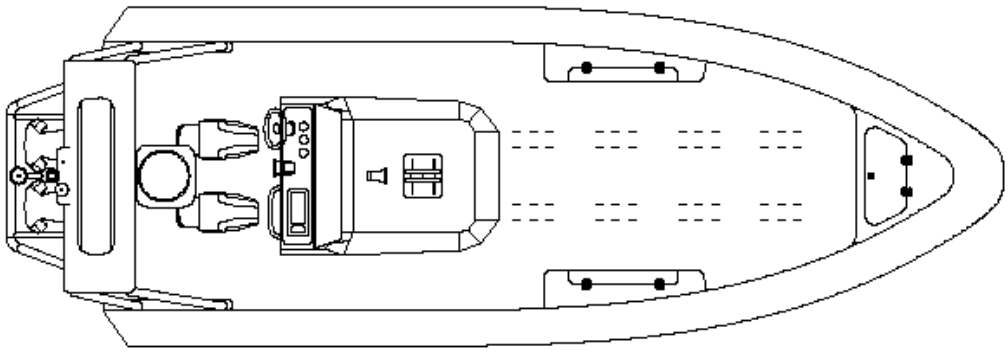
1.10 Asbestos Free

1.10.1 The Vessel must not contain any asbestos or asbestos containing materials. The Contractor must comply with the Hong Kong Air Pollution Control Ordinance (Cap. 311), Part X. The Contractor shall engage a service supplier approved by one of the RO as listed in Paragraph 2.3.4 (a) to (i) of this Part VII to verify that there is no asbestos on the Vessel. An asbestos free certificate or a statement of compliance issued by the service supplier to this effect shall be provided upon delivery of the Vessel.

Chapter 2 - General Technical Requirements

2.1 Conceptual General Arrangement Plan





2.2 General Provisions

2.2.1 Without prejudice to the generality of Chapter 1 of this Part, this Chapter contains the more particular technical specification for the Vessels. The significance of Essential Requirements is explained in Paragraph 1.1 of Chapter 1 of this Part VII.

2.2.2 The work to be done under this Contract consists of the design, construction, outfit, testing and delivery of ten (10) Deep Bay High Speed Craft (Vessel) for the HKPF. Workmanship, functions, characteristics and performance shall be in accordance with this Part VII, best marine construction practices, and the regulatory standards herein specified or otherwise applicable.

2.2.3 The Contractor is required to exercise its professional expertise and knowledge to come up with an appropriate design for the Vessel which can comply with all requirements of the Contract. The Conceptual General Arrangement Plan shown in Paragraph 2.1 of this Part VII only serves as a guidance and reference drawing to help explain the requirements stated in this Part VII.

2.2.4 ALL the machinery, equipment and facilities, furniture (if applicable), fixtures and fittings, including outfitting of the Vessel that are described in this Part VII, together with their requirements for design and installation standards that are stipulated in this Chapter and in any other parts of this Part VII, are the items that must be included in the complete "As-built" Vessel delivered to the Government.

2.2.5 The Vessel will be required to take part in security, anti-terrorism, counter-terrorism and other confidential operations involving specialist kit and equipment, details of which cannot be made public. Therefore, detailed information pertaining to the design requirements for certain storage, mounting and/or installation of such specialist equipment will only be made known to the Contractor at the kick-off meeting. Such specialist equipment would not influence ship lines, hull form nor unduly alter centre of gravity.

2.2.6 The Vessel shall have self-righting ability by using inflatable bag. After self-righting, the Vessel shall be able to use its own power to return to the nearest safe haven. Please refer to Paragraph 3.5 of this Part VII for details.

2.3 Rules and Regulations

2.3.1 The Vessels shall be designed and constructed in accordance with the latest edition of the rules and regulations of the RO acceptable to MD. For each and every Vessel, design approval and survey during construction shall be carried out by the RO, and examinations and tests shall be witnessed by the RO. Either a hull construction certificate or a full Classification Certificate shall be provided for each and every Vessel on delivery. [E]

2.3.2 With reference to machinery, systems and fire protection, the Vessel shall be provided with specific equipment for managing the fire risks.

2.3.3 Service and navigation notations, if assigned by the RO to the Vessel as shown in the Classification certificate, shall be in line with the operational requirements stated in this Part VII.

2.3.4 Without prejudice to the general requirement that the Contractor shall perform all Work in full compliance with all applicable laws and regulations, and in full compliance with the requirements of the Contract including this Part VII, the construction of the Vessel must comply with the requirements of the RO specified in Schedule 9 or the requirements of any of the RO listed below (where it is expressly specified in this Part VII in relation to a particular requirement, another RO which is any one of the ROs listed in sub-Paragraphs (a) to (i) below may be designated for compliance with the relevant requirement), and also the requirements further specified in sub-Paragraphs (j) to (o) below:

(a)	American Bureau of Shipping	ABS
(b)	Bureau Veritas	BV
(c)	China Classification Society	CCS
(d)	Det Norske Veritas Germanischer Lloyd	DNVGL
(e)	Korean Register of Shipping	KR
(f)	Lloyd's Register of Shipping	LR
(g)	Nippon Kaiji Kyokai	NK
(h)	Registro Italiano Navale	RINA
(i)	Russian Maritime Register of Shipping	RS

and other entities as specified below:

(j) International Electrotechnical Commission (IEC) Regulations for the Electrical and Electronic Equipment.

(k) International Telecommunications Union recommendations in the International Radio Regulations (ITU-R).

(l) Quality and standards of the welding shall comply with the rules of one of the ROs listed in sub-Paragraphs (a) to (i) above or American Welding Society (AWS) or other applicable international standards or rules.

(m) International Regulations for Preventing Collisions at Sea 1972, as amended by International Maritime Organization (IMO) Resolution A464(XII) and A626(XV).

(n) ISO 12215-4 “Small craft – Hull construction and scantlings – Part 4 Workshop and manufacturing”.

(o) All equipment/fittings shall be designed and manufactured to at least the standards as specified in these Technical Specifications. If none of the rules and regulations in Paragraphs 2.3.4(j) to (n) above are applicable, then the applicable standards specified by the applicable organisations below shall be complied with:

BSI	British Standards Institute
GB	Standardization Administration of the People’s Republic of China
IEEE	Institute of Electrical and Electronic Engineers
ISO	International Organization for Standardization
JIS	Japanese Industrial Standards

In the event of any inconsistency amongst the above requirements, rules and standards, those mentioned in sub-Paragraphs (j) to (o) shall prevail over the requirements of the relevant RO as listed in sub-Paragraphs (a) to (i) above.

2.4 Contract Speed

2.4.1 When all of the engines are running at their declared maximum (rated) power, the guaranteed minimum highest achievable speed of the Vessel shall be 40 knots in WMO Sea States 0 to 2 under Light Operational Load Condition specified in Paragraph 1.7.2(e) of this Part VII. [E]

2.4.2 The Contract Speed prescribed above shall be achieved without porpoising, or other dynamic instabilities as stated in Paragraph 2.10.3 of this Part VII. The waterjet units selected shall match the engine profile and minimising cavitation.

2.5 Principal Dimensions

Length Overall (LOA):	7.0 to 8.5 metres (to be measured from bow to waterjet including the foam collar as described in Paragraph 3.8 of this Part VII)	[E]
Breadth:	Not more than 3.2 metres at maximum beam including the foam collar as described in Paragraph 3.8 of this Part VII	[E]
Draft (extreme) when vessel is stationary:	Not more than 0.6 metres in light operational load conditions stated in Paragraph 1.7.2(e) of this Part VII	[E]
Deadrise Angle:	Not less than 20 degrees at transom Not less than 24 degrees at midship	[E]

2.6 Material of the Structure

2.6.1 Material of hull structure shall be marine grade aluminium alloy. [E]

2.6.2 Plate material shall meet the requirement of EN AW 5083 or equivalent.

2.6.3 Profile material shall meet the requirement of EN AW 6082 or equivalent.

2.7 Vessel Operating Profile and Environment

2.7.1 The Vessel shall be designed to have sufficient space for carrying at least six (6) seated persons and four (4) standing or seated persons. Shock mitigating seats for two (2) crew and four (4) officers shall be provided with the Vessel as per Paragraphs 3.7.4, 3.7.5 and 3.7.6 of this Part VII. [E]

2.7.2 The Vessel shall be designed for deployment by the HKPF on at least 300 days per year including both day and night time operational deployment. The Vessel shall be designed and built to operate in Hong Kong Waters.

Summary of Operational Hours / Range

(a) Number of hours/day:	12 hours engine running time per day	
(b) Number of days/year:	300 days/year	
(c) Endurance for fuel capacity:	Sufficient fuel for 2.0 hours at Contract Speed or 2.5 hours at patrol speeds (as per Paragraph 1.2.2(b) of this Part VII) at the Light Operational Load Condition (as per Paragraph 1.7.2(e) of this Part VII) without refuelling	[E]

2.7.3 The Vessel shall be able to operate (fulfil its operational roles) safely within Hong Kong Waters, including in swamps and rough sea conditions up to and including WMO Sea State 5 and to survive WMO Sea State 6 while returning to base.

2.8 Markings and Colour Scheme

2.8.1 (a) The Contractor shall provide the markings and colour scheme for the Vessel. All painting colour scheme for the Vessel and fittings shall be approved by GNC before application.

(b) Draft marks, names, insignia and other colour markings should be in a colour contrasting with the hull and console's colour. [D]

2.8.2 All labelling shall be in both traditional Chinese and English and as per applicable rules and regulations.

2.8.3 The Vessel's name shall be marked permanently on both sides of the console of the Vessel. Details of the size and calligraphy shall be confirmed by the HKPF.

2.8.4 Draft marks shall be permanently provided at the port and starboard of stem and stern. Draft marks shall be in Arabic numerals 100 mm high and shall be measured from the underside of the keel to the underside of the number markings. A draft mark plan shall be produced by the Contractor and agreed by GNC before the draft marks are permanently marked onto the hull surface.

2.8.5 All labelling, stencilling and marking (not limited to the hull but including all aspects of the Vessel) shall be made on separate plaques, boards or labels attached to the structure. By default all displays, control actuators, electric switches, valves, and other equipment shall be labelled to indicate their type and function as appropriate.

2.8.6 Safety markings designed to prevent persons from tripping on board the Vessel shall be provided where necessary.

2.9 Tally Plates

2.9.1 The following information shall be displayed on the builder's plate:

(a) Builder's name;
(b) Vessel's name;
(c) Year of build; and
(d) Maximum number of persons including the crew that the Vessel is designed to carry.

2.9.2 Tally plates in both English and traditional Chinese characters shall be fitted for all spaces and all equipment as required by MD including but not limited to:

(a) Equipment in the console;
(b) Electrical and communication equipment;
(c) Air vents and filling pipes for the fuel oil tanks;
(d) All valves, equipment on deck;
(e) Control panels, switchboards, distribution boxes and electrical circuits; and
(f) Any other equipment/fitting as required.

Information engraved on the tally plates shall include: service, function, mode of operation, source of power, fuse rating, voltage, warning and other information as required by MD.

2.9.3 Tally plates exposed to weather shall be made of durable and weatherproof material and be fastened securely.

2.9.4 All cable termination shall be identified clearly for disconnection and reconnection.

2.10 Other Design Features

2.10.1 The berthing requirements of the Vessel shall match the designated points of berth at the Government Dockyard and the Marine Police operational bases.

2.10.2 Permanent ballast can only be used as agreed by GNC.

2.10.3 The Vessel shall perform at all speeds in WMO Sea States 0 to 2 without the following characteristics:

(a) chine walking;

(b) porpoising;

(c) loss of horizon (meaning that the view of the horizon forward of the bow of both the coxswain and the commander both in the seated and standing positions at the console shall not be obstructed by the bow of the Vessel at any time);

(d) loss of directional control;

(e) permanent list; and

(f) engine strain and/or cavitation manifested by engine overspeeding.

2.10.4 The Vessel's deck shall be of a flush design free of trip and snag hazards for both seated positions and areas where officers may be required to move around. Where seats and other fixtures and fittings are removable, the requirement for a design which is free of trip and snag hazards shall apply whether the seats and other items are fitted to the Vessel or not.

Chapter 3 - Hull

3.1 Hull Construction and Scantlings

3.1.1 The hull shall be a continuous deep "V" with minimum deadrise angles of twenty (20) degrees at the transom and twenty-four (24) degrees at midship, with suitable appendages or other design features to minimise potential "side-kick" or "skidding" effects during high-speed manoeuvring. Stepped hull designs will not be accepted. [E]

3.1.2 The hull configuration specified at Paragraph 3.1.1 of this Part VII shall not incorporate a horizontal flat area at the keel unless the design also incorporates additional appropriate features to prevent "side-kick" or "skidding" during high speed manoeuvres.

3.1.3 The strength of the hull structure shall be calculated based on the vertical acceleration at the longitudinal centre of gravity (LCG) being equal to or greater than 6g where g is the gravitational force while fulfilling the Contract Speed specified in Paragraph 2.4.1 of this Part VII. [E]

3.1.4 The design stresses and scantling including internal structural members shall be determined according to the RO Requirements.

3.1.5 The Contractor's quality control personnel shall carry out quality control throughout the construction of the Vessel. Inspection shall be carried out by the RO's surveyors and MD assigned personnel or consultants.

3.1.6 Any openings in the hull and the deck shall comply with the applicable RO's rules for watertight integrity if not otherwise specified by MD or the HKPF at or prior to the kick-off meeting.

3.1.7 The hull design shall incorporate a self-bailing deck with scuppers capable of draining the cockpit in accordance with the ISO 11812:2001 Small Craft – Watertight Cockpits and Quick-Draining Cockpits requirements for Design Category B or as per the RO Requirements.

3.1.8 The hull design shall incorporate reinforcement at the keel for conducting beach landing operations. [E]

3.1.9 The hull shall be fitted with appropriate sacrificial anodes.

3.1.10 The hull construction material shall be new and of a type which has been certificated by the RO in accordance with the RO Requirements. Mill certificates shall be obtained and records shall be strictly maintained to match them with the various sections produced during Vessel's manufacture.

3.1.11 Welding and Fabrication

(a) All welding and fabrication shall be implemented according to the applicable requirements of any one of the Classification Societies listed in Paragraph 2.3.4 (a) to (i) of this Part VII.

(b) Welded joints shall be designed and constructed carefully to conform to the latest established standards to prevent fatigue failure. Cutting for edge preparation shall be performed by qualified persons to achieve the correct angle, shape and smooth finish of the edges. Only qualified welders shall perform the welding work.

(c) The Contractor shall submit certification of the qualifications of each individual welder and inspector. Welds installed using unqualified procedures or welding performed by non-certified welders shall be subject to removal by the Contractor at its own expense.

(d) The structure fabrication and quality control regime shall include but not be limited to the following:

(i) Inventory of incoming material, consumables, components and machinery;

(ii) Traceability procedures for materials together with traceability identification codes which shall be serial and indexed to the controlled manufacturing procedures;

(iii) Lofting, cutting, fit up, welding, forming and dimensions of structural components;

(iv) Welding and inspection procedures identifying clearly the type and extent of NDT inspection carried out on the Vessels' structure. Normally, not less than 10% of the structure shall be subjected to Ultrasonic Test (UT) and Radiographic Test (RT);

(v) Machining, measuring and inspection equipment maintenance and calibration;

(vi) Finish surfaces and bolting;

(vii) Procedures for non-conformance reporting and rectification of defects; and

(viii) Design and manufacturing drawing control and procedures for revisions, updates and reissue of drawings.

3.2 Stability

3.2.1 The offered Vessel shall meet the stability requirements of the IMO's Intact Stability Code given in MSC.267(85) (as amended) or ISO 12217-1 Category B or as per stability requirements of the RO, and Paragraph 3.2 of this Part VII. [E]

3.2.2 The Vessel is required to comply with the intact and damaged stability requirements stated in this Part VII.

3.2.3 Final stability calculations of the sea trial loading condition using final lightship data shall be delivered to MD prior to conducting the tests and trials mentioned in Paragraph 1.7 of this Part VII. All calculations and drawings must be in metric units.

3.2.4 Inclining Experiment

(a) At least 14 working days in advance of the inclining experiment, the Contractor shall submit a "Scheme of Inclining Experiment" which includes:

(i) the Vessel's intended condition during the inclining experiment with intact stability results, including surplus and missing weights, and their centre of gravity;

(ii) the proposed locations and movements of inclining weights;

(iii) the calculation of estimated metacentric height, heel and trim of the Vessel before and during the inclining experiment;

(iv) the proposed number, location and lengths of pendulum used;

(v) hydrostatic table and tank capacity tables. The increment of draft shall be every 5 mm in the hydrostatic table and the increment of sounding shall be every 5 mm in the capacity tables; and

(vi) the list of data to be measured (i.e. drafts, specific gravity of floating water).

(b) The inclining experiment shall only be conducted:

(i) after the "Scheme of Inclining Experiment" has been approved by the RO surveyors and the MD officers; and

(ii) in the presence of RO surveyors and MD officer(s) and/or appointed consultant.

A request for attendance shall be made at least five (5) working days in advance. The lightship weight and centre of gravity shall be calculated and presented in the inclining experiment report. The GM of the Vessel after each and every shift of inclining weights shall be determined. All spaces and tanks should be kept dry, or tanks being pressed up with the intended liquid. Free surface of liquids remaining on board shall be taken into account.

(c) This inclining experiment report shall be submitted to and approved by the RO. The report must include a statement from the Contractor stating that the Vessel shall be safe to go to sea for the intended sea trials specified in the Contract. No sea trials shall be conducted until MD, based on the information given in the inclining experiment report, agrees that it is safe to carry out sea trials.

(d) The first (1st) and the sixth (6th) Vessel (i.e. Item 1 and Item 6, as referred to in Schedule 1 of Part V respectively) shall be inclined to determine the final lightship data by carrying out the inclining experiment. For the other Vessels (i.e. Items 2 to 5, and Items 7 to 10, as referred to in Schedule 1 of Part V), lightship measurement shall be carried out to determine the lightship weight and LCG. If the lightship weight and LCG as measured deviate from those of the Vessel most recently inclined by more than 2% of weight or 1% of LCG, inclining experiments for such other Vessels shall be carried out.

3.2.5 Stability Information Booklet

(a) The Contractor shall supply to MD three (3) copies of the Stability Information Booklet. The final version of the Stability Information Booklet must be submitted to MD at the time of Delivery Acceptance.

(b) The final version of the Stability Information Booklet shall include:

(i) the Vessel's particulars, a sketch of the general arrangement drawing showing different compartments and tank positions, hydrostatic curves and cross curves;

(ii) tank calibration/sounding tables, including but not limited to the fuel oil tank(s). These tables shall consist of the locations of tanks (in terms of frame numbers), the levels from tank bottom, the capacities, the VCG/LCG/TCG and free surface moments, and the location of sounding points. The trim and heel of the Vessel where these tables are applicable shall be stated;

(iii) a stability calculation for each loading condition (as stated in Paragraph 3.2.5(c) of this Part VII) which shall include but not be limited to a profile drawing of the Vessel and items of deadweight, lightship, displacement, drafts, trim, VCG, GM (solid & fluid), LCG, down-flooding angle and statistical stability curve, etc.;

(iv) any other information as reasonably required by the RO and/or MD;

(v) the inclining experiment report approved by MD and the RO; and

(vi) the lightship weight measurement report as approved by MD and the RO.

(c) Loading Conditions in the Stability Information Booklet

(i) The maximum free surface moments shall be used for calculating the stability of the Vessel in all of the following conditions.

