Part VII – Technical Specifications

Supply of Five (5) High Speed Interceptors for the Hong Kong Police Force

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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 **five (5) High Speed Interceptors (**"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 five (5) high performance Vessels. 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. 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];
b) 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 not labelled with [E] or [D]; and
c) Desirable Specifications [D].

1.1.4. All this Part VII shall form part of the Contract. As part of the tender evaluation during the tendering stage (viz., completeness check), the Tenderer shall submit all the information sufficiently detailed to substantiate that the product and the services offered meet the Essential Requirements as stipulated in Annex C to the Conditions of Tender, failing which its tender will not be considered further.

1.1.5. The whole of this Part VII, including all Essential Requirements [E], those without any label (viz., [E] or [D]) and the Desirable Specifications labelled with [D] (if and to the extent the Contractor has indicated compliance in its tender), shall also 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 1.1.3(b) above, no differentiation shall be made based on the classification unless otherwise expressly specified.

1.1.6. 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.

1.1.7. 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.

1.1.8. Where design details are not required to be approved by the specified RO, they must be approved by GNC/HKPF prior to manufacture.

1.1.9. For the avoidance of doubt, references to "tests" throughout the Tender Documents and the Contract shall include all inspections, surveys, assessments, trials and experiments.

1.2. Statement of Purposes of the Vessel

1.2.1. The Vessel's primary role is the deterrence, pursuit, interception and apprehension of highly manoeuvrable speedboats and other craft commonly encountered in HKSAR waters.

1.2.2. 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, for the following purposes:

a) Maritime law enforcement
b) Immigration, excise and conservancy law enforcement
c) Response to emergency calls for service
d) Tactical boarding operations
e) Emergency response capability to enable the HKSAR Government to fulfil their ISPS Code obligations
f) Support to other HKPF units, Government departments or law enforcement agencies
g) Search and Rescue (SAR) operations
h) IPP/VIP escort duties at sea
i) Warship escort duties
j) Other maritime emergency response duties as required

1.2.3. 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 9 of this Part VII.

b) KPP 2: Normal Operational Speed
The Vessel shall be capable of performing duties under Full Operational Load Condition (as per Paragraph 1.7.2(e) of this Part VII) maintaining speeds of between thirty five (35) and forty five (45) knots in WMO Sea State 2.

c) KPP 3: Interception Speed
The Vessel shall be capable of transitioning from normal operational speed to a maximum speed of at least sixty two (62) knots and preferably in excess of sixty six (66) knots under Intermediate Operational Load Condition (as per Paragraph1.7.2(e) of this Part VII) in WMO Sea State 0 to 2.

d) KPP 4: Minimum Load Speed
The vessel shall be capable of transitioning from normal operational speed to a maximum speed of at least sixty six (66) knots under the Minimum Load Condition (as per Paragraph 1.7.2(e) of this Part VII) in WMO Sea State 0 to 2.

e) KPP 5: Manoeuvrability
The Vessel shall be capable of safe, stable, predictable high-speed manoeuvrability whilst performing the activities stated in Paragraphs 1.2.1 and 1.2.2 of this Part VII.

1.2.4. 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 of the Hong Kong Special Administrative Region (HKSAR) of the People's Republic of China (hereinafter referred to as the Government).

1.3.2. GNC may delegate the supervision work including plan reviewing work during the construction stage to private consultancy firms to act on behalf of the Government.

1.3.3. 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.

1.3.4. The HKPF is the ultimate user of the Vessel and will carry out the Technical and Operation Acceptance of the Vessel.

1.4. **Shipyard**

1.4.1. The Contractor's nominated shipyard must have the essential shipbuilding and workshop facilities such as lifting gear, hull construction and calibration equipment, machinery installation and 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 normal 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 Paragraphs 1.2.1 and 1.2.2 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 (i) to (ix) 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 and design appraisal document (without condition) with notations by the RO as specified in Schedule 9. All plans, particulars and documentations which are required for the issuance of such certificate by the RO, in addition to those listed in Annex 3 to this Part 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 under the approval of the RO 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 then 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 rules of RO.

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.

1.5.7. The Contractor shall have prior experience in designing and building similar high speed craft. Where similar means conducting one or more of the roles mentioned in Paragraph 1.2.2 of this Part VII and high speed means capable of speeds equal to or in excess of fifty five (55) knots. Please also see Annex D to Part II of the Tender Documents.

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 twenty (20) 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 desks, chairs, power supply and cupboards for storage of documents and working clothes and be kept clean and presentable. The space provided by the Contractor shall also be fitted with air conditioning, and access to WiFi.

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 1.2.4 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(g) 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 3.2.5 and 3.2.6 of this Part VII respectively. Other documentary evidence acceptable to the Government showing that the Vessel is safe to proceed 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.

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

(i) The pre-shipment speed trial shall be carried out with the engine power at declared maximum (rated) power specified by the manufacturer under the Intermediate Operational and Minimum Load Conditions as specified in Paragraph of 1.7.2(e) of this Part VII. If the Vessel fails to achieve the Contract Speeds stated in Paragraph 2.4.3 of this Part VII, the Government will deem that the Vessel has failed to pass Stage 1 - Pre-Shipment Construction and Handling Inspection.

(ii) 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.

e) Electronic Navigation Equipment (ENE) items

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

g) 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.

h) 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

(i) The Official Sea Trial 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:

	Minimum Load Condition	Light Load Condition	Operational Load Condition	
			Intermediate	Full
Fuel (minimum)	10%	10%	100%	100%
Crew	2	2	3	5
Officers	0	0	2	3
Kit	0	20 kg	50 kg	80 kg
Equipment	0	0 kg	92.5 kg	92.5 kg
Total crew/officers + equipment mass	165 kg	185 kg	555 kg	832.5 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 3.2.5 and 3.2.6 of this Part VII respectively.

In the case of the Contract Speed assessment and prediction, 100% fuel is to be considered the greater of the fuel required for the vessel to operate at maximum speed in the Intermediate Operational Load Condition for two hours at Wide Open Throttle, or for one hour at Wide Open Throttle and subsequently 2 hours at 45 knots. For all other purposes, such as intact and damaged stability, 100% fuel is to be 100% of the maximum fuel that can be fitted in the tanks.

Other documentary evidence acceptable to the Government showing that the Vessel is safe to proceed to sea for the intended tests and trials specified in the Contract shall be submitted.

f) All Load Conditions used for the Contract Speed assessment is subject to confirmation by GNC and HKPF.

g) Official speed trials

As part of the Official Sea Trials, the Contractor shall carry out the official speed trials to determine whether the Contract Speeds under Intermediate Operational Load Condition and Minimum Load Condition 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 the operational load condition as specified in Paragraph 2.4.1 of this Part VII. The Contract Speed stated in Paragraph 2.4.2 of this Part VII shall be achieved in the minimum load condition specified in Paragraph 2.4.2 of this Part VII. If the Vessel fails to achieve either of the two Contract Speeds stated in Paragraphs 2.4.1 and

2.4.2 of this Part VII respectively, 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.

h) 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).

i) Manoeuvrability test

(i) Forward turning circle tests to port side, and to be repeated for starboard side, shall be carried out from 20 knots up to maximum safe speed in 5 knot increments with:

- all engines running;
- port engine(s) running; and
- starboard engine(s) 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.

(ii) Crash stop test

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

(iii) Astern running test

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

(iv) Emergency steering test

An emergency steering test shall be carried out to ascertain that the Vessel can still be steered satisfactorily when the Hydraulic Power Unit (HPU) for the steering system has been disabled. If the engines are fitted with separate HPUs then only one should be disabled to simulate single HPU failure. The results

shall be recorded. For the purposes of this TS, if the engines are fitted with electronically actuated steering, HPU will refer to the electronic actuator.

(v) 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.

(vi) 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.

(vii) 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 shall 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 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, 8.2.3 and 8.2.6 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

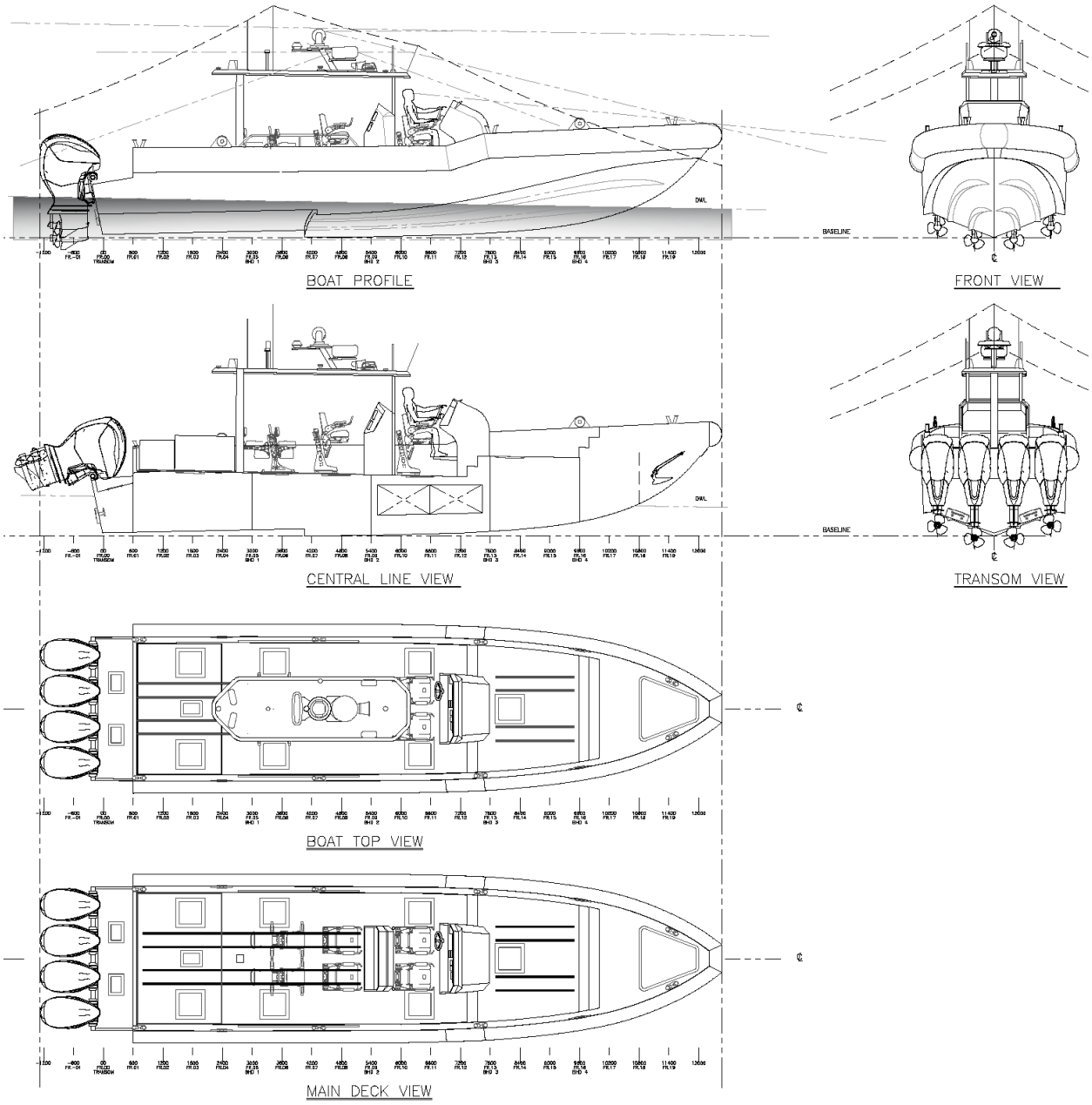
1.10.1. The Vessel must not contain any asbestos or asbestos containing materials. The Contractor must comply with the Hong Kong Air Pollution Control Ordinance (Cap. 311), Part X. The Contractor shall engage a service supplier approved by one of the RO as listed in Paragraph 2.3.4(i) to (ix) of this 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.

1.11. Export

1.11.1. All equipment/machinery fitted to or provided with the Vessel shall be exportable to HKSAR.

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 five (5) High Speed Interceptors (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 high speed interception, logistical operational support, and other confidential operations. 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 post Contract Signing.

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. A relevant certificate as per Paragraph 2.3.6 of this Part VII shall be provided for the Vessel on delivery. **[E]**

2.3.2. The Vessels shall meet all the applicable requirements of the RO where possible, where not possible this shall be justified and a design basis describing the rules and regulations used in the design provided for MD approval. Details of areas of the design not conforming to the RO requirements shall be discussed at the kick-off meeting.

2.3.3. With reference to machinery, systems and fire protection, the RO shall provide specific requirement for the management of risks due to the presence on board of fuel having a low flash point (petrol). See Paragraph 2.3.5 of 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 (i) to (ix) below may be designated for compliance with the relevant requirement), and also the requirements further specified in sub-paragraphs (a) to (f) below:

(i)	American Bureau of Shipping	ABS
(ii)	Bureau Veritas	BV
(iii)	China Classification Society	CCS
(iv)	DNVGL	DNVGL
(v)	Korean Register of Shipping	KR
(vi)	Lloyd's Register	LR
(vii)	Nippon Kaiji Kyokai	NK
(viii)	Registro Italiano Navale	RINA
(ix)	Russian Maritime Register of Shipping	RS

and other entities as specified below:

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

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

c) 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.

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

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

f) 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 2.3.3(a) to (e) above are applicable, then the applicable standards specified by the applicable organisations below shall be complied with:

BSI	British Standards Institute
GB (or SAC)	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 (a) to (f) shall prevail over the requirements of the relevant RO as listed in sub-Paragraphs (i) to (ix) above.

2.3.5. The Vessel machinery arrangement and systems shall be designed in accordance with the chosen RO’s latest rules and requirements.

2.3.6. The Vessel shall be designed and built as per one of the following Class Notations of the selected RO prior to delivery and acceptance

a) Lloyd’s Register (“LR”) ✠100A1 SSC PATROL HSC G2

b) DNVGL ✠A1 HSLC PATROL R3

c) American Bureau of Shipping ("ABS") ✠A1 HSC SPECIAL GOVERNMENT SERVICE AMS

d) Other notations equivalent to any of the above, with prior agreement with GNC

2.4. Contract Speed

2.4.1. When all of the engines are running at their declared maximum (rated) power, in WMO Sea State 0 to 2 under the Intermediate Operational Load Condition specified in Paragraph 1.7.2(e) of this Part VII the minimum achievable speed of the Vessel shall be 62 knots. Please also see Annex D to Part II Conditions of Tender. **[E]**

2.4.2. When all of the engines are running at their declared maximum (rated) power, under Minimum Load Condition specified in Paragraph 1.7.2(e) of this Part VII the minimum achievable speed of the Vessel shall be 66 knots. The Minimum Load Condition entails the minimum weight of person, fuel, equipment and fittings to allow the Vessel to conduct the trial safely. **[E]**

2.4.3. The Vessel will have two (2) Contract Speeds, which shall both be assessed as part of the acceptance trials as detailed in Section 1.7 of this Part VII. The Contract Speeds are to be as follows:

a) The speed in Paragraph 2.4.2 above must be achieved in the Minimum Load Condition specified in Paragraph 1.7.2(e) of this Part VII; and

b) The speed shall be the one offered and committed by the Tenderer in response to Section (A)1.(a) of Annex D of Part II under the Intermediate Operational Load Condition specified in Paragraph 1.7.2(e) of this Part VII, and in the event that the Tenderer do not offer, the speed shall be 62 knots as stipulated in Paragraph 2.4.1 of this Part VII.

2.4.4. The Contract Speeds prescribed in Paragraph 2.4.3 above shall be achieved without porpoising, or other dynamic instabilities as stated in Paragraph 2.10.3 of this Part VII.

2.4.5. The design of the Vessel and the engines so chosen shall minimise cavitation, unless the propellers are designed to operate in the cavitation regime (i.e. of super cavitating or ventilating design).

2.4.6. The Vessel shall be designed, as a minimum, with the acceleration characteristics of achieving zero (0) to fifty (50) knots within 28 seconds when in WMO Sea State 0 to 2 under the Intermediate Operational Load Condition specified in Paragraph 1.7.2(e) of this Part VII.

2.5. Principal Dimensions

2.5.1. Length Overall (LOA): 13 to 16 metres **[E]**

To include any fendering, transom overhang, crash bar and engines

2.5.2. Breadth: 3.0 to 4.8 metres **[E]**

To include any fendering

2.5.3. Air draft: not more than 3.5 metres

Lightning rods can exceed the 3.5m air draft requirement, so long they are foldable/collapsible and when folded/collapsed are within the 3.5m air draft. Whip aerials can also exceed 3.5m if they are flexible enough that under an impact they will deform to fall within the 3.5m air draft.

2.5.4. Draft: Design to suit

2.5.5. Deadrise Angle: not less than 19 degrees at the transom

2.5.6. Deck to gunwale height: 500mm to 650mm over at least 75% of the cockpit length

2.5.7. The Vessel shall be of open topped type with canopy to hold antennae, aerials and other electronic equipment as required.

2.5.8. The Vessel layout shall be open plan, maximising the cockpit length and width to give operational flexibility in performing the operations listed in Paragraphs 1.2.1 and 1.2.2 of this Part VII.

2.6. **Material of the Structure**

2.6.1. Material of hull, deck and canopy structures shall be either predominately (i.e. 85% of weight of construction material excluding equipment and outfittings) marine grade aluminium alloy, or marine composite. **[E]**

2.6.2. If the Vessel is of composite construction it must comply with the following requirements as well as the remainder of this Part VII:

a) Any core must be of closed cell type to prevent water absorption should one of the skins be penetrated;
b) The composite shall be of a type so as to minimise water ingress into the laminate itself and/or between the outer skin and core if a sandwich construction is utilised should the gelcoat become damaged or the outer skin be punctured;
c) All composite materials used for the hull and side shell laminate outside of the core (if a sandwich structure is used) or for the whole laminate in these regions (if a monolithic laminate is used) shall have strain to failure in excess of 1.2%. In other regions of the vessel's structure more exotic fibres with lower strain to failure may be utilised as appropriate;
d) All composites used shall have proven impact resistance in vessels of similar size and speed to the Vessel;
e) The resin system and/or gelcoat must be resistant to degradation from exposure to Ultra Violet radiation;
f) The composite shall be designed to minimise water absorption. If the gelcoat is used to achieve this, a method of identifying damage to the gelcoat shall be provided, such as a contrast in colour between the gelcoat and underlying laminate;
g) The Tenderer must either be based in HKSAR or demonstrate a partnership with a suitable facility in HKSAR who can repair the Vessel should the composite undergo damage.

2.6.3. In this Part VII composite construction refers to fibre reinforced plastic materials where the fibres can be carbon, Kevlar or glass and the resin system can be vinyl-ester or epoxy, subject to the other requirements of this Part VII. Other reinforcement fibres and resin systems shall be subject to acceptance by GNC.

2.7. Vessel Operating Profile and Environment

2.7.1. The Vessel shall be designed to have sufficient space for carrying at least five (5) crew and three (3) other persons. Shock mitigating seats for all eight (8) persons shall be provided with the Vessel as per Paragraphs 3.7.1 to 3.7.8 of this Part VII. **[E]**

2.7.2. The Vessel shall be designed for deployment by the HKPF in Hong Kong Waters for all of the following operating profile, days per year and endurance: **[E]**

a) Summary of Typical Daily Operating Profile Operational Hours:

(i) 1 hour at Wide Open Throttle (WOT);
(ii) 2 hours at 45 knots; and
(iii) 3 hours loitering.

Note that typically the engines can be considered off during loiter operations.

b) Number of days/year: 220 days/year

c) Endurance requirement is that sufficient fuel for the greater requirement of the following:

(i) Operation at WOT for 2hrs; or
(ii) The typical daily operating profile mentioned above in sub-paragraph (a) above.

Both are for the Intermediate Operational Load Condition (as per Paragraph 1.7.2(e) of this Part VII) without refuelling.

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 ISO 12217-1 Operational Limit Category B as well as to survive WMO Sea State 6 while returning to base.

2.7.4. The Vessel and all equipment onboard shall be suitable for operation without any degradation in performance or life in temperatures between 0℃ and 50℃

2.7.5. The Vessel shall be designed for a Service Area Restriction of at least 20nm from safe haven.

2.8. Markings and Colour Scheme

2.8.1. The Vessel hull, deck, console and canopy shall be painted in a marine grade dark grey paint, exact colour to be confirmed by GNC in kick-off meeting post Tender award. If composites are used the colour can be achieved using a pigmented gelcoat

2.8.2. The fender shall be black in colour

2.8.3. If composite is chosen to be the predominant construction materials as described in Paragraph 2.6.1 of this Part VII, the gelcoat used on composite structures above the waterline shall be fire retardant.

2.8.4. The hull shall be antifouled below the waterline and the antifoul shall be AFS 2001 compliant

2.8.5. Contractor shall provide draft marks, names, insignia and other markings confirmed by GNC in the kick-off meeting post Tender award. These shall be in a colour contrasting with the hull and console's colour. This colour is also to be confirmed with GNC at the kick-off meeting post tender award

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

2.8.7. 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 in the kick-off meeting post Tender award

2.8.8. Draft marks shall be permanently provided at the port and starboard of stem and stern. Draft marks shall be in Arabic numerals (size of numerals to be confirmed at the kick-off meeting) 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

2.8.9. 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.

2.8.10. Safety markings designed to prevent persons from tripping on board the Vessel shall be provided where necessary. Markings on the hull indicating the locations where lifting slings are to be positioned during lifting operation shall be made. Details to be discussed at the kick-off meeting.

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.

2.9.3. 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.

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

2.9.5. 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);
d) loss of directional control;
e) permanent list; and
f) engine strain and/or cavitation manifested by engine overspeeding.

2.10.4. The Vessel shall be highly manoeuvrable over all operating speeds to facilitate its use in the operating roles presented in Paragraph 1.2.2 of this Part VII.

2.10.5. 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 deep "V" with deadrise angle of not less than nineteen (19) degrees at the transom, with suitable appendages or other design features to minimise potential "side-kick" or "skidding" effects during high-speed manoeuvring. **[E]**

3.1.2. The strength of the hull structure shall be calculated based on reference acceleration at the longitudinal centre of gravity (LCG). This shall be not less than 6g where g is the acceleration due to gravity. **[E]**

3.1.3. The Vessel structure shall be designed according to the RO's requirements based on the Full Operational Load Condition provided in Paragraph 1.7.2(e) of this Part VII, as well as the more onerous of the following: **[E]**

a) A design speed of 70 knots in WMO Sea State 0
b) The design speed of 66 knots in WMO Sea State 2 (0.5m significant wave height)

3.1.4. The design stresses and scantling including internal structural members shall be determined according to the RO's Requirements. An operational envelope curve or table with speed against significant wave height demonstrating compliance with RO's structural strength requirements shall be issued by the RO and submit to GNC on delivery of the Vessel.

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. There shall be no penetrations in the hull below the design water line unless agreed with GNC.

3.1.8. 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.

3.1.9. 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.

3.1.11. Mill certificates shall be obtained for all metallic material used in the vessel construction.

3.1.12. Type Approval certificates shall be provided for all composite materials used in vessel construction.

3.1.13. Records shall be strictly maintained for the inspection of RO, GNC, or consultant appointed by GNC to match them with the various sections used during the Vessel's construction.

3.1.14. Welding and Fabrication

a) All welding and fabrication shall be implemented according to the applicable requirements of any one of the RO listed in Paragraph 2.3.4 (i) to (ix) of this Part VII.
b) All welded and bonded 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 noncertified welders shall be subject to removal by the Contractor at its own expense.
d) All composite construction/layup shall be conducted by Suitably Qualified and Experienced Personnel (SQEP), where SQEP refers to personnel involved in the manufacture process and indicates that they have adequate training and/or experience to ensure the vessel is built to the satisfaction of the RO on-site surveyor in terms of quality and performance of the material. Evidence of SQEP status to be supplied to GNC in the form of training/experience logs for approval prior to vessel construction.
e) 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) Composite layup, procedures and material usage;
    (vi) Machining, measuring and inspection equipment maintenance and calibration;
    (vii) Finish surfaces and bolting;
    (viii) Procedures for non-conformance reporting and rectification of defects; and
    (ix) Design and manufacturing drawing control and procedures for revisions, updates and reissue of drawings.

3.2. **Stability**

3.2.1. The Vessel is required to comply with the intact and damaged stability requirements stated in this Paragraph 3.2 of this Part VII.

3.2.2. 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.

3.2.3. Inclining Experiment

a) The Vessel shall be inclined to determine the final lightship weight and position of centre of gravity by carrying out the inclining experiment.

b) 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 trim every degree 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).

c) 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 ten (10) 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.

a) The 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.