Loading conditions		Fuel oil	Supplies & Equipment	Persons and Effects
(1)	Lightship	Nil	Nil	Nil
(2)	10 persons plus cargo Departure Condition	98%	75 kg	1025 kg (2 crew, 8 passengers, plus effects)
(3)	10 persons plus cargo Arrival Condition	10%	75 kg	1025 kg (2 crew, 8 passengers, plus effects)
(4)	4 persons plus cargo Departure Condition	98%	650 kg	410 kg (2 crew, 2 passengers, plus effects)
(5)	4 persons plus cargo Arrival Condition	10%	650 kg	380 kg (2 crew, 2 passengers, plus effects)
(6)	Light Load Departure Condition	98%	0 kg	205 kg (2 crew plus effects)
(7)	Light Load Arrival Condition	10%	0 kg	205 kg (2 crew plus effects)

(ii) The weight of each person shall be assumed to be 82.5 kg, and effects per person to be 20 kg.

(iii) The VCG of each person shall be assumed to be 300 mm above the seat when seated, and 1000 mm above the deck when standing. The seated or standing position, and LCG of each person, shall be in their most likely position on board.

(iv) The weight of the supplies and equipment as stipulated in Paragraph 3.2.5(c) of this Part VII shall be evenly distributed along the deck and the VCG of the additional payload will be assumed to be 500 mm above deck.

(v) In addition to Paragraph 3.2.5(c)(i) above, the Contractor shall provide a pair of departure and arrival loading conditions for reference purpose in case of emergency situations. This pair of loading conditions shall demonstrate the maximum possible number of persons that the Vessel is capable of carrying while complying with the intact and damage stability criteria as given in Paragraphs 3.2.6 and 3.2.7 of this Part VII. The pair of loading conditions should have 2 crew members, no cargo and the maximum number of survivors (each assumed to be weighing 82.5 kg), with 98% fuel at departure, and 10% fuel at arrival.

3.2.6 Intact Stability Criteria

(a) Stability will be considered satisfactory for the loading conditions set out in Paragraph 3.2.5(c)(i) above if, after taking free surface effects, the following criteria are complied with:

(i) The intact stability criteria stated in Part A Chapter 2 of the Intact Stability Code as specified in MSC.267(85) as amended; or

(ii) The criteria specified in ISO 12217-1 for Category B vessels; or

(iii) As per stability requirements of the RO.

(b) Provided that the Vessel complies with the RO's rules and regulations governing stability, the Vessel shall be deemed to have met the requirement stipulated in Paragraph 3.2.6(a) above.

3.2.7 Damaged Stability Criteria

Transverse bulkheads shall be arranged to contain flooding of any one watertight compartment between the adjacent watertight transverse bulkheads, and asymmetric flooding due to damage of any smaller watertight spaces located within the compartment between the adjacent watertight transverse bulkheads. The residual stability shall be sufficient to maintain the Vessel afloat with the pre-damage payload on board in case of damage.

N.B.: Irrespective of whether the RO has requirements for damage stability or not, the Contractor shall obtain the agreement of the RO and GNC on the opening(s) to be used to determine the down flooding angle.

3.3 Painting

3.3.1 Paints shall be of a fire-retardant marine quality and be applied in accordance with the manufacturer's specification.

3.3.2 The volatile organic compound (VOC) content limits of the paints shall comply with the Hong Kong Air Pollution Control (Volatile Organic Compounds) Regulations CAP 311W.

3.3.3 The Painting Schedule shall be submitted for approval of MD before commencement of work. The proposal shall contain a list and the detailed specification of the paint intended to be used. Thickness of each coating shall be specified.

3.3.4 The Contractor shall guarantee all painting work for one (1) year against defects in material and workmanship. At Delivery Acceptance the Contractor shall provide MD with a letter of certification from the paint manufacturer signed by coating inspectors of NACE Level 2 or FROSIO Level III qualification, to certify that the paint was applied under the paint manufacturer's quality control and in accordance with the manufacturer's requirements including but not limited to the surface preparation (blasting profile and water soluble salt content), surface temperature of the metal surfaces above dew point, atmospheric conditions, (temperature and relative humidity), dry film thickness and method of application.

3.3.5 A Tributyltin (TBT) free fouling-release/anti-fouling paint shall be applied on the exterior of the hull below the water line to provide at least two years' protection against marine growth. A TBT free certificate issued by the paint manufacturer shall be submitted before the Delivery Acceptance. The fluoropolymer foul release coating / antifouling paint (e.g. Intersleek 1100SR or equivalent) shall comply with the International Convention on the Control of Harmful Anti-Fouling Systems on Ships.

3.3.6 All deck areas shall be covered with hard wearing and anti-slip epoxy paint.

3.3.7 A painting report shall be submitted to MD upon completion of work.

3.3.8 Surfaces that require painting shall be fully prepared and pre drilled prior to painting.

3.3.9 All fastening preparation and other penetrations shall be complete before painting of any surface.

3.3.10 All surfaces and any parts of the hull, deck or machinery, fittings that may cause glare or reflection must be matte powder-coated.

3.4 Operational Console

3.4.1 The offered Vessel shall have an operational console (the console). The layout of the console shall be submitted for MD's approval before any construction work on the console commences. To facilitate the efficient visualisation and inspection of the design of the console, a full size mock-up console complete with deckplate, seats, mounting systems and any other fixtures that may influence the final design of the console are to be manufactured for inspection, modification (if necessary) and confirmation by MD and the HKPF. The mock-up console may also be used for the purposes specified in Paragraph 7.1.3 of this Part VII. The console of an existing craft may be used as the basis for initial discussions.

3.4.2 The Console

(a) The console shall be designed to deflect wind up and over the heads of the coxswain and the commander in both the seated and standing position and to house the equipment required by the coxswain and the commander to control/monitor the Vessel.

(b) The console shall be ergonomically designed to fit a coxswain of Asian stature (approximately 1.64 metres in height), with the controls and displays in immediate reach or view from both a seated and standing position and the craft can be operated for extended periods. The crew shall also be provided with an unobstructed view over the console and bow from a seated as well as a standing position.

(c) The layout of the controls and displays shall be designed to ensure that the coxswain has an unobstructed view from both seated and standing positions.

(d) The controls or displays of the following equipment shall be installed in the console and located in front of the coxswain in natural positions, with the highest priority devices being located in prime positions. All controls and displays shall be operable when wearing normal Marine Police uniform with foul weather gear, bullet resistant vest and lifejacket.

(i) Helm;

(ii) Engine throttle/Waterjet control head;

(iii) Trim control selector panel (for steerable sterndrive version);

(iv) Engine monitoring display panel;

(v) Engine start control;

(vi) PA/Loudhailer control unit and microphone;

(vii) A magnetic compass fitted with an independent dimmer switch, installed on the top of the console in line with the coxswain's line of sight dead ahead;

(viii) Radar and electronic chart display;

(ix) Engine monitoring display panel;

(x) Electric horn;

(xi) Siren and flashing beacon control panel;

(xii) Navigation lights, search lights and flood lights switch panel as appropriate;

(xiii) Satellite compass electronic digital display unit;

(xiv) Fuel tanks level gauge; and

(xv) Radio communication controls and microphone as appropriate.

3.4.3 The controls, displays and equipment

(a) All the controls, displays and equipment shall be waterproof, shockproof and suitable for external marine use.

(b) All indication lights, illumination of instrumentation gauges and panel lighting shall be fitted with dimmers for day and night operation.

(c) The flat surfaces between controls, displays and equipment shall be coated in a rubberised, matt black coating suitable for the marine environment. Details of the rubberised coating required will be discussed at the kick-off meeting.

(d) Lockers shall be provided as far as possible, if space permits, to allow for the watertight storage of items of police equipment. The console and locker(s) shall be designed to ensure easy access for the maintenance and repair of equipment mounted, installed or stored therein. Details to be discussed at the kick-off meeting.

(e) The arrangement shall be designed to protect the crew and persons on board from injury inflicted by the console and the equipment installed in it.

(f) Sufficient legroom shall be provided to obviate the risk of impact injury during rough weather or violent manoeuvres in both the seated and standing positions.

(g) A waterproof black/grey cover shall be provided to cover the console down to deck level when the Vessel is not in use.

3.5 Self-Righting/Aerial Mounting Frame

3.5.1 The Vessel shall be provided with a self-righting system mounted on a frame at the stern of the Vessel, which incorporates an inflatable bag with a heavy-duty coated fabric cover and a CO_2 bottle. In the event that the Vessel capsizes, this self-righting system shall be capable of being activated automatically through a hydrostatic release and manually by pulling a release handle. The system shall be dimensioned so that it is capable of righting the Vessel at the Light Operational Load Condition as stipulated in Paragraph 1.7.2(e) of this Part VII.

3.5.2 The self-righting system mounting frame shall be positioned so that the head of a crew member standing at the stern of the Vessel shall not coming into contact with the frame during passage in heavy sea conditions.

3.5.3 The self-righting/aerial mounting frame shall be detachable and designed to minimise wind resistance.

3.5.4 The self-righting/aerial mounting frame shall be a strong and rigid structure to support the self-righting gear, lightning arrestor, navigation lights, search light and other electronic and navigational equipment as appropriate.

3.5.5 The self-righting/aerial mounting frame shall be provided with all necessary fittings including but not limited to brackets for all navigation lights and lightning arrestor as per the Conceptual General Arrangement Plan shown in Paragraph 2.1 of this Part VII.

3.5.6 All hardware such as screws, hooks, hasps, hinges, handles and sliding bolts shall be made of stainless steel or corrosion resistant material with galvanic protection between contacts with the aluminium hull.

3.5.7 The self-righting/aerial mounting frame shall not cover or be attached to the console and shall not obstruct operations at the coxswain or commander positions.

3.5.8 The design of the mounting frame, self-righting system and aerial positions shall be discussed at the kick-off meeting, and shall be submitted to the HKPF and MD for approval.

3.6 Lockers/Void Spaces

3.6.1 Lockers / Void Spaces

(a) A demountable pyrotechnics box (about 37 cm x 23 cm x 24 cm internally) with internal partitions fitted with rubber padding for the storage of a signal pistol (26 cm x 17 cm x 5 cm) and pyrotechnics (10 x cartridge of diameter 3.1 cm x 8 cm and 2 x cartridge of diameter 5 cm x 28 cm) shall be installed onboard and be accessible by the crew from a seated position. The box shall not obstruct the crew's operations or field of visions. This box shall be of a rigid construction, impact resistant, shockproof, waterproof and buoyant.

(b) Four watertight lockers (each with approximate internal measurements of 95 cm long x 30 cm high x 20 cm wide) or other watertight storage acceptable to the HKPF shall be provided. This storage shall be designed to be installed on the deck track railing attachment system specified at Paragraph 3.7.7 of this Part VII.

(c) The location and dimensions of lockers or other storage acceptable to HKPF for arms, ammunition, bullet resistant vests and helmets, night vision equipment and assorted stores shall be discussed at the kick-off meeting and agreed by the HKPF.

(d) Lockers or other storage acceptable to the HKPF shall be provided for one emergency tool kit.

3.6.2 Air pipes shall be fitted to all tanks, cofferdams, void spaces, tunnels and other compartments which are not fitted with alternative ventilation arrangements.

3.6.3 The design of lockers or other storage acceptable to the HKPF, or void spaces and their mounting facilities, shall be approved by MD and the HKPF during the kick off meeting. Lockers or other storage shall be ready in the mock-up for inspection before finalisation.

3.7 Deck, Seating and Attachment Systems

3.7.1 High quality shock-mitigating seats, anti-vibration deck covering and handrails shall be provided to reduce the risk of impact injury and long-term health damage to both crew and boarding officers resulting from the harsh maritime environment in which the Vessel will operate.

3.7.2 The seats shall be designed to prevent occupants from falling or being thrown onto the deck or overboard, to optimise body posture thereby minimising the potential for spinal or other injuries and to mitigate the potentially harmful forces to which the Vessel and crew conducting the type of operations specified in Paragraph 1.2.1 of this Part VII according to the operational profile specified in Paragraph 2.7 of this Part VII may be subjected.

3.7.3 Basic requirements of the seats:

(a) Specifically designed for use aboard small, high-speed marine craft at 40 knots or above;

(b) Material of the structure: Titanium, stainless steel and/or aluminium alloy;

(c) Materials of upholstery: Water resistance materials such as fire retardant foam/reinforced nylon laminated neoprene/heavy duty cordura laminate.

(d) Protective covers: Covers shall be supplied to protect all of the seats from rain and ultraviolet radiation when not in use.

3.7.4 Two (2) damping seats shall be provided immediately aft of the console for the coxswain and the commander. These seats shall be designed with progressive damping, with adjustable shock absorbers for light/heavy personnel, and safety harness. A footrest for use when seated shall be attached to the console in front of each seat. A drop-down seat base is an option being considered.

3.7.5 Two (2) damping twin jockey seats with front handholds shall be provided.

3.7.6 The seats mentioned in Paragraphs 3.7.4 and 3.7.5 above shall be capable of progressive damping travel, manual height adjustment as well as fore and aft adjustment and be mounted in a manner which will enable them to be removed, repositioned or replaced. Further specifications shall be discussed at the kick-off meeting and agreed by the HKPF.

3.7.7 A recessed track railing attachment system consisting of a single pair of flush fitting seat mounting rails shall be fitted, if space permits, on the foredeck immediately in front of the console and extend forwards to allow for the temporary installation of seating and stores tie-down points if required.

3.7.8 All areas of the deck shall be covered by shock/vibration mitigating material or equivalent in such a manner that the removal of any of the shock-mitigating seating specified at Paragraphs 3.7.4, 3.7.5 and 3.7.7 above will result in a flush surface free of trip or snag hazards.

3.7.9 Suitable handrails and grips, coated with appropriate anti-slip material, shall be provided at the console and at other locations around the Vessel to enable operators to move safely around the Vessel at all times.

3.7.10 All flat, horizontal surfaces above deck level where personnel may step such as gunwales and bow boarding platform shall, if practicable, be coated with an appropriate anti-slip material.

3.7.11 The designs of the fixtures, fittings and finishing specified at Paragraph 3.7 of this Part VII shall be discussed during the kick-off meeting and drawings shall be submitted to GNC and HKPF within one month from the date of the kick-off meeting for approval.

3.8 Foam Collar

3.8.1 A closed cell polyethylene foam collar such as ethafoam 220E or equivalent shall be fitted to cover the full length of the port and starboard sides for hull protection. The foam collar shall be protected by a reinforced cover.

3.8.2 The collar shall be detachable but tightly affixed to the hull and flush with the sheerline. The method of attachment may be by adhesive recess belts, a track system, bolting or other non-adhesive mechanical means agreed by the Government Representative. The design shall ensure that the collar cannot become detached or slide aft as a result of wave action or other unintended external influences.

3.8.3 The collar must be clear of the water when planing at Full Operational Load Condition as per Paragraph 1.7.2(e) of this Part VII.

3.8.4 The collar shall be resistant to impact, abrasion, outdoor temperature extremes, degradation caused by ultraviolet radiation, ozone and contact with seawater, oil, petrol, diesel, lubricating oil or chemicals. The testing of the foam-filled material shall comply with IMO MSC 81(70) as amended and ISO 6185-4 or other international standards or rules acceptable to the MD and the RO.

3.8.5 The bow section of the Vessel shall be fitted with additional protection consisting of a tied down sacrificial covering with recessed tie-down points on the bow deck and stem. Details of the design and the dimensions of the collar shall be discussed at the kick-off meeting and submitted to the MD for approval before the completion date stipulated in Annex 2 to this Part VII.

3.8.6 Detachable swimmer grab strips/lines shall be provided along the sides of the Vessel at intervals of about one metre. These shall be attached either at dedicated points or to grab/safety rails of sufficient strength. Stowage for these lines shall be provided when not attached to the Vessel.

3.8.7 Mounting points shall be provided at an appropriate location along both of the Vessel's sides to which the HKPF's 710 mm wide FRC 710 Jason's Cradle may be affixed to assist in the recovery of unresponsive persons from the water. Details of the design shall be discussed at the kick-off meeting and submitted to the MD for approval before the completion date stipulated in Annex 2 to this Part VII.

3.8.8 The collar shall incorporate a survivor recovery cutout abaft the beam on both the port and starboard sides to facilitate the safe and efficient recovery of a person in the water by on board crew members. The height of the lower edge and the width of this cutout shall be appropriate for its function and discussed at the kick-off meeting.

3.8.9 Details of the design and dimensions of the collar shall be discussed at the kick-off meeting and shall be submitted to MD for approval before the completion date stipulated in Annex 2 to this Part VII.

3.9 Bow

3.9.1 A bow sheer deck boarding platform at a height flush with the top of the side sheet and collar system, with steps leading up to it, shall be provided at the bow to facilitate embarkation and disembarkation. The void cuddy space under this platform shall be enclosed and designed for watertight storage. Details of the design shall be discussed at the kick-off meeting and submitted to the MD for approval before the completion date stipulated in Annex 2 to this Part VII.

3.9.2 All gunwale fittings such as cleats and bollards shall be designed to minimise the risks of line tangling or snagging. All deck level tie-down points shall be flush fitting or removable to minimise trip hazards.

3.10 Transom and Stern

3.10.1 The transom and the propulsion systems and their respective attachment to the Vessel shall be designed to comply with the rules of the RO and be capable of operating in WMO Sea State 6.

3.10.2 The transom shall be constructed with an inspection hatch of a size agreed by the MD and the HKPF.

3.10.3 The design shall provide safe and easy access to the impellers of the waterjets for routine checking and troubleshooting while at sea.

3.10.4 The propulsion system shall be protected by a sturdy tube construction, fitted to the stern plate. The stern guard can also be used as a platform when inspecting the jet unit. Details of the design shall be discussed at the kick-off meeting and submitted to the MD for approval before the completion date stipulated in Annex 2 to this Part VII.

3.11 Anchor and Chains and Strong Points

3.11.1 The Vessel shall be equipped with one hot dip galvanized anchor with certificate issued by the RO and suitable swivel, shackles and secured stowage shall be provided by the Contractor.

3.11.2 Two (2) 50 m long 20 mm diameter braided nylon wraps for anchoring and towing shall be provided by the Contractor in a suitable stowage.

3.11.3 Two (2) 30 m long 16 mm diameter nylon wraps for mooring shall be provided by the Contractor in a suitable stowage.

3.11.4 The strong points shall be designed and installed with sufficient safety factor to prevent material yield of the strong points or surrounding structures to which they are attached in a welded condition. Calculation of the horizontal load shall be in accordance with the requirements of ISO 15084 or other equivalent international standards. The following strong points shall be provided:

(a) Anchoring/towing points forward (port and starboard);

(b) Towing points fore and aft capable of withstanding the forces involved when towing or being towed by a sister vessel or other craft of similar size. The forward towing point shall be located on the stem immediately below the forepeak. Details of the design shall be discussed at the kick-off meeting and submitted to the MD for approval before the completion date stipulated in Annex 2 to this Part VII;

(c) Specialist equipment mounting points shall be provided at the centreline forward and aft and on both sides aft of the console. Each point shall be secured by at least four (4) bolts and be designed for an applied pull-tested load of at least 680 kg at the installed height. Details to be discussed in kick-off meeting; and

(d) Lifting strong points for a one-point lift and a four-point lift.