3.2.4. 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 Vertical Centre of Gravity (VCG) / Longitudinal Centre of Gravity (LCG) / Transverse Centre of Gravity (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 3.2.4(c) of this Part VII) which shall include but not be limited to criteria compliance and margins, 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; and

(v) the inclining experiment report 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 (%)	Persons and Equipment (kg)
(1)	Lightship	nil	Nil
(2)	Light Departure	98	185 (2 crew with effects)
(3)	Light Arrival	10	185 (2 crew with effects)
(4)	Operating Departure	98	555 (5 crew with effects and 92.5kg of equipment)
(5)	Operating Arrival	10	555 (5 crew with effects and 92.5kg of equipment)
(6)	Full Departure	98	832.5 (5 crew and 3 passengers with effects and 92.5kg of equipment)
(7)	Full Arrival	10	832.5 (5 crew and 3 passengers with effects and 92.5kg of equipment)

(ii) The weight of each person shall be assumed to be 82.5 kg, and effects per crew member to be 10kg

(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 crew equipment as stipulated in Paragraph 3.2.4(c)(i) of this Part VII shall be evenly distributed along the deck between the crew

seat positions immediately behind the secondary console and the transom, and the VCG of the equipment will be assumed to be 500 mm above deck.

(v) Other fuel conditions are to be considered if they give worse stability characteristics.

(vi) In addition to Paragraph 3.2.4(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 3.2.5 and 3.2.6 of this Part VII. The pair of loading conditions shall have 5 police officers operating the vessel, no equipment and the maximum number of survivors (each assumed to be weighing 82.5 kg), with 100% fuel at departure, and 10% fuel at arrival.

3.2.5. Intact Stability Criteria

The Vessel stability shall be considered satisfactory if for the loading conditions set out in Paragraph 3.2.4(c)(i) the Vessel is shown to meet the criteria from Part A Chapter 2 of the IMO Intact Stability Code as specified in MSC.267(85) with the exception of criteria only applicable to passenger vessels and the severe weather criterion (Chapter 3, 3.2) or alternatively the intact stability criteria presented in the UK MCA Police Boat Code (PBC3). **[E]**

3.2.6. Damaged Stability Criteria

The Vessel damaged stability shall be considered satisfactory if for all the loading conditions set out in Paragraph 3.2.4(c)(i), the Vessel is shown to comply with sub-Paragraph (a) below with single compartment flooding.

a) The Vessel shall remain afloat, with positive freeboard at a point anywhere along the length of the vessel **[E]**
b) The Vessel shall maintain a trim of magnitude less than 15° **[D]**
c) The vessel shall maintain trim and freeboard such that the engines and all electronic and electrical systems remain functional after recovery when not in the flooded compartment **[D]**

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. In determining the damaged stability, where a down flooding point is submerged, the connected compartment shall be assumed flooded.

3.3. Painting

3.3.1. For the purposes of this Part VII, if a composite with gelcoat is utilised in the Vessel construction, the gelcoat shall be considered part of the paint scheme, as such all the requirements stated for paint also apply to gelcoats.

3.3.2. If composite is chosen to be the predominant construction materials as described in Paragraph 2.6.1 of this Part VII, the gelcoat used on composite structures above the waterline shall be fire retardant.

3.3.3. 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.

3.3.4. The Painting Schedule shall be submitted for approval of MD before commencement of work. In general, all exposed surfaces shall be painted unless expressly agreed otherwise by GNC. The proposal shall contain a list and the detailed specification of the paint intended to be used. Thickness of each coating shall be specified.

3.3.5. The Contractor shall guarantee all painting work for one (1) year from acceptance 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 qualified coating inspectors 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:

a) the surface preparation (blasting profile and water soluble salt content)
b) surface temperature of the metal/mould surfaces above dew point
c) atmospheric conditions, (temperature and relative humidity)
d) dry film thickness and
e) method of application.

3.3.6. 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.

3.3.7. All exposed deck areas shall be covered with hard wearing and anti-slip paint or equivalent. The paint or covering to be used is to be confirmed with GNC and HKPF in the kick-off meeting.

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 bonding shall be conducted prior to final painting.

3.3.11. All surfaces and any parts of the hull, deck or machinery, fittings that may cause glare or reflection must be matt coated.

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

3.4. Operational Console

3.4.1. The offered Vessel shall have two operational consoles (the primary and secondary consoles), each constructed using either marine grade aluminium or composite. The layout of the consoles shall be submitted for MD's approval before any construction work on the console commences and is to be agreed in the kick-off meeting. To facilitate the efficient visualisation and inspection of the design of the consoles, full size mock-ups of both consoles 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 consoles 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 Primary Console

a) The console shall be designed to deflect wind up and spray 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 coxswain position should be on the port side of the commander position;

d) When the vessel is static (i.e. not underway) in any of the load conditions mentioned in paragraph 3.2.4(c)(i) of this Part VII, a 1.64m tall Coxswain of Asian stature's sight line in seated and standing positions, shall intersect the waterline within 2 boat lengths of the Vessel's bow. **[D]**

e) 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 control located on the right hand side of the wheel;
(iii) Trim control selector panel;
(iv) Engine start/stop control;
(v) Deadman's switch with lanyard;
(vi) A magnetic/fluxgate 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;
(vii) Digital repeater for satellite compass readout, speed over the ground and echosounder (exact requirements will be confirmed in kick-off meeting;
(viii) Electric horn;
(ix) Ammunition storage box in front of the commander, to be fitted with a lid that may be locked open or closed and as large as reasonably possible, exact size and layout will be confirmed at kick-off meeting;
(x) Two open storage boxes below the ammunition box in front of the commander suitable for stowage of night vision goggles and/or a portable handheld searchlight;
(xi) Siren and flashing beacon control panel;
(xii) Gauges showing engine rpm and trim;
(xiii) Two (2) Fixed Communication Unit (FCU) plug in points; and
(xiv) Other display items to be included, and the integration of those items will be discussed at the kick-off meeting.

3.4.3. The Secondary Console

a) The console shall be positioned aft of the coxswain and commander.
b) The console shall be ergonomically designed to fit a navigator and platform engineer 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.
c) The controls or displays of the following equipment shall be installed in the console and located in front of the navigator/engineer 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) An electronic Multi Functional Display (MFD) with a size of at least 15" capable of displaying information from the satellite compass, DGPS, radar, chart plotter, thermal imager and any other equipment as appropriate;
(ii) PA/Loudhailer control unit and microphone;
(iii) Navigation lights, search lights and flood lights switch panel as appropriate;
(iv) Radio communication controls and microphone as appropriate;
(v) Two (2) units of contemporary Marine Police radio sets with hand microphones and speakers;
(vi) One (1) unit of IMM VHF radio set, with hand microphone and speaker;
(vii) AIS transponder;
(viii) Fuel tanks level gauge;
(ix) Engine monitoring display panel (see Paragraph 4.2.11 of this Part VII);
(x) Other display items to be included, and the integration of those items will be discussed at the kick-off meeting.

3.4.4. Both Consoles' controls, displays and equipment

a) All 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, and be capable dimming to off.
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) Durable waterproof black/grey covers shall be provided to cover the consoles down to deck level when the Vessel is not in use.

h) Switches shall be separate from each other with guards to aid in preventing multiple switches being operated accidentally.

i) Creative use of space is encouraged and shall be discussed with GNC and HKPF in the kick-off meeting. This can include mounting switch panels and communications plug in points to the underside of the canopy above the consoles.

3.4.5. The console widths shall maintain at least 600mm clear space between each side of the console and the most inboard aspect of the side shell or bulwark to enable unobstructed movement of crew and passengers around the vessel whilst wearing operational kit/equipment. The inboard-most side shell structure could be the frames, stiffeners or lockers.

3.5. **Canopy**

3.5.1. The canopy shall be designed to minimise wind resistance.

3.5.2. The canopy shall be a strong and rigid structure to support the lightning arrestor or dissipater, navigation lights, search light, radar, thermal imager and other electronic and navigational equipment as appropriate.

3.5.3. The canopy is to be constructed from either marine grade aluminium or composite. If composite is used the relevant conditions from Paragraph 2.6 of this Part VII shall be adhered to.

3.5.4. The canopy shall be provided with all necessary fittings including but not limited to brackets for all navigation lights and lightning arrestor.

3.5.5. 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 as required at contact points with the deck/hull.

3.5.6. The canopy shall not cover or be attached to the primary console and shall not obstruct operations at the coxswain or commander positions. It shall also not extend further than 30% of the overall Vessel width either side of the centre line and shall have a sacrificial hand rail or fender along its edge to absorb any impacts.

3.5.7. The position of aerials and antennae on the canopy is to be such to minimise interference and allow proper functionality of all systems.

3.5.8. The lightning arrestor or dissipater arrangement on the canopy is to give full lightning protection to all electronic and metal aspects of the vessel, and all crew/passengers when seated or standing in their operational seat positions.

3.5.9. Multiple lightning arrestors or dissipaters may be utilised to provide protection, and may exceed the 3.5m air draft limit if foldable/collapsible and when folded/collapsed they fall within the 3.5m air draft and within a 4m air draft when deployed.

3.5.10. The design of the mounting frame 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) Provision shall be made for a lockable stowage for the onboard toolkit.
b) Where possible void spaces in the hull shall be accessible for storage of equipment.
c) All seating aft of the secondary console shall be mounted via a deck track which will extend from the secondary console to the aft end of the cockpit, as specified in Paragraph 3.7.7 of this Part VII. Stowage boxes shall be provided to mount to this track system and sufficient boxes shall be provided to fill the space between the crew seats for the secondary console and the aft end of the tracks.
d) The above storage boxes shall be modular to allow the fitment of a reduced number when the passenger seats are fitted and can be constructed from either aluminium or composite.
e) All storage lockers or boxes shall be:
    (i) watertight;
    (ii) lined with detachable shock absorbent material;
    (iii) installed with hydraulic or air-filled cylinder support to aid the opening/closing of the stowage box covers;
    (iv) easily accessible without any locking device (unless for the toolkit and/or shore supply system); and
    (v) Not obstruct the legroom or movement of crew/passengers.
f) The location and dimensions of lockers/storage boxes shall be discussed at the kick-off meeting and agreed by the HKPF.

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 discussed during the kick-off meeting, and subsequently approved by MD and HKPF.

3.6.4. An on board toolkit, as mentioned in Paragraph 3.6.1(a) shall be provided, the contents of which will be discussed with HKPF at the kick-off meeting, and its weight can be assumed to be not exceeding 10kg.

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 persons on board resulting from the harsh maritime environment in which the Vessel will operate.

3.7.2. The seats shall be designed to optimise body posture and to prevent occupants from injuries, such as illustrated in the following:

a) falling or being thrown onto the deck or overboard;
b) spinal injuries; and
c) other injuries which may be caused by potentially harmful forces to which the Vessel and crew conducting the type of operations specified in Paragraphs 1.2.1 and 1.2.2

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 not less than 50 knots;
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) Adjustable height and tailorable to different crew weights without tools;
e) Suitable for those of Asian stature (1.64m tall); and
f) 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 complete with arm rests and drop-down seat cushions shall be provided immediately aft of the primary console for the coxswain and commander. These seats shall be designed with progressive damping, with adjustable shock absorbers for light/heavy personnel, and safety harness. A foldable, height adjustable footrest for use when seated shall be attached to the console in front of each seat. The seats shall be movable fore and aft between the two consoles for personnel of different heights to maintain reach of the footrest and controls on the console. The range of movement will be confirmed with HKPF and GNC in the kick-off meeting.

3.7.5. Two (2) damping seats complete with arm rests and drop-down seat cushions shall be provided immediately aft of the secondary console for the navigator and platform engineer. These seats shall be designed with progressive damping, with adjustable shock absorbers for light/heavy personnel, and safety harness. A foldable, height adjustable footrest for use when seated shall be attached to the console in front of each seat. The seats shall be mounted to a recessed deck track system that runs from the secondary console to the aft of the cockpit.

3.7.6. Four (4) removable damping seats of either jockey or fully isolated type shall be provided aft of the navigator and platform engineer seats. These seats shall be secured on the same recessed track system as the navigator and platform engineer seats, allowing all seats aft of the secondary console to be moved fore and aft to maximise flexibility. The seats shall be capable of folding to allow movement fore and aft on the track system and maximise space for payload without full removal.

3.7.7. The two jockey seats on either side of the vessel (i.e. the port and starboard pairs) may utilise a common base, as shown in the conceptual General Arrangement in 2.1 of this Part VII.

3.7.8. The seats mentioned in Paragraphs 3.7.4, 3.7.5 and 3.7.6 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.

3.7.9. A recessed track railing attachment system consisting of flush fitting seat mounting rails shall be fitted between the secondary console and rear of the cockpit. The cockpit length shall be maximised to facilitate the maximum track length for maximum flexibility in payload. The track may be non-continuous if required to facilitate soft patches for void

space/fuel tank access, but the discontinuities shall be minimised, and it shall be ensured that seats can be fitted spanning the discontinuities.

3.7.10. If space permits, recessed tracks as mentioned in Paragraph 3.7.9 of this Part VII shall also be fitted on the deck immediately in front of the primary console to allow for the temporary installation of seating and stores using tie-down points if required.

3.7.11. Notwithstanding the requirement for all deck area to be covered with anti-slip paint or coatings as specified in Paragraph 3.3.7 of Part VII, 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 3.7.6 above will result in surface free of trip or snag hazards.

3.7.12. 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. The exact arrangement of these handrails is to be confirmed with HKPF at the kick-off meeting.

3.7.13. 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, the specification of which is to be agreed with HKPF at the kick-off meeting.

3.7.14. 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. Fendering System

3.8.1. A robust highly protective fendering system shall be provided together with the Vessels to protect the hull when carrying out the activities specified in Paragraphs 1.2.1 and 1.2.2 of this Part VII.

3.8.2. The fendering system may be in the form of a foam collar, which shall be fitted to cover the forward end and the full length of the port and starboard sides. The fendering system 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 other chemicals.

3.8.3. The fender shall be detachable but tightly affixed to the hull and flush with the sheerline. The method of attachment may be by any means proposed by the Tenderer and agreed by MD and HKPF. The design shall ensure that the fendering system shall not detach or slide aft as a result of wave action or other unintended external influences.

3.8.4. The fender shall be at least 300mm tall and 250mm deep.

3.8.5. 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.

3.8.6. Should a foam collar be offered, it shall be a closed cell polyethylene foam collar. The foam collar shall be protected by a reinforced cover. 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. 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.

3.8.7. An inflatable only collar is not acceptable, but an air-cored foam collar may be accepted, and shall be approved by HKPF prior to installation on the Vessel.

3.8.8. Details of the design and dimensions of the fendering system 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 alighting platform at a height flush with the top of the side sheet and collar system, with full width steps leading up to it, shall be provided at the bow to facilitate embarkation and disembarkation.

3.9.2. The platform shall extend at least one metre aft from the bow, but its length over this shall be minimised so as to maximise deck space in front of the primary console. The void cuddy space under this platform shall be enclosed and designed for watertight storage, primarily for the anchor and mooring equipment. If space permits the compartment shall be separated to allow one compartment for mooring and other equipment and a second for the anchor system. The division between the compartments does not need to be full height or watertight, and both areas shall be accessible through the single deck hatch. 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.

3.9.3. All gunwale fittings such as cleats and bollards shall be designed to minimise the risks of line tangling or snagging through being, recessable, foldable or flush fitting. All deck level tie-down points shall be flush fitting or removable to minimise trip and snag 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. A tray with drains shall be attached to fore of the transom to accommodate the petrol filters, fuel supply water separator drain, control wires and hydraulic steering pipes. This can take the form of an ‘outboard well’ so long as the well is of such a construction as to prevent oily fluid entering the surrounding water under normal operation, i.e. not capsized.

3.10.3. The transom shall be designed to provide safe and easy access to the outboard engines for routine checking and troubleshooting even while underway at sea as much as possible.

3.10.4. The outboard engines can be protected by a crash guard. If fitted the crash guard shall be of sturdy but detachable construction (e.g. secured by bolts and nuts) and protect the engines from rear and side impacts. **[D]**

3.10.5. A separate towing bit shall also be provided near the stern, this can also be used as a mooring bitt if of suitable construction. 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 Super High Holding Power anchor with certificate issued by the RO and suitable swivel, shackles and secure stowage such that the anchor and the relevant parts would not cause impact or undesirable rattling in the stowage compartment under adverse sea states.

3.11.2. One (1) anchor cable made up of chain and synthetic fibre shall be supplied by the contractor either to meet RO requirements and to allow the Vessel to anchor in 25m of water depth. The length of chain shall be the minimum required to meet the RO requirements, with the remainder of the length of cable to use a suitable synthetic fibre construction.

3.11.3. The anchor and cable will be deployed by hand from the bow compartment and the bitter end of the cable shall be securely connected to a suitable hard point in the compartment. The cable shall be capable of being secured to one of the forward mooring/towing bitts for normal anchoring operations.

3.11.4. Two (2) 50m long tow ropes with a minimum breaking load such that when towing a sister vessel at 10knts in WMO Sea State 2 the line tension is below 50% of the minimum breaking load shall be provided by the Contractor in a suitable stowage.

3.11.5. Four (4) heavy duty double braid mooring lines each of which having a minimum length of 8m, with strength exceeding the RO strength requirements and are at least 20mm diameter to provide a reasonable handling diameter shall be provided by the Contractor in a suitable stowage.

3.11.6. The mooring/towing strong points shall be designed and installed with sufficient safety factor to prevent material yield in a welded condition or first ply failure of the strong points or surrounding structures to which they are attached. Calculation of the horizontal load shall be in accordance with the RO requirements or other equivalent international standards, and the bow and stern strong points shall also be rated to the tow loads associated with towing a sister vessel in WMO Sea State 2 at 10 knots. The following strong points shall be provided with details to be discussed at the kick-off meeting:

a) Mooring/towing cleats at four (4) locations along the vessel's length and both port and starboard, giving eight (8) total;
b) The forward and aft pairs are to be suitable for towing and capable of withstanding the forces involved when towing or being towed by a sister vessel or other craft of similar size at 10knts in WMO sea state 2;
c) The forward pair shall be suitable for use in making off the anchor cable;
d) Lifting strong points for a four-point lift;
e) Specialist equipment mounting points shall be provided at the centreline forward and aft and on both sides aft of the Secondary Console. Each point shall be secured by at least four bolts and be designed for an applied pull-tested load of at least 680 kg at the installed height. Details of the mounting to be discussed at the kick-off meeting; and
f) Mounting points shall be provided at an appropriate location on both port and starboard sides of the Vessel, 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.

3.11.7. Devices for Lifting the Vessel

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

(i) 4-Points Lifting Method

The Vessel shall be designed with strong point lifting attachments permanently fitted to the hull. A spreader shall be provided if the bending stress induced during lifting exceeds the Vessel's permissible tolerance or if the lifting wires/strops would otherwise foul the radar frame or equipment fitted thereto. The design of the lifting attachments, wires/strops and spreader, if any, shall be approved by the RO and shall match, where practical, the lifting facilities at the HKPF's operational bases.

(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. Attention shall be paid to appendages being in the way of the lifting slings, and if unavoidable, suitable arrangement and measures shall be provided for protecting such appendages.

b) The lifting points and locations shall be designed and installed with sufficient safety factor to prevent material yield or first ply failure of the strong point or surrounding structure. For aluminium aspects this aspect shall take the welded yield stress into account. Detail drawings of lifting attachments and related equipment shall be approved by the RO.

3.11.8. All the lifting devices/accessories not permanently fixed to the Vessel (i.e. lifting strops, shackles and spreader bars) 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 four-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.

3.11.9. All lifting or strong points shall be provided with a tally denoting their Working Load Limit (WLL), date of last load test and date of next required load test. All lifting points shall be

load tested to two times of their WLL and all strong points to 120% of their WLL prior to Vessel shipment to HKSAR.

3.12. Cradles

3.12.1. The Contractor shall supply a total of two (2) suitably designed metal slipping cradles 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 a 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.

3.12.2. If the cradle is of a dissimilar material to the Vessel, means shall be provided to isolate the cradle from the hull to prevent galvanic corrosion.

3.12.3. All tow and lashing points on the cradle shall be provided with a tally denoting their Working Load Limit (WLL), date of last load test and date of next required load test. All tow and lashing points shall be load tested to 120% of their WLL prior to shipment to HKSAR.

CHAPTER 4 – MACHINERY

4.1. General Requirements

4.1.1. The Vessel is for use in Hong Kong and it is desirable that the outboard engines and any other machinery offered are similar to those commonly used on the Hong Kong Government fleet at present, and therefore support networks for spare parts and after sale services are already in existence locally. If any machinery is not in use on current Hong Kong Government Vessels, evidence shall be provided to demonstrate that spare parts and after sales services are available within HKSAR.

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 outboard 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. 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. Outboard Engines

4.2.1. The Vessel shall be powered by an adequate number of marine four-stroke outboard petrol spark ignition engines of adequate power to deliver the Contract Speeds as stated in Paragraphs 2.4.1 and 2.4.2 of this Part VII. The engines shall drive stainless steel fixed pitch propellers through integral gearboxes. The propellers driven by port and starboard engines shall be counter-rotating. **[E]**

4.2.2. The Contractor shall be responsible for ensuring the correct installation and setting up of the engines including the choice of propellers in accordance with the manufacturer's recommendations so as to avoid ventilation and cavitation, unless the propellers are designed to ventilate and/or cavitate.

4.2.3. The declared (rated) power of an engine model or propulsion system shall be the full throttle power at the declared (rated) speed at the final output shaft of the engine or propulsion system as offered for sale by the manufacturer. The power measurements and declarations for the engines and the propulsion system shall comply with the International Council of Marine Industry Associations (ICOMIA) 28/83 requirements.

4.2.4. The engines shall have a three-star rating (ultra-low emission) or higher as per the California Air Resources Board star system that describes exhaust emissions of both two-stroke and four-stroke outboard engines or equivalent standards. **[E]**

4.2.5. The Vessel shall be capable of navigating on two (2) engines at lower speeds.

4.2.6. All engines shall be controlled using two throttles/levers, with the engines on each side of the vessel corresponding to one lever and the centre engine in the case of a triple or quintuple install shall follow either one of the outer engines. The two throttles/levers will be placed conveniently for onehanded simultaneous operation by the coxswain. The engine

throttle/levers shall be designed/approved by the engine manufacturers. The throttle system shall be equipped with a mechanism selectable by the coxswain to enable all engines to be operated by a single throttle/lever.

4.2.7. If the engines are to be electronically controlled (fly by wire) then the throttle levers shall be provided with adequate friction for use in high speed operations. The acceptable level of friction shall be agreed by HKPF at the kick-off meeting, reviewed during console mock up as described in Paragraph 3.4.1 of this Part VII and finally accepted as part of the acceptance trials as described in 1.7 of this Part VII.

4.2.8. The engines shall be equipped with power trim with switches on the throttle controls/levers that enable the operator to adjust the trim angles on all engines from a single switch whilst making way. If the engines are not connected by a tie bar they shall have secondary individual trim control switches on the primary console. The engines shall be designed to trim fully down to start and be trimmed up as the Vessel gains momentum, until reaching the point just before ventilation begin. **[E]**

a) Automated trim and roll control system as per Annex D to Part II, such as Humphree's HCS-5 system or equivalent is preferred. It shall optimise trim for performance and control roll through turns to help prevent skidding. The system must be capable of being turned off and there shall be a method of altering the aggressiveness of the system from the console. **[D]**

4.2.9. The engines located at the transom shall be easily accessible for maintenance, routine checking and troubleshooting even when underway as specified in Paragraph 3.10.3 of this Part VII.

4.2.10. The electrical cables, piping for petrol and hydraulic oil lines shall run beneath the deck in order to minimise potential trip hazards on the deck. The runs shall also be easily accessible through deck hatches and designed for ease of maintenance. They shall be supported properly to prevent chafing and unnecessary tension.

4.2.11. Each engine system shall include the following accessories:

a) One 12V or 24V electrical alternator and remote starting control;
b) Dead-man switch and emergency cut-off;
c) Power trim and tilt system with trim gauge at the console;
d) Engine protection system as required by engine manufacturer, with audio and visual warnings at the console. These audio warnings shall be broadcasted to the Vessel's operators via the IC system as specified at Paragraph 7.4 of this Part VII;
e) Engine tie bar linking outboard engines, as appropriate to achieve required steering system redundancy as discussed in Paragraph 4.4 of this Part VII

4.2.12. The Contractor shall supply the Vessel with a comprehensive vessel information system which shall be integrated with the Vessel's GPS and other systems, generate recorded data in NMEA 2000 format, and display on an engine monitoring display panel located on the secondary console, this display panel can be the MFD, or an additional display. The information to be displayed is to include but not be limited to the following:

a) Engine rpm;
b) Engine running hours;

c) Oil temperature and pressure;
d) Fuel level and range until the fuel tank is empty;
e) Battery voltage;
f) Steering and trim data;
g) Course and speed;
h) Engine faults and notification alarms;
i) Trip history; and
j) Any other data which the supplied system and outboard engines are capable of generating.