3.11.5 Devices for Lifting the Vessel

(a) The Vessel shall be provided with two (2) means of lifting for launching and recovery, docking, storage, inspection and maintenance purposes, designed for use with launch mounted davits, fixed jib cranes, telescopic cranes, travel hoists and truck mounted cranes:

(i) Single-Point Lifting method

The Vessel shall be installed with a lifting arrangement, complying with the IMO LSA Code as amended and MSC.81(70) as amended or as per the RO's requirement regarding lifting appliances. The lifting frame shall be made of duplex steel. The lifting structure, which is to be demountable, shall be forward of the control console. A Henriksen off-load release hook, or other off-load release hook having received type-approval from any one of the RO listed in Paragraph 2.3.4(a)

to (i) of this Part VII shall be used. The swivel, davit docking and remote release shall comply with NORSOK R-002:2017 or equivalent international standard.

(ii) Lifting Slings Method

The Vessel shall be designed to allow the Vessel to be hoisted ashore by means of lifting slings around the hull. The hull structure shall, if it is necessary, be strengthened appropriately and the locations at which the slings are to be positioned shall be marked clearly.

(b) The lifting points and locations shall be designed and installed with sufficient safety factor to prevent material yield of the strong point or surrounding structure in a welded condition. Detail drawings of lifting attachments and related equipment shall be approved by the RO.

3.11.6 Strong points for mounting the Jason's Cradle referred to Paragraph 3.8.7 of this Part VII shall be provided on both sides of the Vessel. The arrangement shall be designed so that the Jason's Cradle can be rolled into the sea and used to haul a person inside the cradle back into the Vessel. The mounting arrangement shall be discussed at the kick off meeting and agreed by MD and the HKPF.

3.11.7 Cleats shall be mounted fore and aft, port and starboard for the purposes of mooring the vessel. Cleats shall be flush to the gunwales to reduce the chance of entanglement, snagging of equipment and presenting a hazard to personnel should they fall against.

3.11.8 All the lifting devices/accessories shall be designed to withstand at least six (6) times the mass of the Vessel with all the equipment. All devices and accessories shall be certified by the RO in accordance with the laws of Hong Kong prior to delivery. The single-point lifting and lifting sling method designs shall be discussed at the kick off meeting and agreed by MD and the HKPF. To avoid the need for costly and unnecessary alteration or modification of existing equipment, the Contractor shall, prior to any construction, submit detailed drawings of both methods so that the HKPF can check dimensional compatibility with its existing lifting facilities.

3.12 Cradles

3.12.1 The Contractor shall supply each Vessel with one suitably designed metal slipping cradle with appropriate safety features on which the Vessel can be slipped ashore and tied down during tropical cyclones. The cradle shall have stoppered wheels and shall be designed to be towed by plant within the HKPF's operational base compounds and be steerable for manual positioning. This cradle is not required for use on public roads. The design shall be submitted to the MD for approval.

Chapter 4 – Machinery

4.1 General Requirements

4.1.1 The Vessel is for use in Hong Kong and it is desirable that the main engines, gearboxes, electric generator set and any other machinery offered are those at present commonly used on other craft operating in Hong Kong Waters and therefore good support for spare parts and after sale services locally are already in existence.

4.1.2 The Vessel shall be equipped and fitted with machinery that complies with the specifications set out in this Chapter. The critical spare parts to be provided shall be of the same model as supplied for the Vessel and shall equally comply with all specifications set out in this Chapter.

4.1.3 The machinery, associated piping systems and fittings relating to the main engines shall be of a design and construction adequate for the service for which they are intended and shall be so installed and protected as to reduce to a minimum any danger to persons on board, due regard being paid to moving parts, hot surfaces and other hazards. The design shall have regard to materials used in construction, the purpose for which the equipment is intended, the working conditions to which it will be subjected and the environmental conditions on board.

4.2 Main Propulsion Engines

4.2.1 The offered Vessel shall be equipped with electrically started, fresh water cooled marine diesel engines of adequate power to enable the engines together with the waterjet propulsion systems to achieve the Contract Speed. The proposed diesel engines shall be of the common-rail electronically-controlled type and shall meet IMO Tier II or more stringent emission requirements. The proposed diesel engines shall be capable of:

Engine operation hours and rating per day	:	Not less than twelve (12) hours with 80% MCR and not less than two (2) hour with 100% MCR	[E]

4.2.2 Type approval certificates issued by any one of the RO listed in Paragraph 2.3.4(a) to (i) of this Part VII or other entity acceptable to MD shall be provided to demonstrate that the engines comply with IMO Tier II or more stringent emission requirements.

4.2.3 The main engines' exhausts and silencers shall be protected to avoid the hot surface danger to the personnel and to minimise heat transfer into the machinery space. All components of the exhaust system shall be mounted or suspended by effective isolating arrangements, such as shock absorbers, dampers, and heat insulation, which will minimise the transmission of heat, noise or vibration to the Vessel's structure.

4.2.4 The main engines shall:

(a) stop automatically on capsize and be capable of being restarted following righting, and start up (routine and post-capsize) procedures should be clearly marked;

(b) prevent the loss of fuel and lubrication oil from the fuel and lubricating systems during capsize. Tank ventilation systems should incorporate non-return valves or means to restrict/prevent water entering the fuel supply;

(c) have an emergency stop facility;

(d) keep operational when submerged in water up to the crankshaft centreline;

(e) work for not less than five (5) minutes after starting cold with the Vessel out of the water;

(f) keep operational when inclined at an angle of up to 10 degrees trim and 20 degrees list, either way; and

(g) be started by a powered starting system from two independent sources as well as independent fuel supplies.

4.3 Main Propulsion Engine Control

4.3.1 The controls and instrumentation of the main engines are to be designed for one (1) man operation at the console. They shall be laid out ergonomically and grouped around the steering position.

4.3.2 The reversing and steering systems shall be electro-hydraulically powered under normal condition, with an emergency manual steering capability in the case of power failure.

4.3.3 The control of the engine throttle, gearbox and the reversing bucket of the waterjet for each propulsion system shall be designed to be of one single control lever. Details of the design for the control lever shall be discussed during kick-off meeting and agreed by MD and HKPF.

4.3.4 A separate unit independent from the control levers mentioned at Paragraph 4.3.3 above shall be used to activate the reversing of the gearbox for waterjet back-flushing purposes.

4.3.5 Instrumentation and controls at the console shall be comprehensive and shall include the following functions and indicators:

(a) Remote starting and stopping of main engines.

(b) Engine emergency stop button with guard cover.

(c) Remote/local control change over switch and indicator.

(d) Single helm steering system powered electro-hydraulically under normal conditions, with an emergency manual steering capability in the case of power failure.

(e) Speed and reverse control devices.

(f) Water jet nozzle and bucket position indicators.

(g) Engine tachometers with running hour meters.

(h) Sea water pressure gauge.

(i) Coolant water temperature and pressure gauge.

(j) Engine lubricating oil temperature and pressure gauge.

(k) High cooling water temperature alarm and de-rate function.

(l) Engine low lubricating oil pressure alarm and trip.

(m) Gearbox lubricating oil low pressure alarm and trip.

(n) Ammeter for each engine.

(o) Engine exhaust gas pyrometer.

(p) Coolant water tank content/level gauge and low-level alarm.

(q) Fuel oil tank content/level gauge and low-level alarm.

(r) Main engine overspeed alarm and trip.

(s) Main engine expansion tank low-level alarm.

(t) Battery charging control lamps.

(u) DC power on light.

(v) Central illumination dimmer for all lights on the console.

(w) Lamp test button.

(x) Alarm test and reset button.

(y) Engine compartment fixed fire-fighting system release button.

(z) Any other instrumentation recommended by the engine maker and GNC.

4.3.6 Details of the arrangements specified at Paragraph 4.3.5 above are to be discussed and agreed during the kick-off meeting.

4.4 Engine Compartment

4.4.1 The engine compartment cover shall be watertight, be easily removable and provide good access to the engines for daily maintenance.

4.4.2 There shall be large hatches which provide access to the waterjets and intermediate shafts for daily inspection and maintenance. Hatches shall be provided on the forward and side panels of the console for easy access to the main switch and battery charger.

4.4.3 A compact fixed fire-fighting system type-approved by the RO shall be installed in the engine compartment with a release button at the console.

4.4.4 A standard engine maker's engine local control panel shall be provided in the engine compartment.

4.5 Engines

4.5.1 The two (2) diesel inboard engines shall, in combination with the waterjet units, be capable of achieving the Contract Speed at Paragraph 2.4.1 of this Part VII. Each engine shall be coupled to its respective waterjet through a reversible gear box and an intermediate shaft. When positioned in neutral, the waterjets shall not generate thrust in any direction.

4.5.2 The steering system and the waterjet buckets shall be electro-hydraulically powered. The hydraulic power units shall be belt-driven by the waterjet main shafts.

4.5.3 The engines shall be freshwater cooled and have a wet exhaust system which is led aft through exhaust pipes. The exhaust system shall be equipped with an high exhaust temperature audible alarm. The engines shall also be specially equipped and approved for use in rescue boats.

4.6 Waterjet

4.6.1 General

(a) The waterjet system shall be of proprietary make. The design of the whole waterjet system and control system shall be a patent design approved by any one of the recognised Classification Societies listed in Paragraph 2.3.4(a) to (i) of this Part VII for the operating power range of the Vessel. Classification type-approval certificate shall be provided for the waterjet units. The waterjet system shall be installed in accordance with the manufacturer's instructions.

(b) Torsional vibration calculations and test report for the shafting system shall be approved by the RO.

4.6.2 Waterjet Unit

(a) Each waterjet unit shall be driven by a main propulsion engine through a compatible reversible reduction gearbox and flexible coupling/intermediate shaft.

(b) The gear box shall include the following:

(i) A flexible coupling of proprietary make to absorb ahead and astern maximum thrust and also fully absorb torsional vibrations;

(ii) Built-in gear type oil pump;

(iii) High oil temperature alarm; and

(iv) Higher oil temperature alarm cut out functions.

(c) The waterjet system shall include the following alarms with individual indication at the console:

(i) Power failure of the remote control system;

(ii) Power failure of the alarm system;

(iii) Low hydraulic oil pressure (if forced hydraulic oil system);

(iv) Low level in the hydraulic supply system; and

(v) Power failure of the safety system.

(d) The waterjet system shall be made of corrosion resistant materials and waterjet used in the Vessel shall be precluded from galvanic corrosion. [E]

(e) Controls and instruments of the main engine and waterjet unit shall be designed for one-man operation at the console.

(f) Each manoeuvring system shall be entirely separated all the way from the control lever at the console down to the waterjet unit. There shall be a manual steering system extending, completely separate, all the way down to the waterjet unit.

(g) The back-up system shall be used if there is a fault in the main system. The switch-over should not be automatic, but done by the coxswain with the select switch situated in the vicinity of the back-up levers.

(h) If for any reason there is a loss of all control functions, the Vessel shall be directly manoeuvred by manual operation. Forward, reverse and steering manoeuvring can be made directly after change over to manual mode of control.

(i) The impeller shall be capable of being reversed in rotation and thrust through the main engine reversible gearbox for back flushing and clearing of the waterjet intake grill.

4.7 Diesel Tank(s)

4.7.1 General

(a) The fuel tank(s) shall have a total capacity of approximately 180 litres, shall be of light grade marine alloy and shall be installed with integral baffle to damp surging. The fuel tank(s) shall be equipped with inspection hatch on top with filter, supply and ventilation. The fuel capacity shall be sufficient for not less than 2 hours running at full speed or 2.5 hours at patrol speeds (as per Paragraph 1.2.2(b) of this Part VII) at the Light Operational Load Condition (as per Paragraph 1.7.2(e) of this Part VII). There shall be separate fuel lines to each engine.

4.7.2 Details of Diesel Tank(s)

(a) Construction of Tank(s)

(i) Independent stainless steel or aluminium diesel tank(s) shall be provided. The tank(s) shall not be integral with the hull and shall be installed so that the loads due to the mass of the tank(s) at any filling levels are safely transmitted into the structure, with due consideration given to upward and downward acceleration due to the Vessel's movements at all speeds at sea. The tank(s) shall be capable of being removed from the Vessel for inspection.

(ii) In respect of the effects on the tank(s) due to Vessel's motion, the tank's or tanks' continuous flexible supports spreading loads are preferable to rigid ones. [D]

(iii) The design and tests for Paragraph 4.7.2(a)(i) and (ii) above shall comply with the RO Requirements.

(iv) The tank ventilation system shall incorporate a non-return valve or means to restrict/prevent water entering the fuel supply during capsize.

(b) Fuel tanks are to be filled with coarse-pore expanded aluminium mesh baffle material for explosion suppression to the satisfaction of the RO.

(c) All seals such as gaskets, a-rings and joint-rings shall be of non-wicking, i.e. non-fuel absorbent, material. All materials used shall be resistant to deterioration by the fuel for which the system is designed and to other liquids or compounds with which the material can come in contact as installed under normal operating conditions, e.g. grease, lubricating oil, bilge solvents and sea water.

(d) Internal surfaces of the diesel tank shall be left unpainted and the fuel tank internal shall be cleaned thoroughly to the satisfaction of MD.

(e) Provisions to the Diesel Tank

(i) A tank content gauge and low level alarm shall be fitted on the control console for each tank. A sounding rod calibrated in litres shall be supplied for each tank;

(ii) Marine grade stainless steel 316 or marine grade aluminium with increased resistance to corrosion shall be used. The thickness shall sustain the loads due to the mass of the tank with fuel at all levels with due consideration given to accelerations in all directions due to the Vessel's movements at all speeds at sea without damaging the integrity of the tanks;

(iii) The fuel tank shall have all fittings and openings on top, except metallic filling pipes, which may be connected to the sides or ends of metal fuel tank, provided that they are welded to the tank and reach above the top of the tank.

(iv) Rigid fuel suction tubes and fill pipes which extend near the tank bottom shall have sufficient clearance to prevent contact with the bottom during normal operation of the Vessel;

(v) An inspection manhole, air vent with flame trap on deck and discharge valve with remote operated quick closing device shall be provided;

(vi) The tank support, chocks or hangers shall either be separated from the surface of metal tank by non-metallic, non-hygroscopic, non-abrasive material or welded to the tank;

(vii) An easily removable fine filter of 50 micro meter mesh, and a water separator with water detector and drain valve shall be built into the filling line for each engine;

(viii) The tanks shall be designed or installed so that no exterior surface will trap water;

(ix) Tank drains are not permitted on fuel tank.

4.7.3 Diesel Fuel Tank Tests

Leakage Test

The tank shall be internally tested with a hydraulic pressure with all its accessories installed. The test pressure shall be the greater of 20 kPa or 1.5 times the highest hydrostatic pressure to which the tank may be subjected in service (maximum fill-up height above tank top). The static test pressure shall be applied for five (5) minutes without pressure drop. After the test, the test fuel tank shall not show any leakage when using a leak detection method other than the pressure-drop method.

4.8 Bilge System

4.8.1 An electrical bilge pump shall discharge the bilge in the engine and waterjet compartments. The pump shall be connected to the main battery through fuse and shall be started by automatic switch.

4.8.2 A manually operated bilge pump shall be fitted at the transom as a backup for the engine compartment and other compartments.

4.8.3 The Vessel shall be designed and constructed so as to prevent the accidental discharge of pollutants (oil and fuel) overboard.

Chapter 5 Electrical System

5.1 General Requirements

5.1.1 All the electrical equipment and installation on the Vessel shall comply with the requirements of the RO.

5.1.2 All electrical equipment, fittings, instruments, switches, cables, insulation, sheathing, circuit breakers, rating standards and their installations shall comply with the latest Regulations of the International Electrotechnical Commission (hereinafter referred to as IEC), Electrical Installations in Ships. The electrical system shall be an insulated two-wire Direct Current (DC) system. The hull shall not be used as a current-carrying conductor.

5.1.3 Protective devices such as circuit-breakers or fuses shall be provided at the source of power, e.g. the switchboard, to interrupt any overload current in the circuit conductors before heat can damage the conductor insulation, connections or wiring-system terminals.

5.1.4 All 12-volt DC equipment shall function over a voltage range of 10.5 V to 15.5 V at the battery terminals.

5.1.5 The length and cross-sectional area of conductors in each circuit shall be such that the calculated voltage drop shall not exceed 10% of the nominal battery voltage for any appliance when every appliance in the circuit is switched on at full load.

5.1.6 Switches and controls shall be marked to indicate their purpose. Each cable shall be labelled clearly and bear its own unique identification code.

5.1.7 The Contractor shall submit a layout plan showing the exact locations of the Equipment. All Equipment shall be easily and safely accessible for inspection and maintenance.

5.1.8 Essential drawings and detailed particulars (such as the rating and capacity, type of all electrical equipment as well as the wiring, circuit breakers, lighting and sockets) shall be submitted for the MD's approval before the completion date stipulated in Annex 2 to this Part VII.

5.1.9 Detailed wiring diagrams of the complete supply and distribution network, including wire size, insulation and sheathing shall be approved by the RO when required by the rules and submitted for the MD's approval before the completion date stipulated in Annex 2 to this Part VII.

5.1.10 All Equipment installed shall be accompanied by operation and maintenance manuals.

5.1.11 The Equipment's installation standards shall serve to enhance safety and not present hazards to the operators, e.g. all metal panels exposed to the operator shall be grounded properly. Warnings of any potential hazards shall be displayed in both English and traditional Chinese, or with universally recognised labels.

5.2 Batteries

5.2.1 Two (2) groups of 12-volt maintenance-free batteries shall be provided, one for starting the main engine and the other for shipboard services. These two (2) groups of batteries shall be connected to two (2) independent DC circuits with a crossover network. They shall be interchangeable to back up each other, and be capable of being charged individually by any of the engine-driven alternators. Batteries connected in parallel are not allowed.

5.2.2 Each of the two (2) groups of batteries shall enable at least six (6) consecutive starts of the engines from cold without recharging and maintain an uninterrupted power supply to the shipboard services (e.g. navigational lights, general lights, alarm).

5.2.3 A separate battery shall be dedicated to the emergency services (e.g. radio communications and signalling, emergency and navigation lights) is required and conform to the requirements of the RO specified in Schedule 9.

5.2.4 The engine-driven alternators shall be able to charge the batteries and to provide 12V DC power to the shipboard services.

5.2.5 Batteries shall be permanently installed in a dry, watertight and ventilated location above the anticipated bilge water level.

5.2.6 In consideration of the intended operational role of the Vessel, the batteries shall be installed in a manner that restricts their movement horizontally and vertically. A battery, as installed, shall not move more than 10 mm in any direction when exposed to a force corresponding to twice the battery weight.

5.2.7 Batteries shall be installed, designed or protected so that metallic objects cannot come into unintentional contact with any battery terminal.

5.2.8 Batteries, as installed, shall be protected against mechanical damage at their location or within their enclosure.

5.2.9 Batteries shall not be installed directly above or below a fuel tank or fuel filter.

5.2.10 Any metallic component of the fuel system within 300 mm above the battery top, as installed, shall be electrically insulated.

5.2.11 Battery cable terminals shall not depend upon spring tension for mechanical connection.

5.2.12 All circuits (with the exception of those required for starting the engines and powering navigation lighting, electronic devices with protected memory and protective devices such as bilge pumps and alarms, which are to be protected individually with a circuit breaker or fuse as close as practical to the battery terminal) shall be connected to the supply system voltage in a readily accessible location through a master battery disconnection switch, installed at or as close as possible to the positive conductor from the battery, or group of batteries.

5.3 Distribution Network

5.3.1 12V DC services shall be supplied from the switchboard in the steering console through a 2-wire insulated system to the following items:

(a) Navigation light control panel and navigation lights,

(b) Horn,

(c) General lighting,

(d) Compass light,

(e) Instrument panel in the control console,

(f) Content/level gauge for the diesel tank,

(g) Two (2) hand-held searchlights,

(h) Siren,

(i) Blue flashing light,

(j) Electric bilge pumps, and

(k) All other navigational and electronic equipment (as applicable).