4.2.13. The contractor shall ensure that the following engine information, as a minimum, shall be viewable from the Coxswain's position using analogue or digital gauges, which is to be confirmed with HKPF in the kick-off meeting:

a) Engine rpm;
b) Fuel level; and
c) Trim data

4.2.14. The vessel information system specified at Paragraph 4.2.12 above shall generate an audible notification alarm over the Vessel's IC system as specified at Paragraph 7.4 of this Part VII in respect of the notification alarms specified at Paragraph 4.2.112(h) above.

4.2.15. The data captured by the vessel information system specified at Paragraph 4.2.12 above shall be stored for seventy-two (72) hours locally on the Vessel on an appropriate storage medium provided by the Contractor and be transmittable to government land based systems via a removable storage medium such as a USB memory stick or SD card. Such storage medium shall be protected with lockable security anti-tempering device. Details to be discussed at the kick-off meeting.

4.3. Propellers

4.3.1. All propellers shall be made of stainless steel with a fixed pitch.

4.4. Steering System

4.4.1. The steering system shall be designed and approved by the engine manufacturer and the design approved by the RO. It shall be either a power assisted hydraulic, electronically controlled hydraulic system or electronic system and be capable of operation if at least one HPU, or electronic actuator malfunctions. This is to be achieved through using a closed loop hydraulic system capable of operating the engine cylinders with no power, or through the provision of individual HPUs/electronic actuators for each engine and tie bars between engines so that if one engine HPU fails the other will still function and steer the engines. The HPU size and capacity or electrical input shall be such to fulfil the steering requirements for the number of engines installed and the number of helm revolutions from lock to lock selected as per Paragraph 4.4.13 below. Under normal running conditions, all of the HPUs/actuators shall operate. However, should one or more HPU(s)/actuator(s) fail, even a single HPU/actuator shall be capable of continuing to provide assisted steering for the Vessel to return safely to base under the conditions specified in Paragraph 2.7.3 of this Part VII.

4.4.2. A redundant system with independent power supply shall be provided to maintain the Vessel's steering capability in the case of main power supply failure. This power supply can be provided by the emergency battery bank so long as an automatic changeover is fitted.

4.4.3. The hydraulic fluid tank (if fitted) shall be easily accessible for routine level checking.

4.4.4. The outboard engines shall be installed in such a way that, with any combination of engine turn and tilt, the engines shall not interfere with each other or any other part of the Vessel.

4.4.5. Connections, fittings, oil fill openings and air bleeders shall be accessible with all engines and systems fitted and installed.

4.4.6. Components in the system shall be protected externally against corrosion. The complete hydraulic steering system shall be designed to withstand, without failure or leakage, the conditions of pressure, vibration, shock and movement expected in a Vessel conducting the type of operations specified in Paragraphs 1.2.1 and 1.2.2 of this Part VII.

4.4.7. Materials used in the hydraulic steering systems shall be resistant to deterioration caused by contamination by liquids or compounds with which the material may come in contact under normal marine service, e.g. grease, lubricating oil, hydraulic fluid, petroleum, common bilge solvents, salt and fresh water.

4.4.8. The type of hydraulic fluid used in the hydraulic steering system shall be specified by the steering system's manufacturer and shall be stated in the owner's manual. The hydraulic fluid shall be non-flammable which means its flash point shall be higher than 150 degrees Celsius.

4.4.9. Hydraulic lines shall be supported by clips, straps or other means to prevent chafing or vibration damage. The clips, straps or other devices shall be corrosion resistant and shall be designed to prevent cutting, abrading or damage to the lines and shall be compatible with hydraulic line materials.

4.4.10. A flexible section shall be installed between rigid piping and the hydraulic cylinder(s).

4.4.11. The position of the helm shall be optimised ergonomically so that a coxswain of an Asian stature (approximately 1.64 metres in height) can use it for extended periods from both the seated and standing positions without incurring unnecessary physical strain. The helm shall be fitted with an anti-slip covering and be of a size acceptable to the MD and HKPF. Operation of the throttle levers and other controls by gloved hands shall not be impeded by the size or position of the helm. The helm shall be user-adjustable for rake.

4.4.12. The design strength of the hydraulic steering systems shall be tested in accordance with the requirements of the RO. All the fittings (hoses and piping) shall withstand the system test pressure without leakage.

4.4.13. The steering system shall ensure the helm is having 4 to 5 turns or revolutions from lock to lock.

4.5. Petrol Tanks

4.5.1. Petrol Tanks

a) At least two separate petrol tanks shall be fitted under the deck, with combined capacity to achieve the endurance mentioned in Paragraph 2.7.2(c) of this Part VIII

for the attached engines. Switch(es) shall be provided at the secondary console for the crew to select the supply of fuel from any desirable fuel tank(s).

b) The tank arrangement shall be such that if fuel in one of the tanks is contaminated, at least 40% of the fitted engines shall remain unaffected and operational.

c) The underdeck petrol tanks shall have a combined capacity to fulfil the endurance requirements specified at Paragraph 2.7.2(c) of this Part VII. The design and tests shall comply with the RO's rules.

d) The tanks shall not be integral with the hull and shall be installed so that the loads due to the mass of the full tank are safely induced into the structure, with due consideration given to the effects of vertical acceleration due to the Vessel's movements at maximum speed at sea.

e) In respect of Paragraph 4.5.1(d) above, continuous flexible supports which spread the loads are preferable to rigid supports.

f) Petrol tanks shall be of a suitable bladder/bag or aluminium construction approved by the RO for use on high speed marine craft. The type shall be chosen to allow access to the tank and simplify removal of the tank for maintenance/inspection.

g) Petrol tanks shall be filled with a coarse-pore expanded aluminium mesh baffle material or suitable open cell foam for explosion suppression and to minimise free surface effects which fulfils the requirements of the RO's rules. The foam or baffle must be removable through a soft patch in the top of the fuel tank for inspection purposes.

h) All seals such as gaskets, O-rings and joint-rings shall be of a 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 may come into contact as installed under normal operating conditions, e.g. grease, lubricating oil, bilge solvents, fresh water and sea water.

i) Internal surfaces of the petrol tanks shall be unpainted and cleaned thoroughly to the satisfaction of the MD.

j) Provisions to the Petrol Tanks

   (i) A tank content gauge and low level alarm shall be fitted on the primary console for each tank and the fuel level shall be capable of being monitored using the MFD or engine display on the secondary console.

   (ii) The material of which the petrol tanks are constructed shall comply with the requirements of the RO's rules. They shall be resistant to corrosion and the thickness of the construction material shall be sufficient to sustain the loads due to the mass of the full tank without damaging the integrity of the tanks with due consideration given to the effects of vertical acceleration due to the Vessel's movements at maximum speed at sea;

   (iii) Metallic filling pipes may be connected to the sides or ends of metal petrol fuel tanks, provided that they are welded to the tank and reach above the top of the tank. All other fittings and openings shall be on the top of the fuel tanks;

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

(v) For each of the petrol tanks, an inspection manhole, air vent with flame trap on deck and petrol tank outlet valve with a quick closing device shall be provided. The quick closing devices shall be positioned between the petrol tanks and the outboard engines. The triggers for these quick closing devices shall be installed at a position which is easily accessible to the engineer at the secondary console;

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

(vii) The tanks shall be designed and installed to prevent water from being trapped on the exterior surface;

(viii) Tank drains are not permitted on the petrol fuel tanks; and

(ix) A water separator incorporating a drain valve shall be installed between the petrol tank outlet valves and the outboard engines. It shall be positioned at the transom and shall be easily accessible for inspection and operation.

4.5.2. Petrol 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.

4.6. Bilge System

4.6.1. Electric bilge pump(s) with manual back up and bilge alarms shall be provided by the Contractor for each watertight compartment in the hull. 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.

4.6.2. The Vessel shall be designed and constructed to minimise the potential for the accidental overboard discharge of pollutants (oil, fuel).

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 Electro-technical 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 24V DC equipment shall function over a voltage range of 21V to 31V at the battery terminals.

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

5.1.6. 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. The cross section area of electric cables for starting the outboard engines by using battery power shall be according to outboard engine manufacturer's recommendation.

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

5.1.8. 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.

5.1.9. 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.

5.1.10. 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.

5.1.11. All Equipment installed shall be accompanied by operation and maintenance manuals, provided in both English and traditional Chinese.

5.1.12. 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 recognisable labels.

5.2. Batteries

5.2.1. Two groups of 12 or 24 V maintenance-free batteries shall be provided, one for starting the outboard engines and the other for shipboard services. These two groups of batteries shall be connected to two independent DC circuits with an automatic crossover, as well as a manual crossover. The two groups of batteries shall be interchangeable to back up each other, and be capable of being charged individually by any of the engine-driven alternators, independent of each other. The power from batteries shall also be stepped up and down inside the consoles if an alternative voltage is required by ENE equipment. Batteries connected in parallel are not allowed.

5.2.2. The combined capacity of the two groups of batteries shall be sufficient to provide at least three (3) consecutive starts of all engines from cold without recharging and maintain an uninterrupted power supply to the shipboard services (e.g. navigation lights, general lights, alarm).

5.2.3. A separate battery group shall be dedicated to the emergency services (e.g. radio communications and signalling, emergency and navigation lights) and conform to the RO Requirements specified in Schedule 9. This battery group shall have both manual and automatic crossover so that should the primary battery banks fail the power supply to emergency systems will not be disrupted.

5.2.4. The engine-driven alternators shall be able to charge the batteries and to provide 12V or 24V DC power to the shipboard services including outboard engine control, trim and steering.

5.2.5. Batteries shall be permanently installed in either a watertight compartment or IP67 rated enclosure. The watertight compartment could be the console if designed to be IP67 rated. The compartment where batteries are located shall be ventilated to prevent accumulation of flammable gases released by batteries. The batteries shall be located 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's 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 insulated electrically.

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) will 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 or 24V DC services shall be supplied from the switchboard in the 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 console;
f) Content gauges for the petrol tanks;
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 petrol tanks' 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 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;
b) IP 55 as a minimum, if exposed to splashing water;
c) IP 20 as a minimum, if located in watertight compartments 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 subjected to rain, spray or splashing shall have a minimum protection of IP 55, in accordance with IEC 60529 when not in use, e.g. protected by a cover with an effective weatherproof seal.

5.8. Lighting

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

5.8.2. A blue flashing light shall be provided on top of the canopy, controlled from the primary console.

5.8.3. A self-activating capsize light shall be provided that automatically activates if the boat inverts and illuminates the cockpit.

5.8.4. Independently controlled high-powered white floodlight(s) 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 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 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.

5.10. Navigational and Signalling Equipment

5.10.1. Navigation Lights

a) 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)).
b) The lights shall be controlled from the control and alarm panel at the secondary console. Each navigation light circuit shall be provided with a switch, protection fuse, indicating lamp and alarm.
c) 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 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 navigation 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) An all-round blue flashing light;
b) One siren; and
c) One 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 before submission to MD by the completion date stipulated in Annex 3 of this Part VII for endorsement.

5.12. Searchlights

5.12.1. The Contractor shall supply two high-powered hand-held white searchlights. They shall be connected to sockets on either console with coiled extension cables of appropriate lengths. Sockets shall be installed on both the port and starboard sides of each console. Facilities for storing the two hand-held searchlights shall be provided, one on the primary console, and one on the secondary console. 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 HKPF.

5.12.2. In addition to the searchlights stated in 5.12.1, the Contractor shall also supply one ultra high-powered hand held search and rescue searchlight (SAR Searchlight) with each vessel. The installation and stowage locations will be discussed in the kick-off meeting. This SAR Searchlight (MicroFire XP 750, or equivalent) shall meet the following requirements:

- Brightness: 50,000 lm (minimum)
- Range: 2,500m (minimum)
- Modes: Dimmable from 10-100% brightness
- Light Source: White LEDs of at least 750W power
- Power Supply: 24V DC power, capable to be connected to the vessel's power supply via a power supply cable of no less than 3 meters
- Portable Power Supply: Portable battery bank capable of supplying power for no less than 75 minutes
- Working Temperature: from not more than 0℃ to not less than +50℃
- Water Resistance: IP X6
- Drop Resistance: At a height of 1 metre or more
- Weight (excluding portable battery): 3kg or less

5.13. **Shore Supply**

5.13.1. A shore supply connection shall be provided interfacing between the main switchboard and a standard 3 pin blue 16 amp connector.

5.13.2. The shore supply shall be capable of charging on board batteries and powering all navigation and communication systems.

5.13.3. The shore supply connection system shall lead to an onboard transformer to drop the supply voltage to 12V or 24V as required prior to connecting to the main switchboard. The shore supply system shall be stowed in a locked watertight compartment in either the console or on the deck and easily removable from the Vessel.

5.13.4. The details of the shore supply system shall be discussed and agreed with HKPF at the kick-off meeting.

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. A total capacity of 6kg dry powder fire extinguishers shall be provided utilising two (2) separate portable extinguishers. The stowage locations shall be in the cockpit and are to be confirmed with HKPF at the kick-off meeting. All such fire extinguishers shall have approval certificate issued by a competent body recognised by MD, such as one of the RO as stated in Paragraph 2.3.4 of this Part VII, or by the registered fire services installation contractors recognised by the Hong Kong Fire Services Department.

6.1.4. The fuel tank compartments shall be fitted with gas detectors suitable for detecting low flash point fuel.

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. During the mock-up meeting, the Contractor shall provide drawings that show the installation locations of all the other ENEs that are installed on mast, canopy, inside the consoles and other locations before construction and installation.

7.1.4. The Contractor shall provide drawings of all ENE in hull and canopy to COMMS for discussion at the kick-off meeting

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

7.1.6. 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 Vessel as Contract spare parts, including cabling, control panel, gauges. Please also see Schedule 1 of Part V.

7.1.7. All ENE outfit is to be confirmed by HKPF and COMMS at the kick-off meeting.

7.1.8. All ENE of the Vessel and its spare parts shall have after sales service support locally in HKSAR.

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. All of the ENE shall be suitable for marine use on the Vessel in the operating conditions specified in Paragraphs 2.7.3 and 2.7.4 of this Part VII and shall maintain the manufacturer stated performance under such conditions, operating without blacking out or suffering a reduction in performance. All ENE equipment shall also either:

a) Have demonstratable track record for use on craft of similar size and speed to the Vessel; or
b) Be of a ruggedised type and shock rated to 40g in line with a suitable UK or USA Defence or Military Standard or equivalent

7.2.3. 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.

7.2.4. 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.

7.2.5. 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.

7.2.6. 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:
(ii) Ambient temperature between 0 ℃ and 40 ℃; and between -5℃ and +50℃ if the equipment (including display units and antennae) is exposed to the open air.
(iii) Relative humidity up to 95%, non-condensing.
(iv) Salt and chemical corrosion as found in a tropical coastal atmosphere.

(v) Materials that promote mould growth shall not be used.

(vi) 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 or 24 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.

7.2.7. 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.

7.2.8. 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 Paragraphs 7.2.2 and 7.2.6(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 that 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.
i) Suitable weather protection covers, which do not obstruct users from operating the equipment, shall be provided as necessary.

7.2.9. 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 as 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 a unique identification wiring code number.

7.2.10. 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.

7.2.11. 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 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(e) of this 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 7.2.3 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.

7.2.12. 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 USB 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 7.2.12(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 7.2.11(b) above.

d) The documents specified at Paragraphs 7.2.12(a) to (c) above shall be supplied in both paper copy and on USB 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.

7.2.13. 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.

7.2.14. 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 (but not limited to) Radar, Secure AIS, D/GNSS, Satellite Compass, Echo Sounding System, Electronic Chart System and Thermal Imager information.

a) The radar shall be used as the primary radar and shall have a minimum specification equal to the Simrad HALO24. 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 radar shall be suitable for use on a high speed vessel with a maximum rotational frequency of 60rpm or above.
f) The display unit shall incorporate control keys and processor equipment to integrate, control, operate and display all radar, AIS and chart plotter functions. The electronic chart system shall support both the connection to and being accessed remotely from the Government router through an Ethernet interface.
g) 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.

h) The integrated Multi-Functional Display (MFD) 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.

i) 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 100 knots encountered when the Vessel is operating at high speeds in the maritime environment.

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

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

l) 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 at all possible. Where such obstruction is unavoidable it should be discussed with the HKPF at the kick-off meeting. If such obstruction becomes apparent after installation, the Contractor shall rectify it.

m) The radar shall have NMEA 0183 and/or 2000 interface ports capable of accepting navigational data from a wide selection of D/GNSS 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 chart-plotters.

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

o) Radar performance to be equivalent to or greater than Simrad Halo 24:

(i)	Reference:	Magnetic and True North
(ii)	Warm-up Time:	Instant On
(iii)	Distance Accuracy:	<1% of the range
(iv)	Bearing Accuracy:	<1°
(v)	Operational Maximum Wind Speed	At least 100 knots
(vi)	Scanner Size:	≥600 mm (24 inches nominal)
(vii)	Scanner Rotation:	60 rpm or greater rotation speed
(viii)	Beam Width H/V:	< 3.9°/22°
(ix)	Max/min range, scale:	48 nautical miles / 100 metres
(x)	Transceiver Output Power	At least 25W with 0.04-60μs pulse

(xi) Integrated MFD:	15-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.
(xii) Operating Temperatures:	Better than –5℃ to +55℃ for the antenna/scanner unit. Better than –5℃ to +45℃ for the display unit.
(xiii) Waterproofing	Radome antenna: IPX6, Display unit: IPX6

p) 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.

q) 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) The display shall either be connected to or have an integral PC-based ruggedised navigation system (such as the Seacross WX315 or equivalent) providing detailed navigational sea charts covering the entirety of Hong Kong Waters using IHO S-57 format sea charts and future updates into a format readable by the chartplotter. Navigation system which cannot support IHO S-57 format charts and subsequent updates will not be accepted;
(xii) The radar system 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 chart-plotter;
(xiii) If the radar system utilises a Microsoft Windows operating system, it shall be of the latest version and be equipped with Symantec Endpoint anti-virus software with a perpetual virus definition update license;

(xiv) The radar system shall be capable of integrating into the Command and Control systems of other HKPF vessels;

(xv) The radar system shall integrate with Thermal Imager and be able to provide radar tracking in azimuth, as selectable by the police officers onboard. The Contractor shall be responsible for connecting and configuring the interface of the radar system and Thermal Imager.

(xvi) The radar system shall provide both 'Estimated Position' and 'Dead Reckoning' (EP and DR) functions in order to overcome spoofing, jamming or other sensor failures. A paddle wheel type speed transducer and fluxgate or magnetic compass shall be provided and connected to the radar system to facilitate EP and DR functions. The compass may be that provided on the primary console. If a fluxgate type compass is used it must be capable of running off of the emergency battery bank.

r) The radar system shall be interconnected with the D/GNSS, satellite compass and fluxgate systems so that real-time data from these three (3) 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.

s) 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).

t) The integrated MFD and radar system shall be fully integrated with the Thermal Imager and facilitate both radar tracking in azimuth by the Thermal Imager, and display of the Thermal Imager feed on the integrated MFD. 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.

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

v) 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.

w) 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).

x) The radar shall provide with an 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 which can be incorporated into the MFD.
b) A digital repeater for heading and speed shall be provided on the primary console.
c) The satellite compass sensor unit shall be connected directly to the radar.
d) The sensor unit shall incorporate two or more satellite receivers from at least two types of satellite positioning system.
e) 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).
f) 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.
g) The satellite compass shall provide the GPS source for the GMDSS function used by the fixed IMM VHF radio specified at Paragraph 7.4 of this Part VII.
h) 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℃ to 50℃; Display unit: 0℃ to 55℃
(vii)	Waterproofing:	Sensor unit: IPX5, Display unit: IPX6.

7.3.3. Differential Global Navigation Satellite (D/GNSS System) integrated with Radar/ D/GNSS and Electronic Chart System

a) The Contractor shall supply and install a D/GNSS system which fulfils the following general requirements:

(i) The D/GNSS shall support at least GPS and GLONASS;
(ii) The D/GNSS system shall consist of a GPS receiver integrated with the GPS antenna and be suitable for mounting in the open air;
(iii) The D/GNSS 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;
(iv) The D/GNSS system shall be fully compatible with the radar;
(v) The D/GNSS system shall support Serial NMEA 0183, Serial 26-pin D-sub, Serial 9-wire RS232, Serial 3-wire RS232 and Ethernet (NMEA 2000); and
(vi) The D/GNSS system shall support at least the following data displayed either at the D/GNSS display unit or the radar display:
(vii) Position (latitude/longitude): to at least four (4) decimal points
(viii) Horizontal Position accuracy (at speed of 15kt): less than or equal to 10m
(ix) Course: 1° resolution

(x) Speed: 0.1 knot or 0.1 km/hour resolutions with at least three (3) digits
(xi) Date and time: selectable as GMT or local mode
(xii) Satellite status information

b) The D/GNSS system's antenna/receiver shall fulfil 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℃ to 55℃ or better
(vi)	Waterproofing:	IPX7 or better
(vii)	Correction:	IALA compliant Beacon RTCM SC-104

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 **[D]**
b) The system shall function as a siren and powerful loud hailing 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 a warble signal, 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 system shall be fully integrated with the Vessel's digital intercommunications system so that the crew may use it whilst wearing their helmets.
e) 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.
f) The system shall be provided with a waterproof connector to enable a digital multimedia device to be attached to facilitate the transmission of pre-recorded messages.
g) Verbal messages shall be broadcast through a fist microphone mounted on the primary console and shall be communicated with clarity.
h) The loudspeakers shall have an impedance which shall match the amplifier.
i) The loudspeakers shall have an acoustic power of at least 135dB, operate over a narrow beam (less than 35 degrees) and be safe for the crew and passengers to use.
j) The system shall be waterproofed to IPX5 standard or better.
k) 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 with clarity over 0.2 km away.
l) The positions of all the system's main components shall be discussed at the kick-off meeting.

m) The system shall be capable of being directed at a vessel moving relative to the launch via integration with the radar system **[D]**

7.4. International Maritime Mobile (IMM) VHF Radio

7.4.1. The Contractor shall supply one (1) IMM VHF 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 and have Type Approval from The Office of the Communications Authority ("OFCA");
b) comply with relevant requirements of the European Parliament and Council Directive 1999/5/EC;
c) be fully compatible with the GMDSS;
d) be fitted to the secondary console;
e) be integrated into the Vessel's intercommunications system;
f) be equipped with the full range of IMM VHF voice channels, all of which shall be selectable;
g) be delivered complete with all components, features and functions necessary for full functionality;
h) be capable of operating in temperatures ranging from -5℃ to +55℃ and be protected to IPX7 or better;
i) Specific Features and Requirements:

(i) Power ON/OFF;
(ii) Handheld microphone head and speaker for use when crew are not wearing helmets;
(iii) "Transmit" indicator, volume and squelch controls;
(iv) Channel number indicator;
(v) Quick selection of Channel 16 (156.8 MHz);
(vi) Dual watch and triple watch on Channel 16 and selected channel(s);
(vii) Channel scanning between Channel 16 and selected channels; and
(viii) 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).

The equipment provided shall be confirmed with HKPF at the kick-off meeting.

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℃ and +65℃
- Humidity: 15% – 95% (non-condensing)

7.5.3. The Contractor shall provide the six (6) pairs of weatherproof, 5G ready, MIMO antennae specified in Paragraphs 7.5.2(a) and 7.5.2(b) above. The MIMO antenna and feeder cables shall also support the 5G frequency band.

7.5.4. The Vessel's electronic equipment including the radar/ D/GNSS 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 encryption mobile router and the associated equipment shall be housed in an IPx7 cabinet and mounted in a mounting frame with shock-absorbing cushions for securely mounting the device onto the Vessel. The device installation location shall be easy to access, and the mounting design of the device means it shall be easy to conduct maintenance work and remove the device. The Contractor shall provide one (1) Ethernet switch port to the console specified at Paragraph 3.4.3 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 Identification 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 come with internal GPS for time synchronisation and be connected to the GPS system and Satellite Compass.

7.6.5. Each AIS shall 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 come with one (1) GPS Antenna with Antenna Element:

a) Centre 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) Centre 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 GPS and VHF antennae capability can be provided by a single combined antenna as long as the performance in Paragraphs 7.6.5 and 7.6.6 of this Part VII are achieved.

7.6.9. The AIS shall be waterproof with IPX6 or better.

7.6.10. 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 nonencrypted 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.

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

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 Paragraphs 1.2.1 and 1.2.2 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 of this Part VII.

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 connect to Fixed Communications Units (FCUs).

7.7.8. The EBIU shall:

a) form an Ethernet network on the vessel;
b) be connected to at least four (4) radio transceivers, including two (2) units of HKPF Marine Radio Communications System as specified in Paragraph 7.10.1(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, navigation and engine notification alarms;
d) be 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 FCU 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 7.7.9(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 FCUs via the Ethernet network.