5.4 Cables

5.4.1 No electrical equipment, components or cables shall run through or be installed inside the fuel tank compartments.

5.4.2 Cables that are not sheathed shall be supported throughout their length in conduits, cable trunking, or trays, or by individual supports at maximum intervals of 300 mm.

5.4.3 Sheathed cables and battery cables to the battery disconnection switch shall be supported at maximum intervals of 300 mm, with the first support not more than one (1) metre from the terminal. Other sheathed cables shall be supported at maximum intervals of 450 mm.

5.4.4 Conductors which may be exposed to physical damage shall be protected by sheaths (armoured cables), conduits or other equivalent means. Cables passing through bulkheads or structural members shall be protected against damage to insulation by chafing.

5.4.5 The metallic sheathing, armour or braid of cable shall be earthed properly at both ends. All bare terminals shall be insulated properly with approved cable insulators.

5.4.6 Wiring shall run along conduits with watertight openings and be secured in such a manner as to allow easy maintenance. Type approved cable penetrations shall be provided at the openings of watertight compartments or deck penetrations.

5.5 Overcurrent Protection

5.5.1 A manually reset trip-free circuit-breaker, or a fuse, shall be installed within 200 mm of the source of power for each circuit or conductor in the system or, if impractical, each conductor shall be contained within a protective covering, such as a sheathing conduit or cable trunking, for its entire length from the source of power to the circuit-breaker or fuse.

5.5.2 The voltage rating of each fuse or circuit-breaker shall not be less than the nominal circuit voltage. The current rating shall not exceed the value for the conductor of smallest diameter in the circuit.

5.6 Switchboard (Panel Board)

5.6.1 Switchboards or panel boards shall be installed in such a way that the control elements, indicating instruments, circuit-breakers and fuses are readily accessible. The terminal side shall be accessible.

5.6.2 Connections and components on panel-boards shall be in locations protected from the expected conditions in conformity with IEC 60529:

(a) IP 67 as a minimum, if exposed to short-term immersion; IP 55 as a minimum, if exposed to splashing water;

(b) IP 20 as a minimum, if located in protected locations inside the Vessel.

5.6.3 Panel-boards (switchboards) shall be marked permanently with the nominal system voltage.

5.7 Receptacles/Sockets

5.7.1 Receptacles/sockets installed in locations subject to rain, spray or splashing shall have a minimum protection of IP55, in accordance with IEC60529 when not in use, e.g. protected by a cover with an effective weatherproof seal.

5.8 Lighting

5.8.1 All lightings, including the navigation lights, shall be equipped with LED bulbs and digital switching.

5.8.2 Independently controlled dimmable red/white walkway lights shall be supplied to cover the fore and aft decks and walkways on both sides of the Vessel.

5.8.3 An overhead red/white light shall be fitted in the bow cuddy.

5.8.4 Independently controlled high-powered white floodlights shall be supplied to cover the fore and aft decks and Vessel's sides.

5.8.5 The arrangements and positioning of the lighting shall be discussed at the kick-off meeting and shall be agreed by the MD and the HKPF.

5.9 Ignition Protection

5.9.1 Electrical components installed in compartments which may contain explosive vapour and gases shall be ignition-protected in accordance with IEC/ISO8846 or other equivalent international standard acceptable to MD and the RO.

5.9.2 Compartments which may contain explosive gases are those which contain or which have open connections with compartments containing such items as

(a) A fuel tank;

(b) Joints or fittings in fuel lines connecting spark-ignition engines with their fuel tanks.

Open compartments having 0.34 m^2 of open area per cubic meter of compartment volume exposed to the open atmosphere outside the Vessel constitute an exception to this requirement.

5.10 Navigational and Signalling Equipment

5.10.1 Navigation Lights

(a) One (1) set of LED navigation lights according to international standard shall be fitted. Two (2) halogen work lights are fitted on the gantry.

(b) Navigation lights shall comply with the requirement specified in the International Regulations for Preventing Collisions at Sea 1972 (as amended by IMO Resolution A. 464 (XII) and A. 626 (XV)).

(c) The lights shall be controlled from the control and alarm panel on the console. Each navigation light circuit shall be provided with a switch, protection fuse, indicating lamp and alarm. A dimmer(s) for the panel indication lights, buzzer stop and lamp test buttons shall be fitted.

(d) Navigation light circuits shall be independent of any other electrical circuits. There shall be two (2) separate power supply systems to the distribution board.

(e) The following navigation lights shall be provided together with double-pole circuit breaker:

(i) Port side light,

(ii) Starboard side light,

(iii) Stern light,

(iv) Masthead light, and

(v) Anchor light.

5.10.2 Type Approval Certificates for all navigational lights shall be submitted prior to Delivery Acceptance.

5.10.3 The Contractor shall provide the following signalling equipment of a type approved by the HKPF:

(a) Two (2) all-round blue flashing lights, and

(b) One (1) siren/horn.

5.11 Lightning Protection

5.11.1 The Vessel shall be fitted with a proven lightning protection system to protect the personnel on board and the electronic equipment installed. The method and working principle of protection shall be approved by the RO for submission to MD by the completion date stipulated in Annex 3 to this Part VII for endorsement.

5.12 Searchlights

5.12.1 The Contractor shall supply two (2) high-powered hand-held white LED searchlight. They shall be connected to sockets on board with coiled extension cables of appropriate lengths. Sockets shall be installed on both the port and starboard sides of the control console. Aft cables shall be sufficiently long to enable use by occupants. Facilities for storing the two (2) hand-held searchlights shall be provided. The type of searchlight, the length of the extension cables, the positioning of the sockets and the stowage shall be discussed at the kick-off meeting and shall be agreed by the MD and the HKPF.

Chapter 6 Lifesaving Appliances (LSA) and Fire-fighting Equipment

6.1 General Provisions

6.1.1 The lifesaving appliances and fire-fighting equipment shall comply with the RO Requirements.

6.1.2 The lifesaving appliances shall include a life ring buoy with marker light and a rescue quoit with line attached.

6.1.3 Fire-fighting Equipment

(a) Compact fixed fire-fighting system shall be installed in the engine compartment, with release button on the dashboard.

(b) Two (2) 2.5-kg dry powder fire extinguishers shall be provided with holding rack.

Chapter 7 Electronic Navigational Equipment

7.1 Electronic Navigational Equipment

7.1.1 The Contractor shall supply, deliver, install, commission, conduct trial test and provide warranty services for all of the Electronic Navigational Equipment and systems, public address system, siren and external broadcasting system, and international VHF radio, lightning protection, antennae and instruments and controls on the Vessel's consoles (collectively, "Electronic Navigational Equipment" or "ENE") of Part VII.

7.1.2 Main units of the ENE shall be installed inside an equipment compartment(s) suitably protected from the weather, environment and sea spray while the associated control panels and displays will be flush mounted and/or recessed in console panels with appropriate watertight sealing. All designs and installation/mounting proposals shall be approved by the HKPF prior to the commencement of any such work.

7.1.3 In addition to the submission of a layout plan to the MD and Communication Branch of the HKPF (COMMS), to facilitate the optimal ergonomic design, user-friendliness, effectiveness and easy accessibility for inspection and maintenance of the console, the Contractor shall build full size a mock-up console as specified at Paragraph 3.4.1 of this Part VII for approval and comments from the MD and COMMS. The mock-up console shall show the positions and arrangement of the actual ENE components and other equipment and controls on the console panels before construction and installation.

7.1.4 The Contractor shall upon COMMS's request submit a block diagram showing the conceptual connections of the ENE for evaluation.

7.1.5 In addition to all the electronic equipment that the Contractor is required to provide for each Vessel under Chapter 7 to this Part VII, the Contractor shall also provide one complete, single Vessel's set of this equipment upon the delivery of the first Vessel as Contract spare parts, including cabling, control panel, gauges.

7.2 General Requirements

7.2.1 All the ENE shall be marine type and comply with the relevant regulations of the Safety of Life at Sea Convention (SOLAS), International Electrotechnical Commission (IEC) and the International Telecommunications Union recommendations in the International Radio Regulations (ITU-R), unless explicitly stated otherwise. They shall comply with all relevant International Maritime Organization (IMO) recommendations on performance standards and operational features. The ENE shall perform effectively even under the most adverse weather conditions. All radio communications equipment, including radars and radios, shall also comply with the requirements of the Office of the Communications Authority (OFCA) of the HKSAR.

7.2.2 The Contractor shall observe and adopt the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines [formerly International Radiological Protection Association (IRPA) Guidelines] and the Code of Practice issued by OFCA of the HKSAR on the limits of exposure to radio frequency electromagnetic fields in the frequency range from 100 kHz to 300 GHz for the protection of operators, workers and the public against Non-Ionizing Radiation (NIR) hazards so as to provide a safe and healthy working or living environment under all normal conditions. In case of multiple simultaneous exposures, the combined effect of such exposure shall also be assessed in accordance with the ICNIRP Guidelines.

7.2.3 The Contractor shall warrant that all the ENE and materials used, irrespective of whether they are in operation or not, shall comply with the health and safety standards adopted by the World Health Organization in particular in relation to all harmful radiation. The Contractor shall also disclose in writing the existence of any radio frequency radiation hazard emitted from the Equipment, which is harmful to human beings under normal operating conditions, by the safety standards adopted by

ICNIRP, American National Standards Institution (ANSI), or other equivalent national or international standards.

7.2.4 All ENE shall be suitable for round-the-clock operation on the Vessel. Equipment displays shall have adjustable brightness levels and be suitable for viewing under different brightness conditions at sea, including under direct sunlight, day time, dusk, dawn and dark night, without causing eye-stress, glaring and/or discomfort. Equipment control keys and buttons shall be suitably back-lit with adjustable brightness levels to aid operation in the dark without causing eye-stress, glaring and/or discomfort.

7.2.5 Design Standards

(a) Environmental Conditions

(i) All ENE shall be capable of operating continuously to the specifications throughout its normal life span in the HKSAR climate and environment. The following parameters shall apply unless otherwise stated:

1. Ambient temperature between 0 °C and 40 °C; and between -5 °C and +50 °C if the equipment (including display units and antennae) is exposed to the open air.
2. Relative humidity up to 95%, non-condensing.
3. Salt and chemical corrosion as found in a tropical coastal atmosphere.
4. Materials that promote mould growth shall not be used.

(ii) ENE shall be capable of withstanding the knocks and jolts likely to occur during repair work or rough handling.

(b) Power Supplies

(i) The power supply for all ENE shall be protected by appropriate circuit-breakers.

(ii) All the ENE shall be capable of working normally when powered by the Vessel's battery-backed DC supply system. A DC/DC converter shall be provided if the equipment cannot operate at this voltage.

(iii) Two spare power supply connections shall be required with a negative earth and be connected to a designated 12 Volt DC (nominal) battery-backed power supply. The battery shall be charged up when an engine generator is working.

(iv) There is a possibility of DC leakage through the negative grounding to the DC battery power bank on the supplied Equipment if it is not connected properly. The Contractor shall take precautions to prevent this type of leakage, e.g. by using an isolation converter.

(v) The ENE's power supply shall be compatible with the Vessel's electrical system. If necessary, a voltage stabiliser or regulator shall be provided and installed to maintain the ENE in proper working condition when connected to the unsteady DC voltage from the generator.

(vi) Adequate provision shall be made to protect the ENE from the adverse effects of excessive voltage, current spikes and surges.

(vii) Suitable devices shall be incorporated for protecting the ENE and its accessories against damage due to lightning and unregulated DC power supply on board.

(viii) All the displays of the ENE equipment shall be connected to an external switch for controlling the power on or off status of the displays of ENE and the illumined device on the control panel. The actual devices to be connected to this external switch shall be subjected to approval by HKPF.

(c) Safety

(i) All ENE supplied shall be of a safe design and shall be installed in a safe manner as approved by the MD and HKPF. The standard of installation shall enhance the Equipment's safety features and not present any hazards to the user.

(ii) All ENE shall be properly grounded to an electrical earth. The installation shall not present hazards to the user in any way, e.g. grounding of all metal parts exposed to the user.

(iii) Electrical contacts and PCBs shall also be protected in an appropriate manner that does not impair their electrical characteristics.

(iv) Lightning protection devices (e.g. lightning surge arrestors) are required, particularly for antennae installed outside the protection zone of the Vessel's own lightning protection device.

(v) The lightning surge arrestors of each feeder cable shall be grouped and concentrated in a "lightning arrestor panel" to be located inside the console for ease of maintenance.

(vi) Warning of any potential hazards associated with the ENE shall be displayed in traditional Chinese characters, English and universally recognised labels in easily seen and prominent positions.

(d) Design Practice

(i) All systems shall be designed for prolonged, continuous and reliable operation, i.e. twenty four (24) hours per day and 365 days per year.

(ii) The normal serviceable life of the ENE shall be a minimum of five (5) years operation on board the Vessel. During the lifetime of the ENE, it shall be possible with reasonable repair and setting up to maintain its performance as defined in this Part VII.

(iii) The design and construction shall be performed to a standard of engineering acceptable to COMMS and the ENE shall withstand handling and transportation without degradation of performance.

(iv) The display digits in the ENE control panel shall be easily legible.

(v) To facilitate night time operations, ENE control panels shall have a dimming function enabling the light emitted from the ENE display to be regulated progressively.

(vi) All units, sub-assemblies, components and adjustable controls of the same type shall be both mechanically and electrically interchangeable without the need for changing connections or wiring. They shall be readily accessible for maintenance purposes.

(vii) Correct impedance matching shall be maintained at all interfaces between any items of any equipment (e.g. audio at 600 ohms or RF at 50 ohms).

(viii) Adequate testing points and other testing facilities, e.g. extension boards, testing probes, shall be provided to permit ease of maintenance.

(ix) Any equipment installed in an external position and exposed to the maritime environment shall have the level of IP protection appropriate to its function and position.

7.2.6 Appearance and Protective Finish

(a) Metal surfaces shall be either corrosion resistant or protected against corrosion for a period of at least three (3) years by high grade enamel painting, plating, galvanising, anodising, or any other suitable surface treatment.

(b) Any such protective layer shall be smooth, continuous, and free from blemishes and scratches.

7.2.7 Installation Standards

(a) All ENE, except portable ENE, shall be fixed firmly in place. Fastenings and supports shall support their loads with a safety factor of at least three (3).

(b) The ENE shall be supplied with all auxiliary items required including but not limited to the following for normal operation:

(i) connectors;

(ii) circuit-breakers;

(iii) lightning arrestors;

(iv) power sockets;

(v) plugs; and

(vi) cables.

(c) RF connectors (of suitable impedance) shall be provided and used for connections of the RF cables, antennae and radio equipment.

(d) All exposed connectors shall be protected by weatherproof material (e.g. 3M self-adhesive tape or equivalent) to prevent water ingress.

(e) Special attention shall be paid to the compass safe distance [Marine Guidance Note MGN 57 (M+F) and IMO Resolution A.694 (17)] of the ENE and the Radiation Hazard Zone of the radar scanner in the Vessel's design. Positioning of the ENE and the associated accessories shall be planned carefully in respect of their relative distances to eliminate any chance of radio interference that might occur in service.

(f) Installation shall be to the highest standard to ensure:

(i) The latest version of the relevant Merchant Shipping Notices ('M' Notices) published by the Department of Transport (London) in respect of setting and installing the compass, VHF radio and sounding devices are observed.

(ii) Satisfactory performance of the ENE.

(iii) Protection from mechanical and water damage.

(iv) Ease of accessibility for maintenance and repair.

(v) Manufacturers' recommendations are followed strictly.

(vi) Precautions and measures shall be taken and adopted in the installation of the ENE to ensure that the g-forces and vibration encountered by the Vessel travelling at high speed in rough seas will not affect the operation of the ENE.

(vii) The installation in the external environment shall withstand the conditions stated in Paragraph 7.2.5(a) (i) above.

(g) Adequate measures to prevent interference between the electronic equipment shall also be provided, which for receiving apparatus and other electronic equipment which may be affected by frequency induced voltage shall include being earthed, screened and protected efficiently according to the rules, regulations and recommended practices regarding screening of electric wiring.

(h) The Vessel is an open deck vessel. All precautions and provisions shall be taken and made to minimise the effect of sea spray and exposure to weather on the console panels, equipment control and display units, and to protect the Equipment in such conditions.

Suitable weather protection covers, which do not obstruct users from operating the equipment, shall be provided as necessary.

7.2.8 Cable Laying

(a) General Cable Requirements:

(i) All cables shall be rated and sized properly.

(ii) The signal cables shall be screened properly to reduce the cross-talk level as necessary.

(iii) All feeder cables shall be of one length, without joints, from antennae to the Equipment and from equipment to equipment, unless such joints are necessary under the specific installation conditions encountered or for ease of maintenance. All joints if provided shall be reliable and durable.

(b) Cables shall be laid in concealed cable trunks and trays inside consoles or other compartments or under the deck floor unless approved otherwise by the MD and HKPF, with due consideration given to the ease of maintenance of the Vessel as a whole. Solutions adopted shall not pose occupational safety and health risks such trip, snag or impact hazards to the Vessel's crew during operations.

(c) Watertight rubber grommets, insulated bushes or cable glands shall be used to protect the cables when passing through the metal covers of distribution boards, boxes, or any other metal work or exposed structure.

(d) The Contractor shall be responsible for the supply, installation and inter-connection of all cables and all related installation materials within the system, and the final connection between the power supply and the ENE.

(e) Wires and cables shall be as short as practicable with sufficient slack:

(i) To enable parts to be removed and replaced during servicing without disconnecting other parts.

(ii) To facilitate field repair on broken or cut wires.

(iii) To facilitate movement of the Equipment for maintenance purposes.

(f) All wiring terminations shall be finished in a neat and approved manner and shall be identified separately by an unique identification wiring code number.

7.2.9 Labelling and Marking

(a) All ENE supplied shall carry the name, trademark or other means of identifying the manufacturer.

(b) Major ENE units and sub-units shall carry a permanent label with serial numbers for identification purposes.

(c) All panels, sub-assemblies of ENE and internal and external cables shall be marked or labelled clearly with their own unique identification codes, in English, in a permanent manner so as to identify each individual function. Such labels shall be recorded and organised properly in a document and handed over to COMMS through MD prior to Delivery Acceptance.

(d) All switches, connectors, jacks or receptacles shall be marked clearly, logically and permanently during installation. All wires and cables shall be identified at every termination and connection point with permanent type markers.

(e) The DC circuit-breakers controlling the Equipment shall be labelled clearly.

7.2.10 Acceptance Test

(a) The acceptance tests for the ENE shall comprise of three (3) parts: bench tests, factory acceptance trials (FAT) and on-site commissioning tests as follows:

(i) Bench tests shall be performed on the ENE to demonstrate their technical compliance with the published specifications. The bench test, if not carried out in the HKSAR in the presence of COMMS representatives, may be accepted in the form of a test report from the original equipment manufacturers certifying that the tests have been conducted and passed satisfactorily before the Equipment left the factory.

(ii) The Contractor shall carry out the FAT in the presence of MD and HKPF representatives to demonstrate that each ENE item individually and that all ENE as a whole were installed and implemented properly. If the Vessel is not constructed in the HKSAR, the Equipment FAT shall be conducted at the manufacturer's shipyard before the shipping of the Vessel to the HKSAR in accordance with the procedures specified at Paragraph 1.7.1(d) of Part VII.