7.7.10. The FCUs shall:

a) be fixed nodes connected to the Ethernet network as specified in Paragraph 7.7.10 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) receive and distribute voice communications;
d) have a full duplex intercom capability;
e) be the operator's primary gateway to the IC system;
f) be connected to both the operators' audio head gear and the RIUs;

g) incorporate a voice-prompted menu selection control, a PTT for the intercom system and PTTs for at least two assigned radios;
h) enable the operator to select whether to mute the communications systems or to transmit on the IC system using PTT, VOX or live microphone;
i) be protected to IP67 standard; and
j) provide six (6) connection ports for the five crew and one passenger. Two (2) connection ports on each console and two (2) at a location to be confirmed with GNC and HKPF at kick-off meeting.

7.7.11. The wireless extension(s) shall:

a) comprise a wireless base station connected to the Ethernet backbone via an appropriate interface unit, capable of interfacing with the radio specified at Paragraph 7.7.11(b) of this Part VII;
b) enable the connection of wireless radios operating on the 2.4 GHz or 5.8 GHz bands or other radio frequency band acceptable to both OFCA and the HKPF (current HKPF equipment, specifications to be provided at the kick-off meeting post Tender award), carried by the operator, to the wireless base station specified at Paragraph 7.7.11(c);
c) enable an operator who is no longer connected to the IC system by a FCU and extension cable, such as a boarding officer who has left the Vessel, to carry out enforcement operations on another craft and have full duplex access to the IC system;
d) not require the operator to carry any additional equipment other than a small belt-mounted wireless radio which shall connect to the wireless base station;
e) allow connectivity of at least six (6) users up to 200m from the Vessel; and
f) shall be compatible with HKPF's existing wireless Portable Control Unit (PCU) (model: Telephonics TruLink Submersible Portable Transceiver). Intercom system which is not compatible with the stated wireless PCU will not be accepted.

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 7.7.9(b) above and other systems as provided for in this Specification;
b) sufficient FCUs with plug-in points for six (6) crew/passenger locations as specified in Paragraph 7.7.10 above;
c) A wireless base station for incorporating wireless radios of the type specified in Paragraph 7.7.11(b) of this Part VII;
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 FCU;
e) bluetooth interface for connecting to HKPF 3G/LTE commercial radio or mobile telephone as specified in Paragraph 7.7.8 (b); and
f) All other components required that have not been specified in this specification 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 encryption mobile router 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 for the maintenance of 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 0℃ to 50℃;
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 mentioned in Paragraph 7.3.1 of this Part VII.

7.8.3. A separate display shall also be installed in the primary console 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 Paragraph 7.3.2 of this Part VII with the detailed 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 pre-set to a given depth and provide an audio and visual alert when entering an area with a depth shallower than the pre-set 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.

7.8.7. The sonar unit shall not require a through hull penetration.

7.9. Thermal Imager

7.9.1. The Contractor shall provide a stabilised Thermal Imager (TI) integrated into the MFD described in Paragraph 7.3.1 of this Part VII. The TI shall be integrated into the radar so as to allow target tracking.

7.9.2. The TI shall have the following specification as a minimum (equivalent to the FLIR M400):

A. Thermal Camera:

a)	Thermal Field of View	18° to 6° Horizontal Field of View (HFOV)
b)	Pan and tilt coverage	360° continuous pan, +/-90° tilt
c)	Thermal Resolution	640x480
d)	Thermal Zoom	≥4x

B. Daylight Camera:

a)	Field of view	64° to 2.3° Optical HFOV
b)	Resolution	1080/30p
c)	Minimum illumination	>0.5 lux at 50 IRE / 0.05 lux in ICR mode (B/W)
d)	Optical zoom	30x

C. Other:

a)	Spotlight	≥580 lumens LED
b)	Pan and tilt coverage	360° continuous pan, +/-90° tilt
c)	Power requirement	24V DC
d)	Operating temperature	-25℃ to +55℃
e)	Water ingress	IPx6
f)	Shock	15g vertical, 9g horizontal
g)	Wind	100 knots

7.9.3. The TI shall be provided with a means for digital data recording, with space for at least 24hrs of recordings without overwriting, deleting or downloading. The TI digital data recorder shall be water resistant and operate at the maximum vessel speed and sea state as specified in this Contract.

7.9.4. The TI is to be shipped from supplier direct to and fitted in HK to facilitate direct returns from HK to the supplier for maintenance and servicing.

7.10. **Installation/Space/Cabling for Existing HKPF Equipment**

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

a) Two (2) sets of HKPF Marine Radio Communications System (MRCS) TETRA mobile radios. The present equipment type is the EADS TETRA TMR880i mobile radio with separate control panel, speaker box and speaker microphone. 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 TETRA Mobile Radio, no additional costs associated with the installation of a radio of a different type shall be chargeable to the Government. The radio sets shall be integrated into the Vessel IC system and not be interfered with or by other electronics or electrics on the Vessel. Each radio shall incorporate a handheld microphone head and speaker for easy communication when crew are not wearing helmets.

b) One (1) set of 13” inch MARSAS tablet with large battery. The Contractor shall provide a mounting location at a console to be discussed at the kick-off meeting.

7.10.2. The Contractor shall:

a) Coordinate and finalise the positions of all the radio, radar equipment and antennae systems during the detailed system design stage.
b) Reserve sufficient space for the installation of the EQ-HKPF, including for flush mounted panels.
c) Note that the TMR880i radio and its accessories are not intended to be mounted in a position exposed to the elements. Consequently, the Contractor shall provide suitable protection from the elements for the control panel, speaker box and microphone.
d) Supply and install all RF signal, power and grounding cables and wires. COMMS will provide the specifications of all the RF cables and connectors to the Contractor.
e) Supply and install all power converters and power supply terminals necessary for the EQ-HKPF's installation.
f) Supply and install two UHF antennae, one for each MRCS TETRA radio a frequency range of 380 MHz to 430 MHz at a VSWR of 1.5 or less. The Contractor shall provide and install suitable co-axial cable surge suppressors to these UHF antennae to protect the radio equipment from lightning surges.
g) Design, rig and suitably mount the antennae to ensure EMC and avoid interference.
h) Fit and install the EQ-HKPF in the HKSAR in the positions that were finalised during the detailed design stage, subject to any subsequent EMC-necessitated alteration.
i) Provide all necessary cables, materials, labour and transportation for the equipment installation.

7.10.3. COMMS shall:

a) connect up the EQ-HKPF using the connectors, cables and wires installed by the Contractor;
b) test the VSWR of the RF cables and UHF antennae to confirm that neither exceeds 1.5; and
c) commission the EQ-HKPF.

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 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. 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. The detailed inventory list for the whole Vessel covering all discrete items down to major component/unit level shall include the following:

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 USBs 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 USBs;
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 USBs as per the Vessel delivered;

d) Four (4) paper copies and two (2) soft copies in USBs 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 USBs 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 USBs 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 7.2.12 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 7.2.12 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 USB 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 USBs), filed in clear folders, shall be forwarded to GNC at Delivery Acceptance:

a) Associated test certificates;
b) Class Certificate for the Vessel;
c) Test performance certificates of Equipment (e.g. electronics, switchboards);
d) Outboard engine performance test certificates;
e) Complete record of the Official Sea Trial commissioning tests;
f) 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);
g) Certificates of light and sound signalling Equipment;
h) Builder certificates;
i) Certificates of building material;
j) Deviation card for compass (after adjustment in the HKSAR);
k) Hull construction material certificates issued by one of the Classification Societies listed in Paragraph 2.3.4(i) to (ix) of this Part VII;
l) 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;
m) Asbestos free certificate or statement of compliance; and
n) Any other certificates as appropriate.

8.2.7. Ship Model

The Contractor shall provide the Government with three (3) ship models suitably scaled so that the model length overall is between 600 mm to 800 mm. The models shall include all major external fittings above and below the waterline such as the collar, console, hull-steps, 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 and fittings 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 to be provided by the Contractor on:

a) Operator Training;
b) Electronic Navigations Equipment (ENE) Maintenance Training; and
c) Engineering Maintenance of the Vessel

9.1.2. The Contractor shall provide both classroom-based and vessel-based training as appropriate. 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 in both Traditional Chinese and English 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.

9.1.4. The Contractor shall supply each trainee attending the courses specified in Paragraphs 9.2, 9.3 and 9.4 below with one (1) copy of the comprehensive training documents in both paper and USB format. The HKPF and MD shall have the right to reproduce all training documents for internal use.

9.1.5. The Contractor shall, upon successful completion of the entire course specified in Paragraphs 9.2, 9.3 and 9.4, issue each training course participant with a certificate as evidence of his/her attendance and the standard of competence achieved.

9.2. Operator Training

9.2.1. The purpose of the operator training course is to provide each trainee, who will already be an experienced coxswain, with the knowledge and competence to operate the Vessel. On completion of the training course, the trainees will be responsible for delivering further trainings to other HKPF officers.

9.2.2. 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 all aspects of boat handling and on board ENE, Equipment and systems operation. This shall include "hands on" demonstrations of the operation, daily routine cleansing as well as first level troubleshooting and maintenance. The draft operator training syllabus shall include details of the scope, duration and scheduling of the proposed training course and the qualifications possessed by the proposed training instructor(s).

9.2.3. 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.

9.2.4. The exact contents of the training package is to be confirmed with HK GNC and HKPF in the kick-off meeting.\

9.3. ENE Maintenance Training

9.3.1. The purpose of the ENE maintenance training course is to provide the COMMS technical and maintenance staff with a detailed knowledge of all aspects of the design considerations, 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.

9.3.2. The Contractor shall, not less than two (2) months prior to Delivery Acceptance, submit for the HKPF and MD's approval a draft ENE maintenance training syllabus for the approval of MD and HKPF. The draft ENE maintenance training syllabus shall include details of the scope, duration and scheduling of the proposed training course and the qualifications possessed by the proposed training instructor(s).

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

9.3.4. Upon Delivery Acceptance, the Contractor shall then deliver the ENE maintenance training course according to the approved syllabus to fifteen (15) HKPF operational staff.

9.4. Engineering Maintenance Training

9.4.1. 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 training syllabus, which shall include, but not be limited to, all aspects of the design, day-to-day operation, breakdown, routine maintenance and fault diagnosis of the engine/electrical distribution systems and hull structural repair. The draft shall include details of the scope, duration and scheduling of the proposed training course and the qualifications possessed by the proposed training instructor(s).

9.4.2. 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 and Support Section technical and maintenance staff in the HKSAR.

CHAPTER 10 – ABBREVIATIONS

3G	3rd Generation
4G	4th Generation
5G	5th Generation
A/C	Alternating Current
ABS	American Bureau of Shipping
AIS	Automatic Identification 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
CO2	Carbon Dioxide
COMMS	Communications Branch of HKPF
CPA	Closest Point of Approach
dB	Decibel
DC	Direct Current
D/GNSS	Differential Global Navigation Satellite System
DGPS	Differential Global Positioning System
DHCP	Dynamic Host Configuration Protocol
DNVGL	Det Norske Veritas Germanschier Lloyds
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
LR	Lloyd's Register
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
FCU	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
SQEP	Suitably Qualified and Experienced Personnel
TBT	Tributyltin
TCG	Transverse Centre of Gravity
TCPA	Time-based Closest Point of Approach
TD	Time Division
TI	Thermal Imager
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, save that for the outboard engines, the warranty period shall be not less than 250 running hours. 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 shall 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 Chapter 7 of this Part VII.

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/Gelcoat Under the Water Line

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

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

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

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

b) Paint/Gelcoat Above the Water Line

(i) Damaged paint/gelcoat on the hull above the water line shall be repaired properly. After repair, if the finish was originally painted then 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.