(iii) The on-site commissioning tests shall be carried out by the Contractor as part of the Technical Acceptance in the presence of MD and HKPF officers after completion of installation of all ENE.

(iv) The on-site commissioning tests shall include an inventory check, an NIR hazard test, an inspection of ENE installation and thorough technical, functional and integration tests of individual ENE items and all ENE together as a whole and a sea trial to verify that the ENE have been commissioned properly and are ready to be put into service on the Vessel.

(b) The Contractor shall ensure and demonstrate, as part of the on-site commissioning tests, that the electric and magnetic fields as well as the power density radiated from all installed ENE do not expose occupational personnel and members of the general public to radiation in excess of the limits contained in the 1988 IRPA Guidelines specified in Paragraph 7.2.2 of this Part VII. Prior to the issuance of the Acceptance Certificate, the Contractor shall provide a full written report stating that the installation of the ENE complies with the stated NIR safety standards.

(c) At least two (2) months prior to the bench tests, the FAT and the on-site commissioning tests, the Contractor shall submit details of the schedules and test procedures of all ENE for COMMS' approval. When all of the test procedures have been established and agreed by the HKPF, they shall be followed during the relevant tests. Any delay in the submission of these procedures may lead to a corresponding delay in their agreement and, hence, in the commissioning of the Equipment for which the Contractor will assume the financial liability.

7.2.11 Documentation

(a) At least six (6) weeks prior to Delivery Acceptance, for each individual item of Equipment, the Contractor shall supply to COMMS, through MD, three (3) paper copies of the operational manuals and maintenance manuals in English (at least one (1) original) and two (2) soft copies in DVD format. For the avoidance of doubt, these three (3) sets of operation and maintenance manuals are in addition to those required as part of the documentation for each Vessel set out in Paragraph 8.2.2(h) of this Part VII. The manuals shall provide the information listed below:

(i) Description of the principle of operation.

(ii) Details of installation and setting up procedures.

(iii) Maintenance instructions including mechanical assembling and disassembling procedures.

(iv) Schematic diagrams and block diagrams with their respective descriptions.

(v) Fault finding and calibration procedures.

(b) Drawings showing the proposed design of conduit/trunking route for the Equipment installed on board, including future maintenance considerations shall be submitted to MD and COMMS for approval before installation.

(c) At Delivery Acceptance, the Contractor shall supply:

(i) Operational manuals and maintenance manuals specified in Paragraph 7.2.11(a) above (to have been supplied at least six (6) weeks prior to Delivery Acceptance).

(ii) Properly organised individual Equipment testing results including details of test and calibration procedures.

(iii) On-site commissioning and sea trial reports of all Equipment as witnessed by COMMS.

(iv) The initial parameter settings and readings of all Equipment at the time of the on-site commissioning.

(v) "As installed" drawings showing the positions of all individual items of the Equipment installed and the routing of the interconnecting cables between equipment.

(vi) A block diagram showing the interconnections between all equipment units complete with their technical protocols and the wiring schedule.

(vii) “As fitted” diagram showing the locations and positions of all circuit-breakers controlling the power to the Equipment.

(viii) The completed NIR Report as required by Paragraph 7.2.10(b) above.

(d) The documents specified at Paragraphs 7.2.11(a) to (c) above and the training materials specified in Paragraph 9.2.6 of this Part VII shall be supplied in both paper copy and in DVD format or other format acceptable to COMMS.

(e) The Contractor shall not use confidentiality as a reason for withholding the supply of relevant documentation as required by the MD and HKPF.

7.2.12 Electronic Components/ Spares Parts/ Spare Units / Maintenance

(a) The Contractor shall commit to provide spare parts for the Equipment for a period not less than five (5) years from the date of the successful commissioning of the last Vessel.

7.2.13 Warranty Services

(a) The Contractor shall provide a one (1) year free Warranty Period without any qualification for all ENE with effect from the date the Acceptance Certificate in respect of that Vessel was issued.

(b) The Contractor shall rectify any fault within seven (7) days of first being requested by COMMS in writing to do so. The Contractor shall extend the Warranty Period for any item of ENE which has broken down and required repair for a period equal to the period between the date of breakdown and the resumption of operation and service.

7.3 Electronic Navigational Equipment Specifications

7.3.1 Integrated multi-functional display unit incorporating Radar, Secure AIS, GPS/DGPS Echo Sounding System and Electronic Chart System information.

(a) The radar shall be used as the primary radar. Its operational range shall be equal to or better than 0.125 to 36 nautical miles (minimum). It shall be a frequency modulated continuous wave solid state X-band radar.

(b) The radar shall provide a clear display even with severe sea and rain clutter at all ranges without missing small, elusive targets.

(c) The radar images shall remain at a constant brightness during each Point Position Indicator (PPI) sweep.

(d) The radar shall be fitted with an auto-track function which provides acquisition and tracking of at least six (6) targets in a way similar to Automatic Radar Plotting Aid (ARPA). The radar shall provide data on any chosen target. Such ARPA-like auto-track function shall support Closest Point of Approach (CPA) with target based and Time-based Closest Point of Approach (TCPA) features for the tracked targets.

(e) The display unit shall incorporate control keys and processor equipment to integrate, control, operate and display all radar, AIS and chartplotter functions. The electronic chart system shall be capable of both connecting to and being accessed remotely from the Government router through an Ethernet interface.

(f) The radar shall have at least the following operational controls/features:

(i) Operator selection of north up, head up, course up;

(ii) True Motion (TM) and Relative Motion (RM) modes;

(iii) At least three (3) different brightness levels;

(iv) Information displaying Vessel's own latitude/longitude, position and speed;

(v) Trails;

(vi) Fixed and variable range ring;

(vii) Variable Range Marker (VRM);

(viii) Electronic Range and Bearing Line (ERBL);

(ix) Manual rain and sea clutter suppression;

(x) Gain control;

(xi) Autoclutter sea control;

(xii) Range up;

(xiii) Range down;

(xiv) Vectors;

(xv) Centre picture;

(xvi) Acknowledge alarm; and

(xvii) Panel brilliance.

(g) The display unit shall comprise a flush-mounted Liquid Crystal Display (LCD) colour display of a type suitable for use on an open deck vessel. The display unit shall provide a clear and clutter free picture in all weather conditions and be suitable for viewing in direct sunlight without the need for a viewing hood or the like. The display shall indicate clearly the important parameters such as radar targets, range marker, bearing line, heading marker and range rings.

(h) The radar transceiver shall be a low radiation emission broadband type and shall be housed in a marine type radome antenna/scanner unit. It shall be designed for mounting aloft and be capable of operating satisfactorily when subjected to the g-forces, vibration and high relative wind speeds of not less than 70 knots encountered when the Vessel is operating at high speeds in the maritime environment.

(i) The antenna/scanner shall, as far as practicable, be installed well clear of any obstruction to minimise undue interference and NIR hazards.

(j) The radar shall be aligned with the heading of the Vessel.

(k) The Contractor shall ensure at the design stage that unnecessary radar blind zones are not created. The Contractor shall, in particular, ensure that equipment installed before the radar scanner such as navigation lights, floodlights, horn speakers and the like do not obstruct the radar scanner's emissions. If such obstruction becomes apparent after installation, the Contractor shall rectify it.

(l) The radar shall have NMEA 0183 and 2000 interface ports capable of accepting navigational data from a wide selection of GPS/DGPS receivers and electronic compasses, and of providing comprehensive data on all tracked targets in the form of a track table to a wide selection of electronic chartplotters. However, connection of the radar system to the GPS system and satellite compass system supplied under this Contract via other standard or proprietary interface types is acceptable.

(m) 10 Hz GPS/GLONASS-WAAS, EGNOS, SBAS antenna (integrated).

(n) Performance (radar):

(i)	Reference:	Magnetic and True North
(ii)	Warm-up Time:	< 120 seconds
(iii)	Distance Accuracy:	<1% of the range
(iv)	Bearing Accuracy:	<1°
(v)	Operational Maximum Wind Speed:	At least 70 knots
(vi)	Scanner Size:	≥600 mm (24 inches nominal)
(vii)	Scanner Rotation:	24 rpm and 48 rpm or greater rotation speed
(viii)	Beam Width H/V:	< 4°/25°
(ix)	Transceiver Output Power:	At least 4kW with 0.08-0.25-0.8 μs pulse
(x)	Display:	12-inch or larger LCD colour display; resolution 800 x 600 pixels or better for 4:3 aspect ratio. Other aspect ratios of equivalent size and resolution are acceptable. Brightness of 900 cd/m^2 or greater.
(xi)	Operating Temperatures:	Better than –5°C to +55°C for the antenna/scanner unit. Better than –5°C to +45°C for the display unit.
(xii)	Waterproofing	Radome antenna: IPX6, Display unit: IPX6

(o) The crew operator shall be able to select the following modes of presentation at the radar display:

(i) radar image only;

(ii) plotter image only; and

(iii) plotter image overlaid with radar image.

(p) The radar system's in-built chartplotter shall support the following functions:

(i) Operator selectable North Up or Course Up presentation;

(ii) Operator selectable TM or RM presentation;

(iii) Waypoints and routes;

(iv) Seamless and smooth zoom in and zoom out;

(v) Seamless and smooth chart panning;

(vi) Layers of chart details;

(vii) Monitor own Vessel position and heading;

(viii) View information of charted objects;

(ix) Own Vessel vector;

(x) Man-Over-Board (MOB);

(xi) One (1) plug-in chart card shall be used for providing detailed navigational sea charts covering the entirety of Hong Kong Waters using S-57 or equivalent format digital sea chart or with tools for converting S-57 format sea charts and future updates into a format readable by the chartplotter;

(xii) The chart card shall be supplied with the latest version of sea charts covering the entirety of Hong Kong Waters with perpetual licence for use and ownership. The purpose is to ensure that the HKPF shall not be required to pay any periodic fees and charges for using the chart card with its contents, as the HKPF will thereafter obtain S-57 format chart updates and install them into the chartplotter.

(q) The radar system shall be interconnected with the GPS and satellite compass systems so that real-time data from these two (2) systems shall be available at adequate data update rates to support the smooth and seamless operation of the radar system's various functions (including its in-built chartplotter functions). The satellite compass' connection to the radar shall have a data update rate of at least ten (10) times per second. The satellite compass shall provide GPS location data to the radar system for resilience purposes.

(r) The system at the radar display shall be able to display the own vessel's heading (in degrees north) and position (in latitude and longitude).

(s) The radar radome antenna/scanner unit shall comply with relevant requirements of the European Parliament and Council Directive 1999/5/EC and IEC 60945:2002.

(t) The radar display system/unit shall comply with relevant requirements of the European Parliament and Council Directive 2004/108/EC and IEC 60945:2002.

(u) The radar shall be capable of providing external (land-based) radar extractors and trackers with information which as a minimum includes, but is not limited to, analogue video signal, trigger, azimuth count pulse and azimuth reset pulse through the Government data network. COMMS will provide the Contractor with a full list of the information which the radar shall be required to provide.

(v) The IP address of the radar and other units shall be set by setting the IP address directly on the equipment or using Dynamic Host Configuration Protocol (DHCP).

(w) The radar shall provide with interface for controlling and retrieving radar information using an external software with the following requirements:

(i) Turn on and off the radar units;

(ii) Turn on and off the transmission of the radar;

(iii) Setting the gain of the radar;

(iv) Setting the range of the radar;

(v) Setting the sea clutter of the radar;

(vi) Setting the rain clutter of the radar; and

(vii) Setting the interference level of the radar.

7.3.2 Satellite Compass

(a) The Contractor shall supply and install one satellite compass set. The satellite compass shall consist of at least a sensor unit and an electronic digital display unit, and be compact, recessed in the console and easy to operate.

(b) The satellite compass sensor unit shall be connected directly to the radar.

(c) The sensor unit shall incorporate two or more satellite receivers from at least two types of satellite positioning system.

(d) The satellite compass shall incorporate integrated 3-axis rate gyro and acceleration sensors to deliver fast start-up times and provide heading updates even during temporary loss of satellite signals (i.e. during navigation under bridges).

(e) The maximum heading update rate for ARPA targets shall be 20 Hz for ARPA targets as specified in Paragraph 7.3.1 of this Part VII.

(f) The satellite compass shall provide the GPS source for the GMDSS function used by the fixed IMM VHF radio specified at Paragraph 7.5 of this Part VII.

(g) Performance:

(i)	Reference:	Either Magnetic North or True North
(ii)	Warm-up Time:	Less than one second
(iii)	Accuracy:	+1.0° typical
(iv)	Resolution:	0.1°
(v)	Deviation Compensation:	Automatic
(vi)	Operating Temperatures:	Sensor unit: 0°C to 50°C; Display unit: 0°C to 55°C
(vii)	Waterproofing:	Sensor unit: IPX5, Display unit: IPX6.

7.3.3 Differential Global Positioning System (GPS System) integrated with Radar/GPS/DGPS and Electronic Chart System

(a) The Contractor shall supply and install a differential GPS system which fulfils the following general requirements:

(i) The GPS system shall consist of a GPS receiver integrated with the GPS antenna and be suitable for mounting in the open air;

(ii) The GPS antenna/receiver shall be connected to the radar for the provision of GPS-related data, such as position fix, time, speed over ground and course over ground;

(iii) The GPS system shall be fully compatible with the radar;

(iv) The GPS system shall support Serial NMEA 0183, Serial 26-pin D-sub, Serial 9-wire RS232, Serial 3-wire RS232 and Ethernet (NMEA 2000); and

(v) The GPS system shall support at least the following data displayed either at the GPS display unit or the radar display:

1. Position (latitude/longitude): to at least four (4) decimal points
2. Horizontal Position accuracy (at speed of 15kt): less than or equal to 10m
3. Course: 1° resolution
4. Speed: 0.1 knot or 0.1 km/hour resolutions with at least three (3) digits
5. Date and time: selectable as GMT or local mode
6. Satellite status information

(b) The GPS system's antenna/receiver shall fulfill the following technical requirements:

(i)	Receiver Type:	8 or more channel parallel receiver
(ii)	Receiving Frequency and Code:	1,575.42 MHz (C/A code)
(iii)	Position Accuracy:	Within + or - 30 metres rms or better 95% of the time
(iv)	Warm Start Time:	Less than 30 seconds
(v)	Ambient temperature:	0°C to 55°C or better
(vi)	Waterproofing:	IPX7 or better

7.3.4 Public Address (PA)/Siren, Loudhailer/External Broadcasting System

(a) The PA/siren, loudhailer/external broadcasting system shall be an off-the-shelf product.

(b) The system shall function as a siren and powerful loudhailing system designed especially for hailing other craft in the marine environment. It shall comprise of a master control unit, a control panel, a fist microphone, amplifier, horn type loudspeakers and related components and accessories.

(c) In manual mode, the system shall be capable of generating both a "yelp" siren and a horn signal sound. In automatic mode, the system shall have a selection of at least six (6) warning signal sounds for general marine navigational use.

(d) The master control unit shall be recessed into the console with the user control panel flush-mounted on the console and positioned within reach of the coxswain. The user control panel shall incorporate "Power ON/OFF", "Hail Volume Control" and "Function Control" controls.

(e) Verbal messages shall be broadcast through a fist microphone mounted on the console within easy reach of the coxswain.

(f) The loudspeakers shall have a power rating of twenty (20) watts minimum and an impedance which shall match the amplifier.

(g) The system shall be waterproofed to IPX5 standard or better.

(h) The loudspeakers shall be equipped with a volume control system with which the volume can be adjusted to a minimum for night operations and to a maximum level which will enable messages to be heard 0.2 km away.

(i) The positions of all the system's main components shall be discussed at the kick-off meeting.

7.4 International Maritime Mobile (IMM) VHF Radio

7.4.1 The Contractor shall supply one (1) IMM VHF portable or fixed radio per Vessel, details of which shall be discussed at the kick-off meeting. It shall:

(a) be an off-the-shelf product for marine application;

(b) comply with relevant requirements of the European Parliament and Council Directive 1999/5/EC;

(c) be fully compatible with the GMDSS;

(d) be equipped with the full range of IMM VHF voice channels, all of which shall be selectable;

(e) be delivered complete with all components, features and functions necessary for full functionality;

(f) be capable of operating in temperatures ranging from -5°C to +55°C and be protected to IPX7 or better;

(g) if portable VHF is to be supplied :

(i) be supplied complete with antenna and two (2) re-chargeable batteries;

(ii) be supplied with a belt clip and a shoulder carrying case;

(iii) be supplied with one (1) 220V AC battery charger suitable for use ashore; and

(iv) be supplied with one (1) charger unit suitable for use on board the Vessel when the radio is required to be charged at sea. It shall be directly connectable to the Vessel's own DC power supply;

(h) Specific Features and Requirements:

(i) Power ON/OFF;

(ii) "Transmit" indicator, volume and squelch controls;

(iii) Channel number indicator;

(iv) Quick selection of Channel 16 (156.8 MHz);

(v) Dual watch and triple watch on Channel 16 and selected channel(s);

(vi) Channel scanning between Channel 16 and selected channels; and

(vii) The spacing between the channels shall be 25 kHz or better.

7.4.2 Transmitter:

(a)	Frequency Range:	156.025 MHz to 157.425 MHz, or better
(b)	Frequency Deviation:	Frequency modulation with maximum frequency deviation of +5 kHz
(c)	Spurious Emission:	-60 dB or better
(d)	RF Output Power:	Transmission power selector for: (a) High at five (5) watts nominal and (b) Low at one (1) watt nominal.

7.4.3 Receiver:

(a)	Frequency Range:	156.050 MHz to 163.270 MHz or better
(b)	Sensitivity:	Less than 1 µV for 12dB SINAD

(c)	Inter-modulation Rejection:	65 dB or better
(d)	Adjacent Channel Selectivity:	65 dB or better
(e)	Squelch:	Adjustable squelch control
(f)	Spurious Rejection:	65 dB or better
(g)	Audio Output Distortion:	At least 0.2 watt at rated output with less than 10%

7.5 Government Data Network

7.5.1 The Government data network consists of Government Mobile Data Equipment and Antennae that shall include the following equipment:

(a) Encryption mobile router;

(b) Antennae; and

(c) Ethernet switch(es).

7.5.2 The encryption mobile router shall meet the following specifications:

(a)	Wide Area Network (WAN) Interface:	2 x Embedded 4G Frequency Division – Long Term Evolution (FD-LTE) Modem with Multi-input Multi-output (MIMO) antennae 1 x Embedded 4G Time Division – Long Term Evolution (TD-LTE) Modem with MIMO antennae (FD-LTE Band: 2, 4, 5, 14, 17 and 27; TD-LTE Band: 38, 39, 40 and 41) 1 x Embedded 4G TD-LTE Modem with MIMO antennae (TD-LTE with operating frequency band between 1.785 GHz to 1.805 GHz) 1 x 10/100BaseTX Gigabit Ethernet 1 x 802.11a/b/g/n WAN interface with MIMO antennae
(b)	Ethernet interface:	8 x 10/100BaseTX Fixed port with Power over Ethernet capabilities compliance with Institute of Electrical and Electronics Engineers (IEEE) 802.3at class 4 standard. 1 x 802.11a/b/g/n interface with MIMO antennae
(c)	Requirement:	Load Balancing IPv4 and IPv6 support USB LTE/3G Modem support (3G Band: 1, 2, 4, 5 and 8) WAN / Mobile Bandwidth Bonding which is compatible with the Multi-Wan Bonding router IPsec VPN 256-bit AES Encryption PPTP VPN Server QoS for VoIP

	Speed Fusion connections to existing HKPF router (Peplink380)
(d) Environmental:	The mobile router specified at Paragraph 7.5.1(a) above shall be contained within a housing protected to IP67 and securely locked to the Vessel. The whole housing shall be easily detachable for maintenance purposes. Operation temperature at least between -20°C and +65°C Humidity: 15% – 95% (non-condensing)

7.5.3 The Contractor shall provide the six (6) pairs of weatherproof MIMO antennae specified in Paragraphs 7.5.2(a) and 7.5.2(b) above:

7.5.4 The Vessel's electronic equipment including the radar/GPS/DGPS and electronic chart system specified at Paragraph 7.3 above and/or other systems shall be connected to the Government data network by means of the encryption mobile router specified at Paragraph 7.5.1(a) above.

7.5.5 The Contractor shall provide one (1) Ethernet switch port to the console specified at Paragraph 3.4 of this Part VII. It shall be connected by IP67 protected plugs, jacks and cables. If, owing to the requirement to connect the Vessel's electronic systems to the Government data network specified at Paragraph 7.5.4 above, the number of Ethernet connections to the system exceeds the eight (8) Ethernet interface connections available as specified at Paragraph 7.5.2(a) above, the Contractor shall provide additional waterproof Ethernet switches as specified at Paragraph 7.5.1(c) above to meet the requirement.

7.6 Maritime Secure Automatic Identify System (AIS)

7.6.1 The Supplier shall supply one (1) set of AIS transponder to be installed on the vessel.

7.6.2 The AIS shall be fully Class A type approved AIS transponder.

7.6.3 The AIS shall support cipher DES, AES and support cipher keys:

(a) up to 128 time limited keys;

(b) manual keys input and

(c) external application input.

7.6.4 The AIS shall be with internal GPS for time synchronisation and be connected the GPS system and and Satellite Compass.

7.6.5 Each AIS shall be come with one (1) VHF Antenna of

(a) Frequency: 149-162.5MHz

(b) VSWR: 1.5:1

(c) Polarization: vertical

(d) Max Power: 100W

(e) Impedance: 50ohm

(f) Surge arrestor connecting to the lightning ground of the vessel

7.6.6 Each AIS shall be come with one (1) GPS Antenna with Antenna Element:

(a) Center Frequency: 1575.42MHz

(b) Output VSWR: <1.5:1

(c) Polarization: Right Handed Circular Polarization

(d) Output Impedance: 50 ohm

7.6.7 The GPS antenna shall come with a low noise amplifier with:

(a) Center Frequency: 1575.42MHz

(b) Power Gain 28 +/- 4.5dB

(c) Band Width: at least 2MHz

(d) Supply Voltages support 5V DC

(e) Output Impedance: 50 ohm

7.6.8 The AIS shall be waterproof with IPX6 or better.

7.6.9 The AIS shall be able to select, operate and display in at least four (4) modes of operations including but not limited to:

(a) Normal mode – function as a normal SOLAS Class A AIS broadcasting and receiving without encryption;

(b) Secure mode – only encrypted AIS data will be broadcasted, both encrypted and non-encrypted AIS messages will be received;

(c) Passive mode - no AIS will be broadcasted, both encrypted and non-encrypted AIS messages will be received; and

(d) Pseudo mode – receives both encrypted and non-encrypted AIS messages, broadcasts correct encrypted AIS data and virtual unencrypted AIS data for AIS spoofing.

7.6.10 The AIS shall provide an output to the display unit specified in Paragraph 7.3.1(e).

7.7 Intercommunication (IC) System

7.7.1 The Contractor shall supply and install a robust IP-based digital IC voice communication and data distribution system (such as SAVOX ImP system or equivalent) with an Ethernet backbone of at least 100Mb designed for use on open deck speedboats being used as specified in Paragraph 1.2.1 of this Part VII.

7.7.2 The IC system shall be compliant with the latest version of the CE Electrical and Mil Std 461 EMC and Mil Std 810E standards.

7.7.3 The IC system shall provide the Vessel's crew with a modular and expandable platform on which they can communicate with each other within their own vessel via IC and with others elsewhere via radio, mobile telephone networks and the Government data network.

7.7.4 The IC system shall also be capable of integrating with the radar or other data systems so that the vessel operators may receive audio notification alarms as required. The IC system shall also be capable of receiving both remote voice communications and remote digital system configuration, and programming instructions via the Government data network.

7.7.5 The IC system shall be composed of a number of main equipment forming an Ethernet network in ring topology. When any one of the Ethernet network paths or main equipment fails, the IC system shall re-route to use an unaffected path. The Contractor shall propose adequate main equipment to fulfil the requirements stipulated in Paragraph 7.7.

7.7.6 One of the main equipment units of the IC system shall be powered by the Vessel's DC supply and then distribute power to the other main equipment and associated equipment of the IC system via the Ethernet network.

7.7.7 The main equipment of the IC system shall be equipped with Ethernet Backbone Interface Units (EBIUs), the Radio Interface Units (RIUs) and Audio Gear Interface Units (AIUs), and connect to Personal Communications Units (PCUs).

7.7.8 The EBIU shall:

(a) form a Ethernet network on the vessel;

(b) connected to at least three (3) radio transceivers, including one (1) unit of HKPF Marine Radio Communications System as specified in Paragraph 7.9.1(a) of this Part VII, one (1) unit of International Maritime Mobile VHF portable radio as specified at Paragraph 7.4 of this Part VII, one (1) HKPF 3G/LTE commercial radio or mobile telephone and other HKPF data devices into the system;

(c) connect to the Vessel's radar notification alarms as specified at Paragraph 7.3.1(f)(xvi) of this Part VII;

(d) connected to the Vessel's PA system as specified at Paragraph 7.3.4 of this Part VII;

(e) be capable of routing system software configurations to each AIU, RIU, and PCU as appropriate.

7.7.9 The RIUs shall be:

(a) fixed nodes, the purpose of which shall be to integrate on board radio systems as specified in Paragraph 7.7.8(b) above;

(b) able to form individual communication channels within fixed nodes into groups by the operators as specified in Paragraph 7.7.9 (a) above;

(c) connected to the Vessel's DC power supply and the AIUs via the Ethernet network.

7.7.10 The AIUs shall:

(a) be fixed nodes connected to the Ethernet network as specified in Paragraph 7.7.5 above and which, together, form the basic infrastructure of the IC system;

(b) integrate the operator(s) with the IC system via extension cables;

(c) connect to the PCUs via waterproof plugs and sockets;

(d) receive and distribute voice communications; and

(e) have a full duplex intercom capability.

7.7.11 The PCUs shall:

(a) be the operator's primary gateway to the IC system;

(b) be installed in designated crew locations to be discussed at the kick-off meeting;

(c) be connected to both the operators' audio head gear and the AIUs;

(d) incorporate a voice-prompted menu selection control, a PTT for the intercom system and PTTs for at least two assigned radios;

(e) enable the operator to select whether to mute the communications systems or to transmit on the IC system using PTT, VOX or live microphone.

7.7.12 For each Vessel delivered under this Contract, the Contractor shall supply:

(a) sufficient channels from RIUs for the devices listed at Paragraph 7.7.8(b) above and other systems as provided for in this Specifications;

(b) sufficient AIUs with plug-in points for two (2) crew and four (4) passengers as specified in Paragraph 7.7.12(a) above if required;

(c) Six (6) PCUs for two (2) crew and four (4) passengers as specified in Paragraph 7.7.14 (b);

(d) waterproof connections capable of connecting to the HKPF's existing Safety Helmet audio headgear (details to be provided at the kick off meeting) with the PCU; and

(e) All other components required that have not specified in this specifications to enable the IC system to operate.

7.7.13 The system administrator shall be able to configure the system by computer either on site in the Vessel or remotely via the Government data network via the Government Mobile Data Equipment as specified in Paragraph 7.5 above to permit or deny individual operators or groups of operators to listen to or transmit on any of the communications to which the system is capable of being connected.

7.7.14 The Contractor shall, in respect of all of the Vessel(s) delivered under this Contract, supply two (2) sets of system administrator hardware and software with which the IC system can be configured, programmed and troubleshot.

7.7.15 The IC system shall be suitable for continuous operation in the Hong Kong climate and maritime environment throughout its life span in accordance with the specifications in this Chapter. It shall:

(a) be capable of operation in temperatures ranging from -5°C to 50°C;

(b) be capable of withstanding the knocks and jolts likely to occur during repair work or rough handling on a workbench; and

(c) be protected to IP67 standard or be enclosed in an IP67 watertight box;

7.8 Echo Sounding System

7.8.1 The Contractor shall supply and install an Echo Sounding System with the sonar unit securely installed on the body of the vessel.

7.8.2 The echo sounder supplied shall be connected to the radar multi-function display.

7.8.3 A separate display apart from the one mentioned in paragraph 7.3.1 above shall be installed in the control for displaying the current depth as well as all the current position information supplied by the GPS and the satellite compass above. This may be a combined display with the unit mentioned in 7.3.2 with detail arrangement discussed in the kick off meeting.

7.8.4 The Echo Sounding System shall be equipped with a shallow depth alarm, which can be preset to a given depth and provide an audio and visual alert when entering an area with a depth shallower than the preset depth.

7.8.5 The sonar unit shall not interfere or be interfered with by other equipment on the vessel.

7.8.6 The sonar unit shall be capable of detecting the depth of water within Hong Kong Water under any weather conditions.

7.9 Installation/Space/Cabling for the Existing HKPF Equipment

7.9.1 The Contractor shall, at no cost to Government, install onto each Vessel one (1) unit of each of the following equipment (EQ-HKPF), which shall be provided by the HKPF. Details of location, space, cable, and power requirements shall be provided at the kick-off meeting.

(a) HKPF Marine Radio Communications System (MRCS Radio "A") TETRA mobile radio. The present equipment type is the EADS TETRA TMR880i mobile radio with separate control panel and speaker box. The TMR880i is a wide-band version with a frequency range of 380 MHz to 430 MHz. The radio is powered by a +12V DC nominal supply. The HKPF reserves the right to use other radio types in place of the present TMR880i. Provided that the Government notifies the Contractor at least three months in advance of the on-site installation of the MRCS Radio "A", no additional costs associated with the installation of a radio of a different type shall be chargeable to the Government.

(b) A tablet or smartphone with a display of no more than 13 inches. The Contractor shall provide a mounting location at the console to be discussed at the kick-off meeting. The mounting shall include a mounting frame and shock-absorbing cushions for securely mounting the device onto the Vessel using flexible, self-adhesive Velcro tape. The Contractor shall provide two sets of flexible self-adhesive Velcro tape for each Vessel.

Chapter 8 - Services Support

8.1 General Philosophy

8.1.1 In determining the appropriate design for the Vessel, all of the following factors shall be taken equally into account:

(a) Vessel performance (e.g. engine rating, size).

(b) Initial cost.

(c) On-going cost (e.g. maintenance cost, petrol consumption, spare parts).

(d) Reliability (frequency and time to repair breakdown).

(e) Time between maintenance periods.

(f) Time to undertake scheduled maintenance (downtime); and

(g) All machinery and Equipment installed in the Vessel shall be serviceable in the HKSAR.

8.1.2 Maintainability – The Vessel shall be easy to maintain by ensuring that there shall be:

(a) Good access to all installed items for monitoring, service and overhaul; and

(b) Ease of access for in-situ servicing and maintenance in the HKSAR.

8.2 Information to be Provided Prior to and at Delivery Acceptance

8.2.1 Not later than six (6) weeks prior to Delivery Acceptance, the Contractor shall supply the Inventory List to the MD for approval. The detailed inventory list for the whole Vessel covering all discrete items down to major component/unit level shall include the following. At the Delivery Acceptance of the Vessel, the approved Inventory List will be used to check that all the items have been delivered to MD in a satisfactory state.

(a) Item number on the inventory list;

(b) Description;

(c) Type or model (if applicable);

(d) Serial number(s);

(e) Quantity;

(f) Manufacturer;

(g) Manufacturer's reference number;

(h) Location in Vessel;

(i) Local agent/supplier address, telephone and facsimile numbers and email address;

(j) Order lead time;

(k) Shelf life; and

(l) Unit cost.

8.2.2 At Delivery Acceptance, the Contractor shall provide the MD with the following:

(a) Four (4) paper copies and two (2) soft copies on DVDs of the approved inventory list;

(b) Four (4) complete sets of paper print "as fitted" drawings of the Vessel and two (2) soft copies on DVDs;

(c) Four (4) complete sets of paper print "as fitted" electrical schematic, cabling, wiring and single line diagrams for electrical equipment installed on board and conduit / trunk route diagrams and two (2) soft copies in DVDs as per the Vessel delivered;

(d) Four (4) paper copies and two (2) soft copies in DVDs of a list of all bought-in machinery and electrical equipment installed on the Vessel, where the list shall include:

(i) Description,

(ii) Type or model (if applicable),

(iii) Makers part number or equivalent (if applicable),

(iv) Location,

(v) Quantity,

(vi) Supplier or agents name and contact details,

(vii) Order lead time,

(viii) Shelf life, and

(ix) Unit cost;

(e) Four (4) copies (at least one (1) original) of manufacturers' operation, maintenance and workshop manuals in English for all machinery and Equipment, including spares and stores, special tools and test equipment;

(f) Four (4) paper copies and two (2) soft copies in DVDs of the Contractor's "Docking Plan", which shall include the profile, plan and sections as per the Vessel delivered;

(g) Four (4) paper copies and two (2) soft copies in DVDs of the On Board Operator's Manual (English and traditional Chinese) for the Vessels delivered covering:

(i) Daily user check and operation procedure,

(ii) Operating detail of each system, and

(iii) Emergency operation procedure.

(The precise format and detail required shall be subject to the Government's approval when the configuration of the Vessel and outfitting is decided.); and

(h) One (1) set in paper format of the operational manuals and maintenance manuals in English as specified in Paragraph 7.2.11 of this Part VII for each individual item of ENE. For the avoidance of doubt, this set of operation and maintenance manuals is in addition to the sets which are required to be supplied in accordance with Paragraph 7.2.11 of this Part VII.

8.2.3 The first draft of the On Board Operator's Manual (in both English and traditional Chinese) mentioned in Paragraph 8.2.2(g) of this Part VII shall be submitted to GNC for approval not less than one (1) month before Delivery Acceptance.

8.2.4 Tools and Test Equipment for Electronics

All tools and testing equipment for the Vessel's electronic equipment shall be delivered directly to COMMS. All items shall be documented, preserved and packed properly.

8.2.5 Photographs

The Contractor shall at Delivery Acceptance provide the following:

(a) As-Fitted Photographs

(i) Two (2) sets of colour prints (130 mm x 90 mm) from different aspects to give an overall picture of the various parts/areas of the Vessel; and

(ii) Each set of prints shall be presented in a suitable album, indexed and labelled appropriately to ensure that the position from which the picture was taken and the position of the subject in the picture are clearly identifiable.

(b) Official Photographs

(i) Four (4) framed colour photographs of picture size not less than 350 mm x 270 mm and a frame size not less than 510 mm x 400 mm showing the profile of the Vessel in Hong Kong Waters;

(ii) Four (4) 200 mm x 150 mm colour photographs showing the profile of the Vessel in Hong Kong Waters; and

(iii) Four (4) 150 mm x 100 mm colour photographs showing the profile of the Vessel in Hong Kong Waters.

(c) Softcopy of Photographs

(i) All of the photographs specified at Paragraphs 8.2.5(a) and (b) of this Part VII shall be taken using a digital camera with a resolution of at least 12 megapixels and be forwarded to the HKPF on a DVD in RAW and JPEG formats at Delivery Acceptance.

8.2.6 Certificates and Reports

Copies of the following documents (one (1) original with two (2) copies and one (1) softcopy stored in DVDs), filed in clear folders, shall be forwarded to GNC at Delivery Acceptance:

(a) Associated test certificates;

(b) Hull Construction Certificate or Classification Certificate of the Vessel;

(c) Test performance certificates of Equipment (e.g. electronics, switchboards);

(d) Main engine performance test certificates;

(e) Engine International Air Pollution Prevention Certificate and Supplement for the main engines;

(f) Type approval certificate of the waterjet;

(g) Complete record of the Official Sea Trial commissioning tests;

(h) Warranty certificates of all machinery, Equipment and apparatus of the Vessel (valid for twelve (12) months from the date of Acceptance Certificate of the Vessel);

(i) Certificates of light and sound signalling Equipment;

(j) Builder certificates;

(k) Certificates of building material;

(l) Deviation card for compass (after adjustment in the HKSAR);

(m) Hull construction material certificates issued by one of the Classification Societies listed in Paragraph 2.3.4 (a) to (i) of this Part VII;

(n) Undertaking duly signed and sealed by the Contractor's (or its sub-contractor's) shipyard to provide Warranty Services in relation to all aspects of the Vessel during the Warranty Period in the HKSAR as stipulated in Annex 1 of this Part VII;

(o) Asbestos free certificate or statement of compliance; and

(p) Any other certificates as appropriate.

8.2.7 Ship Model

The Contractor shall provide the Government with three (3) ship models (scale 1:15). The models shall include all major external fittings above and below the waterline such as the collar, console, skeg, appendages, propulsion system, mast, mast fittings and navigation lights, lifesaving equipment, fire-fighting equipment, bollards and cleats as agreed by the Government. The ship model shall be made to an overall exact scale standard relevant to model making.

Chapter 9 – Training

9.1 General

9.1.1 This chapter stipulates the training requirements on Electronic Navigations Equipment and for the operation and maintenance of the Vessel, and shall be arranged by the Contractor.

9.1.2 All training courses shall be held in the venue to be provided by HKPF in HKSAR. The training shall be conducted in Cantonese and/or English with relevant training materials supplied by the Contractor.

9.1.3 If any of the training instructor(s), trainer(s), and any other personnel providing the training are travelling from outside Hong Kong, all the trainings shall be provided by such personnel in one visit in Hong Kong.

9.1.4 Unless otherwise specified, the Contractor shall provide all materials necessary for the training courses specified in Paragraphs 9.2 and 9.3 of this Part VII.

9.2 Training on Electronic Navigational Equipment

9.2.1 The Contractor shall provide the HKPF's operational and technical and maintenance staff with both classroom-based and vessel-based training to familiarise them with the operation and maintenance of the ENE.

9.2.2 It is anticipated that two (2) distinct types of training shall be required, namely:

(a) Operator training on ENE; and

(b) Equipment maintenance training on ENE.

9.2.3 The Contractor shall submit a course syllabus and a schedule for conducting the training courses for approval at least two (2) months prior to the commencement of training.

9.2.4 Operator Training Course on ENE

(a) This course shall be a train-the-trainer course;

(b) The course shall provide a detailed understanding of the day-to-day operation of all Equipment and shall include "hands on" demonstrations, the operation of all Equipment and routine cleansing requirements.

(c) The course shall cater for fifteen (15) trainees.

9.2.5 Equipment Maintenance Training Course on ENE

(a) The course shall provide the COMMS technical and maintenance staff with a detailed understanding of all aspects of the design considerations, day-to-day operation, interconnected system operation, fault breakdown, routine maintenance, fault-finding and repair procedures of the Equipment and it shall include both practical demonstrations and tests.

(b) This course shall equip the COMMS technical and maintenance staff with sufficient expertise to enable them to maintain the Equipment after the expiry of the Warranty Period effectively.

(c) This course shall cater for fifteen (15) trainees.

9.2.6 The Contractor shall supply a trainee attending either of the courses specified at Paragraphs 9.2.4 and 9.2.5 above with one (1) copy of the comprehensive training documents in both paper and DVD format. The HKPF shall have the right to reproduce all training documents for internal use.

9.2.7 The Contractor shall, upon successful completion of the entire course, issue each training course participant with a certificate as evidence of his/her attendance.

9.3 Training on Operation and Maintenance of the Vessel

9.3.1 The Contractor shall provide the HKPF's operational and both the HKPF's and Government Dockyard Maintenance Section's technical and maintenance staff with both classroom-based and vessel-based training to familiarise them with the operation and maintenance of the Vessel.

9.3.2 In respect of the operation and maintenance of the Vessel, the Contractor shall provide the following training:

(a) Operator training on Vessel operations to the HKPF's operational staff; and

(b) Engine and on board Equipment maintenance training to the technical and maintenance staff of both the HKPF and the Government Dockyard Maintenance Section.

9.3.3 Operator training on Vessel operations

(a) In respect of the vessel operator's training course, the Contractor shall, not less than two (2) months prior to Delivery Acceptance, submit for the HKPF and MD's approval a draft vessel operator's training syllabus, which shall cover on board Equipment, systems, first level maintenance and troubleshooting as well as all aspects of boat handling which shall include, but not be limited to, trim, turning and operating in rough water. The draft shall include details of the depth, duration and scheduling of the proposed training course and the qualifications possessed by the proposed training instructor(s).

(b) Upon Delivery Acceptance, the Contractor shall then deliver the vessel operator's training course according to the approved syllabus to fifteen (15) HKPF operational staff.

9.3.4 Engine and On Board Equipment Maintenance Training

(a) In respect of the engine and on board Equipment maintenance training course, the Contractor shall, not less than two (2) months prior to Delivery Acceptance, submit for the HKPF and MD's approval a draft engine and on board Equipment maintenance train-the-trainer training syllabus, which shall include, but not be limited to, all aspects of the designs, day-to-day operation, breakdown, routine maintenance and fault diagnosis of the engine/electrical distribution system and hull structural repair. The draft shall include details of the depth, duration and scheduling of the proposed training course and the qualifications possessed by the proposed training instructor(s).

(b) The Contractor shall then deliver the engine and on board Equipment maintenance training course according to the approved syllabus to ten (10) HKPF and ten (10) Government Dockyard Maintenance Section technical and maintenance staff in the HKSAR or overseas.

9.3.5 The Contractor shall supply a trainee attending either of the courses specified at Paragraphs 9.3.3 and 9.3.4 above with one (1) copy of the comprehensive training documents in both paper and DVD format. The HKPF shall have the right to reproduce all training documents for internal use.

9.3.6 The Contractor shall, upon successful completion of either of the courses specified at Paragraphs 9.3.3 and 9.3.4 above, issue each training course participant with a certificate as evidence of his/her attendance on the training course and the standards of competence achieved.

Chapter 10 – Abbreviations

3G	3rd Generation
4G	4th Generation
A/C	Alternating Current
AIS	Automatic Identify System
AES	Advanced Encryption Standard
AIU	Audio Gear Interface Unit
ANSI	American National Standards Institute
ARPA	Automatic Radar Plotting Aid
AWS	American Welding Society
C/A	Course/Acquisition
cd/m^2	Candela per metre squared
cm	Centimetre
CO_2	Carbon Dioxide
COMMS	Communications Branch of HKPF
CPA	Closest Point of Approach
dB	Decibel
DC	Direct Current
DGPS	Differential Global Positioning System
DHCP	Dynamic Host Configuration Protocol
DVD	Digital Video Disk
EGNOS	European Geostationary Navigation Overlay Service
EMC	Electromagnetic Compatibility
ENE	Electronic Navigational Equipment
ERBL	Electronic Range and Bearing Lines
FAT	Factory Acceptance Trials
FD	Frequency Division
GHz	Gigahertz
GLONASS	Global Navigation Satellite System
GM	Metacentric Height
GMDSS	Global Maritime Distress and Safety System
GMT	Greenwich Mean Time
GPS	Global Positioning System
HPEAFS	High Performance Energy Absorbing Flooring System
H/V	Horizontal/Vertical
Hz	Hertz
IC	Intercommunications
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICOMIA	The International Council of Marine Industry Associations
IMM	International Maritime Mobile
IMO	International Maritime Organisation
IEC	International Electrotechnical Commission
IP	Internet Protocol
IPsec	Internet Protocol Security
IRPA	International Radiological Protection Association
ISO	International Organization for Standardization
ITU-R	International Telecommunication Union – Radiocommunication Sector
JPEG	Joint Photographic Experts Group
kg	Kilogram
kHz	Kilohertz
km	Kilometre
kPa	kilo Pascal
kW	Kilowatt
LCD	Liquid Crystal Display

LCG	Longitudinal Centre of Gravity
LED	Light-emitting Diode
LSA	Lifesaving Appliance
LTE	Long Term Evolution
MCR	Maximum Continuous Rating
MOB	Man Overboard
MHz	Megahertz
MIMO	Multi Input Multi Output
mm	Millimetre
NDT	Non-Destructive Test
NIR	Non-Ionizing Radiation
NMEA	National Marine Electronics Association
NORSOK	Norsk Sokkels Konkuranseposisjon
ohm	Unit of Electrical Resistance
OFCA	Office of the Communications Authority
PA	Public Address System
PCB	Printed Circuit Board
PCU	Personal Communications Unit
PPI	Plan Position Indicator
PPTP	Point-to-Point Tunnelling Protocol
PTT	Press To Talk
PVC	Polyvinyl Chloride
QoS	Quality of Service
RAW	A file format that captures all image data recorded by the sensor when a photograph is taken
RF	Radio Frequency
rms	Root mean square
rpm	Revolutions per minute
RM	Relative Motion
RT	Radioactive Test
SBAS	Satellite -based Augmentation System
SINAD	Signal-to-noise and Distortion Ratio
SOLAS	Safety of Life at Sea
TBT	Tributyltin
TCG	Transverse Centre of Gravity
TCPA	Time-based Closest Point of Approach
TD	Time Division
TM	True Motion
TS	Technical Specifications
UHF	Ultra High Frequency
USB	Universal Serial Bus
UT	Ultrasonic Test
V	Volt
VCG	Vertical Centre of Gravity
VHF	Very High Frequency
VOC	Volatile Organic Compounds
VoIP	Voice Over Internet Protocol
VOX	Voice Operated Switch
VPN	Virtual Private Network
VRM	Variable Range Marker
WAAS	Wide Area Augmentation System
WAN	Wide Area Network
µs	Microsecond
µV	Microvolt

Part VII - Annex 1 - Warranty Services and Guarantee Slipping

1. Warranty Services

1.1 The Contractor shall provide Warranty Services in relation to all aspects of the Vessel during the Warranty Period, including Guarantee Slipping as stipulated in this Annex. If the Contractor appoints an authorised agent to perform the Warranty Services, the Contractor shall ensure that the authorised agent appointed will perform the Warranty Services and Guarantee Slipping in full compliance with the requirements of the Contract including those as set out in this Annex 1.

1.2 The Government reserves all rights and claims against the Contractor in the event that any warranty claim has not been handled in accordance with the terms of the Contract.

1.3 For the Equipment in respect of which the manufacturer/supplier does not offer a one-year free warranty on such equipment, the Contractor shall provide the Warranty Services throughout the Warranty Period at the Contractor's own cost. For other loose equipment and installations, such as life-saving and firefighting equipment, etc., which are required to be serviced, inspected or renewed annually, the Contractor shall provide the servicing, inspection and renewal as per the manufacturer's requirements of that equipment or installation in the Warranty Period applicable to such items.

1.4 During the Warranty Period, when the Vessel is handed over for the Warranty Services and/or Guarantee Slipping, the Contractor shall be responsible for the due return of the Vessel in good order. Should there be any loss or damage of the Vessel or any Warranty Item (as defined in Paragraph 1.5 below) caused by any reason whatsoever while the Vessel is in the possession or control of the Contractor (including even when the Vessel is at the Government Dockyard or a maintenance base of the user department) or at the shipyard of the Contractor or an authorised agent appointed by it, the Contractor shall pay for the cost for the loss or damage plus 20% as and for liquidated damages but not as a penalty. Throughout the Warranty Period, notwithstanding anything to the contrary in the Contract, the Vessel and all Warranty Items are deemed to be at the Contractor's risks, and the Contractor shall insure and keep insured, at his own expense, a property insurance with the Government to be named as the sole payee, for an indemnity amount of not less than the purchase price of the Vessel plus 20% to protect the Government property against all risks. The Certificate of Insurance and evidence showing that the premium has been paid shall be available for inspection in advance. The Contractor shall provide this insurance policy before the commencement of the Warranty Services and/or Guarantee Slipping.. Any excess payable under the insurance policy shall be borne by the Contractor.

1.5 Total Vessel Warranty

It is required that the Vessel is covered by free of charge Warranty Services for one year after the date of the issue of the Acceptance Certificate in respect of the Vessel. The Warranty Services shall cover the entire Vessel and all its Equipment (including all major Equipment specified in Schedule 6 in Part V and electronic navigational equipment), fittings and outfit (including spare parts, and documentation) (collectively, "Warranty Items") against defects of design, construction, workmanship or materials and against any non-compliance with any of the Product Warranties. The Warranty Services may be backed up by the Contractor using individual equipment suppliers/manufacturers' warranties but the Contractor shall remain solely liable to MD as a primary obligor to provide the Warranty Services. Notwithstanding and without prejudice to the Contract on warranty obligations for the total Vessel, any individual equipment supplier/manufacturer's warranty extending beyond the one year total Vessel warranty must be assigned to the Government as appropriate.

1.6 Procedures for Warranty Claim

Without prejudice to the provisions of the Contract, a detailed procedure for dealing with warranty claims must be proposed by the Contractor and agreed by MD before the issuance of the Acceptance Certificate of the Vessel. This shall be based on the following principles:

1.6.1 Any notification of claimed defect shall be sent from MD to the Contractor through a defined route.

1.6.2 There shall be a joint inspection to examine the defect and the Contractor shall propose the appropriate and necessary remedial action to the satisfaction of MD.

1.6.3 The Contractor shall undertake on-site Warranty Services (including provision of all replacement Warranty Items, spare parts, labour, materials, test equipment, and transportation) wherever, at the option of the Government, the Vessel is berthed in the Government Dockyard or maintenance bases of the user department. Taking the Vessel to the shipyard of the Contractor should be avoided unless absolutely necessary.

1.6.4 Rectification of defects must have a minimum effect on the operation of the Vessel by the provision of on loan equipment if the anticipated repair time exceeds the time frame as specified in Paragraph 1.7.1 below.

1.7 Throughout the Warranty Period, the Contractor shall be responsible for the provision of free of charge corrective maintenance and rectification of all defects in all and any of the Warranty Items including repair and replacement as necessary. This shall, at no cost to the Government, include Warranty Services to be performed by the Contractor described in the following sub-paragraphs:

1.7.1 To attend to the Vessel for inspection and repair within 24 hours (excluding Hong Kong public holidays) of receiving the report of a fault ("fault report") and to take immediate action to rectify the defect after inspection. Unless otherwise agreed by the Government, all corrective maintenance and rectification must be effected within 48 hours after the fault report is first issued. The MD must be informed of what corrective maintenance and rectification actions have been taken within 72 hours of receiving the relevant fault report.

1.7.2 To provide all necessary transport, replacement Equipment, spare parts, labour and materials, tools and testing instruments required for the corrective maintenance and rectification.

1.7.3 Any replacement item or part to be used shall originate from the manufacturer of the original Warranty Item to be repaired and must be able to be found in the latest spare parts list issued by such manufacturer. Alternative components shall not be used without the prior approval in writing of the MD.

If the Contractor fails to respond to any reported warranty claims within 48 hours, the MD may arrange corrective maintenance and rectification of the defect either on its own or by deploying a third party contractor as deemed appropriate with a view to minimising any downtime incurred. In such case, the Contractor shall compensate the Government for the full cost of such repairs plus 10% as and for liquidated damages but not as a penalty no later than 10 working days after a written demand has been served on the Contractor by MD.

1.8 Extension of Warranty

1.8.1 The Warranty Period for any Warranty Item shall be suspended whilst and if the Contractor fails to repair and correct satisfactorily the defects in such Warranty Item within seven working days counting from the date when the relevant fault report was first issued.

1.8.2 Warranty Items which are electronic equipment sub-assemblies, modules or components and which are replaced during the Warranty Period shall have a new warranty period of one year commencing from the date of replacement.

1.8.3 In relation to a Warranty Item, references to Warranty Period shall be construed to include such extended warranty period as mentioned in Paragraph 1.8.1 and/or 1.8.2 above, depending on whichever is applicable.

1.8.4 Equipment which is found to be defective during the trials at the Guarantee Slipping as mentioned in Paragraph 2.2.3 below shall have an extension of warranty of one year.

1.9 Recurrent Defects

During the Warranty Period, should a second and similar defect arise in relation to a Warranty Item, this shall be construed as conclusive evidence of the Warranty Item's unsuitability for the purpose intended, and the Contractor shall take immediate steps to conduct a thorough investigation jointly with MD at the Contractor's expense, to ascertain the reasons for any such defect and shall forthwith

at the MD's option and the Contractor's expense, procure and deliver another replacement Warranty Item with a new design suitable for the purpose intended to replace the original defective Warranty Item.

1.10 In the event that the Contractor proposes to modify any Warranty Item or any part of the Vessel in order to repair or replace the same or another Warranty Item, the Contractor shall obtain the Government's advance written consent to the proposed modification.

1.11 Throughout the Warranty Period, the Contractor shall maintain an inventory of spare parts, which shall be the same items as listed in Schedule 6 in Part V and in the same quantity in the shipyard of the Contractor which the Contractor shall use for performing the Warranty Services. The Government will not provide its own inventory of the Spare Parts to the Contractor for the provision of the Warranty Services.

1.12 Updated/Upgraded Information

It is expected that during the Warranty Period certain Warranty Items may be modified or changed. All documentation affected by this change must be updated to reflect the new situation. All the support documentation such as the Vessel inventory list, job information and maintenance scheduling in relation to these modifications and changes shall be provided at the expiry of the Warranty Period.

1.13 Warranty of Electronic Navigational Equipment

Please refer to the Paragraphs 7.2.13 in Chapter 7 of the TS.

2. Guarantee Slipping

2.1 As stated in the section "Warranty" above, Guarantee Slipping shall be carried out at the end of the original Warranty Period regardless of any subsequent extension in relation to any Warranty Item under the terms of the Contract.

2.2 At the Guarantee Slipping, the Contractor shall carry out the following work and provide all necessary materials, spare parts, labour and equipment in order to carry out such work:

2.2.1 Engines and Gearboxes

(a) Renew the lubricating oil and replace the filters for the main engines and gearboxes as per the manufacturer's recommendations;

(b) Clean all the engine air filters and change the filter elements as necessary;

(c) Clean the coolers of the engines and renew all zinc anodes if provided;

(d) Check all the engines' belts and adjust if necessary;

(e) Check tappet clearances for the inlet and exhaust valves, ignition timing and idle speed and adjust if necessary;

(f) Conduct function tests for the engines' protection system and their associated sensors, gauges and other measuring devices; and

(g) Any other work required or recommended by the engine manufacturer.

All of the work listed at Paragraphs 2.2.1(a) to (g) shall be carried out by the manufacturer's authorised agent. All the work procedures and the spare parts used shall comply with the manufacturer's specifications and requirements.

2.2.2 Hull and Deck Items (where applicable)

(a) Paint Under the Water Line

(i) Paint under the water line shall be checked by the paint manufacturer's representative for the effectiveness of two years' protection against marine growth;

(ii) The hull shall be cleaned;

(iii) Damaged paint shall be repaired according to the paint manufacturer's procedures;

(iv) After the repair of the damaged paint as specified at Paragraph 2.2.2(a)(iii) above, two coats of touch up primer and one coat of touch up shall be applied; and

(v) One full coat of finishing paint shall be applied to the hull below the water line.

(b) Paint Above the Water Line

(i) Damaged paint on the hull above the water line shall be repaired properly. After repair, two coats of touch up primer and one coat of touch up shall be applied;

(ii) Two coats of paint shall be applied on the Vessel's name, draft marks and insignia; and

(iii) One full coat of anti-slip paint shall be applied to the open and side deck.

(c) Inspect, clean and polish propellers.

(d) Free, clean, grease and recondition all moving parts of the deck fittings, i.e. WT (water tight) hatches, vent covers, rollers and fairleads and anchor chain stoppers, etc.

(e) Renew all zinc anodes.

2.2.3 The following shall be tested at the dock trial / sea trials as part of the Guarantee Slipping:

(a) Engine control and steering system;
(b) Engine alarm and shut down function (including emergency stopping of engines);
(c) Navigational equipment, lights and sound signals;
(d) Ahead and astern running and crash stop test;
(e) Steering trial;
(f) Speed measurement;
(g) Other trials as required by the Government Representative; and
(h) Any item or component found defective shall be repaired or replaced.

Milestones		Completion Dates
1	Kick-Off Meeting	To be held within two (2) months after the Contract Date at the Government Dockyard or the Contractor's Shipyard
2	Completion of hull structures	The Contractor shall propose the completion dates of Milestones 2-6 for GNC's approval within two (2) months after the Contract Date.
3	Completion of installation of engines, propellers and steering gear	
4	Completion of installation of electronic navigation equipment	
5	Pre-shipment Construction and Handling Inspection	
6	Shipment to Hong Kong	
7	Delivery Date	The Delivery Date for the Vessel shall be no later than the date set out in Schedule 2 (Delivery Schedule) of Part V

Drawings Approval	Completion Date
General Arrangement Plan	***A ll the drawings are required to be submitted within two (2) months after the signing of Articles of Agreement for GNC's approval / reference.***
Lines Plan	
Structural Construction Plan in Mid-Ship and Bulkhead Section	
Construction Profile and Deck Plan	
Shell Expansion Plan	
Tank Capacity Plan	
Engine Mounting Arrangement	
Power / Speed Estimation and Curve	
Intact and Damaged Stability Plan	
Details of Electronic Navigational / Communication Equipment	
Details of Deck Equipment, Outfitting, Furniture, etc.	
Details of Engines' Arrangement	
Consoles Arrangement and Schematic Diagram	
Instrumentation and Control System	
Calculation of Fuel Capacity	
Details of Electrical and Electronic Equipment	
Electrical Load Calculations	
Schematic Layout of Electrical Circuits	
Paint Schedule	
Lightning Protection Arrangement	
Torsional Vibration Calculation	
Others as required	

Part VII Annex 4 – Main Items Inspection Timetable

Item No.	Items to be Inspected			Completion Date	
				1st Vessel	Remaining Vessels
	Hull Structure, Layout and Outfitting Inspection				
H-1	Mould lofting				
H-2	Construction materials – Aluminium plate mark checking for hull and superstructure				
	(a)	Aluminium plate mark checking for hull and superstructure			
	(b)	Material certificates verification			
H-3	Welding consumables & welders certificates				
H-4	Keel laying for hull				
H-5	Fabrication of hull up to main deck in stages of work, including:				
	(a)	Alignment			
	(b)	Edge preparation			
	(c)	Welding			
	(d)	Workmanship			
	(e)	Compliance with approved plans			
	(f)	NDT (X-ray) of welds			
	(g)	Hull internal work inspection			
	(h)	Plating thickness gauging			
H-6	Engine bearers fabrication / welding				
H-7	Superstructure scantling & welding checking				
H-8	Welding construction and pressure tests of tanks				
	(a)	Fuel oil tank			
		(i)	Tank construction (internal/external/fitting)		
		(ii)	Tank pressure test		
H-9	Hose test for hull & superstructure				
H-10	Mock up inspection				
H-11	Installation of various outfitting items				
	(a)	Anchor and chain			
	(b)	Seating of heavy equipment and masts			
H-12	Function tests of various outfitting items				
H-13	Watertightness or weathertightness of openings				
	(a)	Manholes			
	(b)	Hatches			
	(c)	Air pipes			
H-14	Painting inspection of different layers				
H-15	Draught marks and vessel dimensions verifications				
H-16	Arrangement of consoles				
H-17	Zinc anodes and lightning system				
	(a)	Installation of zinc anodes			
H-18	Inspection of fire, heat and sound insulation				
	(a)	Fire insulation			
	(b)	Heat insulation			
	(c)	Sound insulation			

H-19	Interior furnishings		
	(a) Console area		
H-20	Lifesaving appliance		
H21	Fire fighting appliance		
H-22	Inclining experiment and/or lightship weight measurement		
H-23	Sea trials including operation test of outfitting equipment		
H-24	Towing test static bollard pull test		
H-25	Site towing demonstration trial		
H-26	Cleanliness inspection before acceptance		
H-27	Inventory check in the HKSAR		
H-28	Acceptance and delivery		
	Electrical and Machinery Installation		
EM-1	General inspection on installation of machinery:		
(a)	General inspection on installation of main engines		
(b)	General inspection on installation of waterjet system		
EM-2	Main engines:		
(a)	Test of engine safety devices and alarms		
EM-3	Fuel oil system:		
(a)	General inspection & dimension checking of fuel oil system		
(b)	Fuel oil tank low level alarm test		
(c)	Fuel oil tank final cleaning/internal inspection before filling		
(d)	Fuel oil tank high level alarm test		
(e)	Fuel oil tank content gauge calibration and test		
(f)	Inspection of piping penetration of bulkhead and deck		
(g)	Hydraulic test of fuel oil piping		
EM-4	Bilge system:		
(a)	General inspection & dimension checking of bilge system		
(b)	Bilge tank high and low level alarms test		
(c)	Inspection of piping penetration of bulkhead and deck		
(d)	Hydraulic test of piping		
(e)	Functional test of bilge system		
EM-5	Functional test of drainage system		
EM-6	Batteries:		
(a)	Inspection of battery connectors and housing boxes		
(b)	Inspection of battery charger		
(c)	Operational test of battery charger Test of main engines and generator consecutive starting by each group of battery (start/stop at remote and local control)		
EM-7	Electrical installation:		
(a)	Inspection of lightning conductor		
(b)	General inspection of cable layout & checking of cable sizes		
(c)	Inspection of cable penetrations of bulkhead and deck		

(d)	Inspection of transformers		
(e)	Inspection of tally plates		
EM-8	Main switchboard & panels:		
(a)	Main switchboard & panels - high voltage injection test		
(b)	Cable size checking of electrical switchboard installations		
(c)	Inspection of DC distribution panel		
(d)	Megger test of the electrical system		
(e)	Earthing test of the electrical system		
EM-9	Control console:		
(a)	Inspection of control console		
(b)	Functional test of console controls		
(c)	Inspection of navigation equipment control panel		
EM-10	Lighting:		
(a)	Inspection and functional test of general lighting		
(b)	Inspection and functional test of emergency lighting		
(c)	Inspection and functional test of floodlight installation		
(d)	Inspection and functional test of searchlight installation		
EM-11	Navigational lights and signals		
(a)	Inspection and functional test of navigational lights		
(b)	Test of horn/whistle/siren		
EM-12	Inspection of lightning protection system		
EM-13	Electronic equipment tested by COMMS		
EM-14	Test of noise level during sea trial		

Note:
These inspection items are preliminary and not exhaustive. Any items found necessary to be included at a later stage will be added to this list.

Part VII - Annex 5 - Endurance and Performance Tests

Date of Test:		Place of Test:	
Vessel's Identification:		Vessel's Name:	

Conditions at Endurance and Performance Test			
Person On Board	**2 Persons**	Dummy Weight	**20 kg**
Fuel (Petrol)	**90% of Fuel Tanks Capacity**	Other Equipment	**20 kg**
Sea Conditions	**WMO Sea State 0 to 2**		

Engines:	**Port Side**	**Starboard Side**	**Propellers:**	**Port Side**	**Starboard Side**
Maker			Maker		
Type			Type		
Serial Number			Diameter		
Rated Power			Pitch		
Rated Speed			Direction of Rotation		

Engine Load	**Engine Speed (rpm)**	**Vessel Speed (Knots)**	**Time (Start)**	**Time (Finish)**	Fuel Consumption (litres/minutes)	**Engine Oil Pressure (Bar)**	**Engine (in) CW Temp. (^{o}C)**	**Others**	**Others**
__% of rated Power	At Minimum Cruising Speed		Not less 15 minutes						
50% of Rated Power/rpm			Not less 15 minutes						
60% of Rated Power/rpm			Not less 15 minutes						
70% of Rated Power/rpm			Not less 15 minutes						
80% of Rated Power/rpm			Not less 15 minutes						
90% of Rated Power/rpm			Not less 15 minutes						
100% of Rated Power (Endurance Test)			Not less 120 minutes						

Remarks:

Witnessed by:	MD's Representative	Shipyard's Representative

Part VII - Annex 6 - As-fitted Drawings and Machinery/Equipment documents and information literature to be delivered to the Government at Delivery Acceptance

1. As-Fitted Drawings

1.1 Upon delivery of the Vessel, the Contractor shall deliver to the Government four (4) hard copies and two (2) soft-copies in pdf. and dwg. formats of the following plans and drawings that contain the technical information of the Vessel and its machinery and equipment as they are on the day when the Vessel is accepted by the MD. These are termed the final version of the "As-Fitted" Plans and Drawings, and they shall consist of the following plans and drawings as well as any other plans and drawings that may be required by GNC/MD during the design and construction of the Vessel and before the Vessel is accepted by the Government.

1.2 The As–Fitted Plans and Drawings shall be prepared by professional ship draughtsmen in the professional manner, scale, size and style normally required in the ship design and construction business sector. All plans and drawings shall show and be clearly marked with the profile, plan, and section views of the layout, arrangement details, and construction details in the manner required by GNC.

1.2.1 General Arrangement Plan.
1.2.2 Lines plan and offsets data and table.
1.2.3 Stability information booklet and the inclining experiment report.
1.2.4 Hydrostatics, cross curves and intact and damage stability calculations for all ship loading conditions specified in the Technical Specifications.
1.2.5 Vessel subdivision drawings and stability calculations.
1.2.6 Painting scheme of the whole Vessel.
1.2.7 Vessel draught marking diagram (if applicable).
1.2.8 Detailed arrangement and layout plan showing the disposition of all of the main equipment, fittings and fixtures, furniture, hatches, manholes and access openings. The down-flooding openings (points) shall be indicated clearly on the drawings.
1.2.9 Equipment layout diagram.
1.2.10 Hull structural construction and hull scantlings drawings.
1.2.11 Hull shell and frames and the framings' arrangement and construction plan.
1.2.12 Hull shell expansion plan.
1.2.13 Keel construction plan.
1.2.14 Steering system and steering arrangement diagrams (if applicable).
1.2.15 Superstructure or consoles and deck structural and construction plan (if applicable).
1.2.16 Hull watertight bulkheads' construction plan.
1.2.17 Superstructure or consoles to deck connection detailed construction plan (if applicable)
1.2.18 Engine casing to deck connection detailed construction plan.
1.2.19 Deck edge and bulwark (if any) details and construction plan, including detailed structural arrangement drawings of hull to deck connection.
1.2.20 Detailed cathodic corrosion prevention and arrangement plans and drawings for the Vessel throughout.
1.2.21 Mast structural and construction plan and mast equipment arrangement plan.
1.2.22 Anchoring arrangement plan.
1.2.23 Piping diagrams for fuel oil, lubrication oil, bilge, firefighting, scuppers and drains system.
1.2.24 Fire prevention, fire control and firefighting system drawings.
1.2.25 Drawings of the main switchboard and all other switchboards and the electrical system.
1.2.26 Main engines arrangement and setting plans and drawings of their fuel lines and exhaust gas piping and arrangement.
1.2.27 Main fuel oil tank drawing and its associated piping and manifold(s), and filling, overflow and ventilation system.
1.2.28 Drawings of the anchor, and the anchoring system.
1.2.29 Lifesaving appliance arrangement plan and fire safety plan (if applicable).
1.2.30 Distress signals, alarm systems, and internal/external communication arrangement and system plan (if applicable).
1.2.31 Navigation lights, sound and signal diagrams and any other external lighting arrangement plan.

1.2.32 Vessel overall lighting arrangement and light control plan.
1.2.33 Vessel alarm and signals, internal communication systems and public address systems plan.

1.3 Documents to be provided by the Contractor

Not less than one (1) month before the Delivery Acceptance of the Vessel, the Contractor shall provide for GNC's acceptance a list of all documents to be provided.

When the Vessel is delivered to the Government Dockyard, the Contractor shall deliver to the Government all the technical information, leaflets, literature, manuals and booklets etc. and whatsoever items that are necessary for the operation, handling, services, maintenance, spare parts, repairs and the technical understanding of all the engines, machinery, motors, pumps, equipment, fittings and outfitting items of the Vessel.

Part VII - Annex 7 – Handling Assessment (HA) at Sea Trial

1. General

1.1 The purpose of the HA is to:

(a) ensure that the offered Vessel's performance characteristics are compatible with the HKPF's operational role; and

(b) mitigate the risks to all parties associated with potential rejection of a constructed Vessel at the Delivery Acceptance.

1.2 The Tenderer shall arrange for a HA of the completed Vessel to be assessed by the Tenderer, in the presence of MD's and HKPF's representatives, either in Hong Kong or at or near the site where the Vessel is constructed. The HA shall be conducted and completed within two days. At least ten (10) working days in advance of the HA, the Tenderer shall submit for MD's approval a HA programme proposal which includes details of the procedures under which the HA is to be conducted and the formats in which the Tenderer proposes to capture and present the data recorded by the device(s) in accordance with Paragraph 1.4 and the digital video footage recorded in accordance with Paragraphs 1.5 and 1.6 during the HA. For the avoidance of doubt, this data and video footage shall be able to be copied, moved, deleted and played using Microsoft Windows' built-in software. Otherwise, the Tenderer shall supply appropriate computer software that is compatible with Microsoft Windows for the reviewing of this data and the video footage at no extra cost to the Government. The HA shall be observed by the Government Representatives. At least one (1) of the HKPF's representatives shall be aboard the vessel to be assessed to monitor and verify the conduct and results of each attempt at an assessment.

1.3 The vessel to be assessed shall be completed and ready for delivery.

1.4 The Tenderer shall ensure that an objective record (which can be reviewed by the Government Representatives, the Contractor or, if necessary, an independent third party such as an RO) of the date, time, position, speed, course, roll, pitch, yaw, trim, running angle and three-dimensional acceleration data generated during the HA. The HA shall be conducted in accordance with the assessment protocols stipulated in Paragraphs 2.1 to 2.2 of this Annex and captured using a suitable device(s) which has/have been properly calibrated and, if required by the Government, with supporting calibration documents issued by the manufacturer or calibration laboratory.

1.5 The Tenderer shall, throughout the HA, record date and time stamped aerial digital video footage of the vessel to be assessed and, using digital video recording equipment affixed at appropriate locations as agreed by the HKPF on the vessel to be assessed, record digital video footage of the:

(a) field of view from the control console forward over the bow to the horizon. For the avoidance of doubt, the camera shall be mounted on the longitudinal centre line at a height and distance from the bow which shall correspond with the eye position of a coxswain, 1.64 metres tall, seated at the helm;

(b) position of the helm and throttle controls at all times; and

(c) view facing astern with the field of vision centred on the longitudinal center line of the vessel to be assessed with the camera mounted as closed as possible at the transom.

1.6 The Tenderer shall provide a suitable logistics vessel from which the Tenderer shall record digital video footage of the Vessel to be assessed undergoing the HA. This logistics vessel shall be capable of a comparable speed and be piloted at a distance and position from the Vessel to be assessed.

1.7 The Tenderer shall, immediately after the HA, provide to the Government Representatives the following:

(a) an electronic and printed record of the data recorded during the HA in a format(s) approved by MD in accordance with Paragraph 1.2 above by the device(s) stipulated at Paragraph 1.4 of this Annex which includes:

(i) the raw data captured in respect of each assessment protocol specified in Paragraphs 2.1 to 2.2 of this Annex;

(ii) a graphical depiction of each assessment showing the position and the track of the Vessel to be assessed throughout the assessment; and

(iii) on one chart the speed in knots and the roll and the pitch in degrees;

(b) the following copies of the digital video footage stipulated in Paragraphs 1.5 and 1.6 of this Annex stored on a digital storage medium in a format approved by MD in accordance with Paragraph 1.2 above, namely:

(i) aerial digital video footage;
(ii) fixed digital video footage captured from the Vessel;
(iii) digital video footage captured from the logistics vessel; and

(c) a certificate, signed by both the Contractor and a Government Representative, which records accurately the actual Loading Condition of the Vessel as described in Paragraph 1.7.2(e) of Part VII during each assessment of the HA.

1.8 The assessment protocols listed in Paragraphs 2.1 to 2.2 below shall be conducted in sea states conforming to WMO Sea States 0 to 2 as specified at Annex 8 of Part VII, unless otherwise agreed with the Government Representative.

1.9 The vessel to be assessed is required to complete and pass each of the assessments set out in Paragraphs 2.1 to 2.2 below. The Contractor shall have no more than five (5) attempts in total to complete and pass each of these assessments. If, at any time during an assessment, a Government Representative considers that it is unsafe to continue that assessment, the assessment shall be terminated immediately and that assessment shall be deemed to have been failed.

2. Assessment Protocols

2.1 Handling Assessment – Light Operational Load Condition

The following assessments shall be conducted at Light Operational Load Condition as specified at Paragraph 1.7.2(e) of Part VII.

2.1.1 Straight Line Assessment

(a) Accelerate from stationary to forty (40) knots within twenty five (25) seconds. At any time during this assessment, the bow of the Vessel should not rise above the horizon line. Should the bow rise above the horizon line, it shall not be for more than five (5) seconds as evidenced by the digital video footage. If the Vessel to be assessed does not achieve this it shall be deemed to have failed the assessment.

(b) If the Vessel, maintaining the same course and settings, does not maintain a speed of at least forty (40) knots for a period of no less than one (1) minute, the Vessel shall be deemed to have failed this assessment.

2.1.2 Speed Transition Assessment

(a) The coxswain shall accelerate from stationary to five (5) knots and, once the Vessel reaches five (5) knots, maintain course and settings for a period of no less than one (1) minute.

(b) The coxswain shall then accelerate from five (5) knots to ten (10) knots and, again, maintain course and settings for a period of no less than one (1) minute.

(c) This assessment protocol shall be repeated incrementally at successive five (5) knot intervals until the maximum achievable speed has been reached.

(d) At each successive speed increment, the Vessel shall hold that speed within a range of ± 10% for the full one (1) minute.

(e) During this assessment protocol, the bow of the Vessel should not rise above the horizon line. Should the bow rise above the horizon line, it shall not be for more than five (5) seconds as evidenced by the digital video footage. If the Vessel to be assessed does not achieve this it shall be deemed to have failed the assessment.

2.1.3 Directional Control Assessment

(a) The coxswain shall bring the vessel to a speed of thirty five (35) knots and navigate a course which places the prevailing wind and waves abeam.

(b) At this juncture the coxswain shall remove his hands from the controls. Without human interference in respect of helm, throttle or trim the vessel shall not deviate from its base heading by more than ten (10) degrees within a period of twenty (20) seconds.

(c) The vessel shall not deviate from its original heading by more than ten (10) degrees within a period of twenty (20) seconds.

2.1.4 Avoidance Line Assessment

An avoidance line test shall be conducted in accordance with the test procedures, but not

the loading condition, specified in ISO 6185-4. The vessel shall be required to demonstrate a maximal manoeuvring speed of no less than forty (40) knots.

2.1.5 Slalom Assessment

(a) This assessment shall be conducted along a straight line of five (5) buoys, each positioned four (4) boat lengths apart. For the avoidance of doubt "boat length" shall mean the length of the vessel to be assessed measured from the bow to the aft most part of the Vessel.

(b) The coxswain shall bring the vessel to a speed of thirty (30) knots and manoeuvre alternately port and starboard (without applying the waterjet buckets) in a slalom in and out of the buoy line, maintaining the same speed.

(c) The vessel shall at all times remain within a maximum of one (1) boat length from the buoy line and shall not touch any of the buoys.

(d) This assessment protocol shall be repeated incrementally at successive five (5) knot intervals until the maximum achievable speed has been reached.

2.1.6 Figure of Eight Assessment

(a) This assessment shall be conducted around two (2) buoys positioned one hundred (100) metres apart.

(b) The coxswain shall bring the vessel to a minimum speed of thirty five (35) knots and manoeuvre in a "figure of eight" pattern (without applying the waterjet buckets) three (3) times around the two buoys, maintaining a minimum speed of twenty (20) knots at all times.

(c) The vessel shall turn around each buoy as close as possible without touching the buoy and make the passage between the buoys by the shortest route.

2.2 Handling Assessment – Full Operational Load Condition

The following assessment shall be conducted at Full Operational Load Condition as specified at Paragraph 1.7.2(e) of Part VII.

2.2.1 Straight Line Assessment

(a) Accelerate from stationary to thirty (30) knots within thirty (30) seconds. At any time during this assessment, the bow of the Vessel should not rise above the horizon line. Should the bow rise above the horizon line, it shall not be for more than five (5) seconds as evidenced by the digital video footage. If the Vessel to be assessed does not achieve this it shall be deemed to have failed the assessment.

(b) The coxswain shall then accelerate to maximum achievable speed and maintain the same course and settings for a period of no less than one (1) minute. If the Vessel does not maintain a speed of at least thirty (30) knots, it shall be deemed to have failed this assessment.

2.2.2 Speed Transition Assessment

This assessment contains two part.

(a) The vessel shall accelerate from stationary and transition to hydrodynamic planing mode within twenty (20) seconds.

(b) From stationary, the coxswain shall accelerate to five (5) knots and, once the vessel reaches five (5) knots, maintain course and settings for a period of no less than one (1) minute.

(c) The coxswain shall then accelerate from five (5) knots to ten (10) knots and, again, maintain course and settings for a period of no less than one (1) minute.

(d) Following on from (c) above, this assessment protocol shall be repeated incrementally at successive five (5) knot intervals until the maximum achievable speed has been reached.

(e) At each successive speed increment, the vessel shall hold that speed within a range of ± 10% for the full one (1) minute.

Part VII - Annex 8 World Meteorological Organization (WMO) - State of the Sea

State of the Sea

Sea State	Descriptive Terms	Wave Height (in metres)
0	**Calm (glassy)**	**0**
1	**Calm (rippled)**	**0 – 0.1**
2	**Smooth (wavelets)**	**0.1 – 0.5**
3	**Slight**	**0.5 – 1.25**
4	**Moderate**	**1.25 – 2.5**
5	**Rough**	**2.5 – 4**
6	**Very Rough**	**4 – 6**
7	**High**	**6 – 9**
8	**Very High**	**9 – 14**
9	**Phenomenal**	**Over 14**

Notes:

(1) Refer to the WMO Technical Regulations (Manual on Codes (Publication No.306), Volume I.1, State of the Sea (Code table 3700).

(2) The exact bounding height shall be assigned for the lower code figure; e.g. wave height of four (4) metres is coded as Sea State 5.