PART VII - ANNEX 2 – IMPLEMENTATION TIMETABLE

	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

PART VII - ANNEX 3 - DRAWINGS SUBMISSION TIMETABLE

Item No.	Drawings Approval	Completion Date
1	General Arrangement Plan	Preliminary issues of all drawings are required to be submitted to GNC for approval / reference two (2) months from the kick-off meeting.
2	Lines Plan	
3	Structural Construction Plan in Mid-Ship and Bulkhead Section	
4	Construction Profile and Deck Plan	
5	Shell Expansion Plan	
6	Tank Capacity Plan	
7	Engine Mounting Arrangement	
8	Power / Speed Estimation and Curve	
9	Intact and Damaged Stability Plan	
10	Details of Electronic Navigational / Communication Equipment	
11	Details of Deck Equipment, Outfitting, Furniture, etc.	
12	Details of Engines' Arrangement	
13	Consoles Arrangement and Schematic Diagram	
14	Instrumentation and Control System	
15	Calculation of Fuel Capacity	
16	Details of Electrical and Electronic Equipment	
17	Electrical Load Calculations	
18	Schematic Layout of Electrical Circuits	
19	Paint Schedule	
20	Lightning Protection Arrangement	
21	Torsional Vibration Calculation	
22	Others as required	

Part VII - ANNEX 4 – Main Items Inspection Timetable

Item No.	Items to be Inspected			Completion Date 1st Vessel
	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		
	(c)	Composite material type approval certificates		
H-3	(a)	Welding consumables & welders certificates		
	(b)	Composites consumables and staff training/experience certificates		
H-4	(a)	Keel laying for hull		
	(b)	Mould preparation		
H-5	Fabrication of hull up to main deck in stages of work, including:			
	(a)	Alignment/mould preparation		
	(b)	Edge preparation		
	(c)	Welding/layup		
	(d)	Workmanship		
	(e)	Compliance with approved plans		
	(f)	NDT (X-ray) of welds		
	(g)	Hull internal work inspection		
	(h)	Plating/skin thickness gauging		
H-6	Engine bed fabrication / welding			
H-7	Console scantling & welding/layup/bonding checking			
H-8	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)	Windlass		
	(c)	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 protection system		
	(a)	Installation of zinc anodes	
	(b)	Installation of lightning protection system	
H-18	Inspection of fire, heat and sound insulation (if applicable)		
	(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		
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 outboard engines		
EM-2	Outboard 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 outboard 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 (as applicable):	
(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	Electronic equipment tested by COMMS	
EM-13	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					Dummy Weight	kg			
Fuel (Petrol)					Other Equipment	kg			
Sea Conditions	WMO Sea State 0								
Engines:	Port Outer	Port Inner	Stbd Inner	Stbd Outer	Propellers:	Port Outer	Port Inner	Stbd Inner	Stbd Outer
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-Finish)	Fuel Consumption (litres/minute)	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 each 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. Layup tables/book (if composite construction)

1.2.15. Material test data for typical laminates, resin systems and manufacture processes (if composite construction)

1.2.16. Steering system and steering arrangement diagrams (if applicable).

1.2.17. Superstructure or consoles and deck structural and construction plan (if applicable).

1.2.18. Hull watertight bulkheads' construction plan.

1.2.19. Superstructure or consoles to deck connection – detail construction plan (if applicable)

1.2.20. Engine casing to deck connection detailed construction plan (if applicable).

1.2.21. Deck edge and bulwark (if any) details and construction plan, including detailed structural arrangement drawings of hull to deck connection.

1.2.22. Detailed cathodic corrosion prevention and arrangement plans and drawings for the Vessel throughout.

1.2.23. Mast structural and construction plan and mast equipment arrangement plan.

1.2.24. Anchoring arrangement plan.

1.2.25. Piping diagrams for fuel oil, lubrication oil, bilge, firefighting, scuppers and drains system (as applicable).

1.2.26. Fire prevention, fire control and firefighting system drawings (if applicable).

1.2.27. Drawings of the main switchboard and all other switchboards and the electrical system (if applicable).

1.2.28. Main propulsion engines arrangement and setting plans and drawings of their fuel lines and arrangement (as applicable).

1.2.29. Main fuel oil tank drawing and its associated piping and manifold(s), and filling, overflow and ventilation system.

1.2.30. Drawings of the anchor, and the anchoring system.

1.2.31. Lifesaving appliance arrangement plan and fire safety plan (if applicable).

1.2.32. Distress signals, alarm systems, and internal/external communication arrangement and system plan (if applicable).

1.2.33. Navigation lights, sound and signal diagrams and any other external lighting arrangement plan.

1.2.34. Vessel overall lighting arrangement and light control plan.

1.2.35. Vessel alarm and signals, internal communication systems and public address systems plan.

1.2.36. Other drawings as appropriate.

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 PRE-SHIPMENT CONSTRUCTION AND HANDLING INSPECTION

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;
b) document the manoeuvring/performance characteristics of the Vessel; and
c) 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 centre 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 9 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 the maximum achievable speed at Light Operational Load Condition with full throttle. At any time during this assessment, the bow of the Vessel shall not rise above the horizon line with the trim control system (if fitted) turned off. Should the bow rise above the horizon line with the trim control system (if fitted) turned off, it shall not be for more than three (3) 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) While maintaining the same course and settings, if the Vessel does not maintain the maximum achievable speed at Light Operational Load Condition for a period of no less than one (1) minute, or during which the bow of the Vessel rise above the horizon line with the trim control system (if fitted) turned off, 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 shall not rise above the horizon line. Should the bow rise above the horizon line, it shall not be for more than three (3) 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 forty five (45) knots with the ride control system (if fitted) turned off.

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 five (5) degrees within a period of twenty (20) seconds.

2.2. Handling Assessment –Intermediate Operational Load Condition

The following assessment shall be conducted at Intermediate 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 the Contract Speed as specified in Paragraph 2.4.3(b) of Part VII with full throttle. At any time during this assessment, the bow of the Vessel shall not rise above the horizon line with the trim control system (if fitted) turned off. Should the bow rise above the horizon line with the trim control system (if fitted) turned off, it shall not be for more than three (3) 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) While maintaining the same course and settings, if the Vessel does not maintain the Contract Speed as specified in Paragraph 2.4.3(b) of Part VII for a period of no less than one (1) minute, or during which the bow of the Vessel rise above the horizon line with the trim control system (if fitted) turned off, the Vessel shall be deemed to have failed this assessment.

2.2.2. Speed Transition Assessment

This assessment contains two parts.

a) 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.
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) 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.
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 shall not rise above the horizon line. Should the bow rise above the horizon line, it shall not be for more than three (3) 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.

2.2.3. Avoidance Line Assessment

An avoidance line test shall be conducted in accordance with the test procedures as in ISO 6185-4, except the loading condition and the distance from the point of start-to-turn to the imaginary line of maximum distance being seventy (70) metres. The Vessel

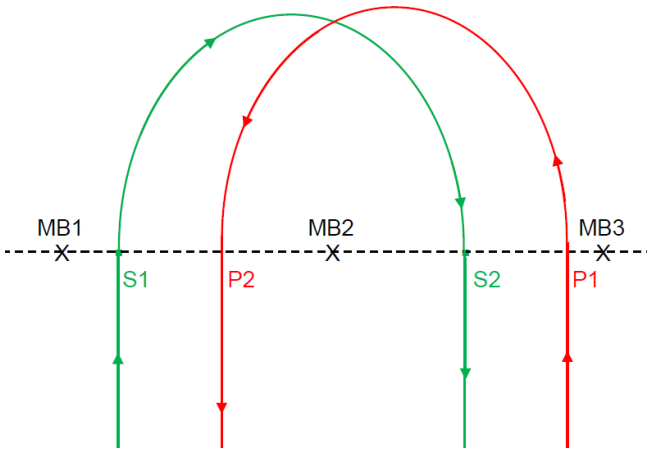
shall be required to demonstrate a maximal manoeuvring speed of no less than fifty (50) knots.

2.2.4. U-Turn Test

a) The Vessel shall make a straight line course in a direction perpendicular to an imaginary line with three (3) collinear marker buoys on the imaginary line, as shown in the diagram below. MB1, MB2 and MB3 are the marking buoys each being twenty five (25) metres apart.

b) When the Vessel crosses the imaginary line at S1 which is anywhere between MB1 and MB2, the speed of the Vessel shall be not less than fifty (50) knots, turning to the starboard side with any speed that is safe to drive and making a U-turn with the Vessel crossing the imaginary line again at S2 which is anywhere between MB2 and MB3. The speed of the Vessel shall be not less than fifty (50) knots at S2 or after crossing the imaginary line again. The time measured from S1 to the point at or after the Vessel crosses the imaginary line and regain a speed of fifty (50) knots shall not exceed twenty eight (28) seconds.

c) Paragraph 2.2.5 b) above shall be repeated in a similar manner. When the Vessel crosses the imaginary line at P1 which is anywhere between MB2 and MB3, the speed of the Vessel shall be not less than fifty (50) knots, turning to the port side with any speed that is safe to drive and making a U-turn with the Vessel crossing the imaginary line again at P2 which is anywhere between MB1 and MB2. The speed of the Vessel shall be not less than fifty (50) knots at P2 or after crossing the imaginary line again. The time measured from P1 to the point at or after the Vessel crosses the imaginary line and regain a speed of fifty (50) knots shall not exceed 28 seconds.



PART VII – ANNEX 8 – HULL PERFORMANCE ASSESSMENT (HPA) AS PART OF MARKING SCHEME VERIFICATION

1. General

1.1. The purpose of the HPA is to verify the submitted information and data in supporting the tenderer's commitment in achieving the stated hull performance as given in Section (A)2.(b) of Annex D to Part II. If so required and at MD's sole discretion, either all tenderers who have passed Stage 1 and Stage 2 of the Tender Evaluation Procedures, or no tenderer, will be required to carry out the Hull Performance Assessment. Failure in carrying out HPA if so requested would render the Tenderer achieving zero (0) score in Section (A)2.(b) of Annex D to Part II.

1.2. If so requested, the Tenderer shall arrange for a HPA of a test vessel which shall be having the same hull geometry to the offered Vessel, or having a similar geometry to the offered Vessel with proportional main dimensions, and must satisfy Paragraph 1.4 of this Annex 8 below. The HPA shall be conducted in the presence of MD's and HKPF's representatives, either in Hong Kong or at a place proposed by the Tenderer and agreed by the Government. At least ten (10) working days in advance of the HPA, the Tenderer shall submit for MD's approval a HPA programme proposal which includes details of the procedures under which the HPA 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 1.5 and the digital video footage recorded in accordance with Paragraphs 1.6 during the HPA.

1.3. 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 HPA 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.

1.4. The test vessel shall have the following parameters:

a) Length Overall shall be between 12 metres and 16 metres;
b) Hull form and hull lines shall be the same as the offered Vessel, or being geometrically similar and proportional to the offered hull;
c) Hull materials shall be aluminium or composite;
d) Propulsion system shall consist of inboard engines with sterndrives, or inboard engines with surface piercing drives, or outboard engines; and
e) Speed shall be at least fifty (50) knots in all operational loading conditions.

1.5. The Tenderer shall ensure that an objective record such as the date, time, position, speed, course, roll, pitch, yaw, trim, and running angle of the test vessel are captured and recorded during the HPA. The HPA 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.

1.6. The Tenderer shall, throughout the HPA, 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 centre line of the vessel to be assessed with the camera mounted as closed as possible at the transom.

1.7. The Tenderer shall provide a suitable logistics vessel from which the Tenderer shall record digital video footage of the test vessel undergoing the HPA. This logistics vessel shall be capable of a comparable speed and be piloted at a distance and position from the test vessel.

1.8. The Tenderer shall, immediately after the HPA, provide to the Government Representatives the following:

a) an electronic and printed record of the data recorded during the HPA 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 test vessel 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 1.6 of this Annex stored on a digital storage medium in a format approved by MD in accordance with Paragraph 1.3 above, namely:

   (i) aerial digital video footage;
   (ii) fixed digital video footage captured from the test vessel;
   (iii) digital video footage captured from the logistics vessel;

c) a certificate, signed by both the Contractor and a Government Representative, which records accurately the actual Loading Condition of the test vessel as described in Paragraph 1.7.2(e) of Part VII during each assessment of the HPA.

1.9. 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 9 of Part VII, unless otherwise agreed with the Government Representative.

1.10. 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 the maximum achievable speed at Light Operational Load Condition with full throttle. During this assessment, the bow of the test vessel shall not rise above the horizon line with the trim control system (if fitted) turned off. If the test vessel does not achieve this, it shall be deemed that no score will be obtained on this test.

b) While maintaining the same course and settings, if the test vessel does not maintain the maximum achievable speed at Light Operational Load Condition for a period of no less than one (1) minute, or during which the bow of the test vessel rise above the horizon line with the trim control system (if fitted) turned off, it shall be deemed that no score will be obtained on this test.

2.1.2. Directional Control Assessment

a) The coxswain shall bring the vessel to a speed of forty five (45) knots with the ride control system (if fitted) turned off.

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 two (2) degrees within a period of twenty (20) seconds.

2.2. Handling Assessment – Intermediate Operational Load Condition

The following assessment shall be conducted at Intermediate Operational Load Condition as specified at Paragraph 1.7.2(e) of Part VII.

2.2.1. Straight Line Assessment

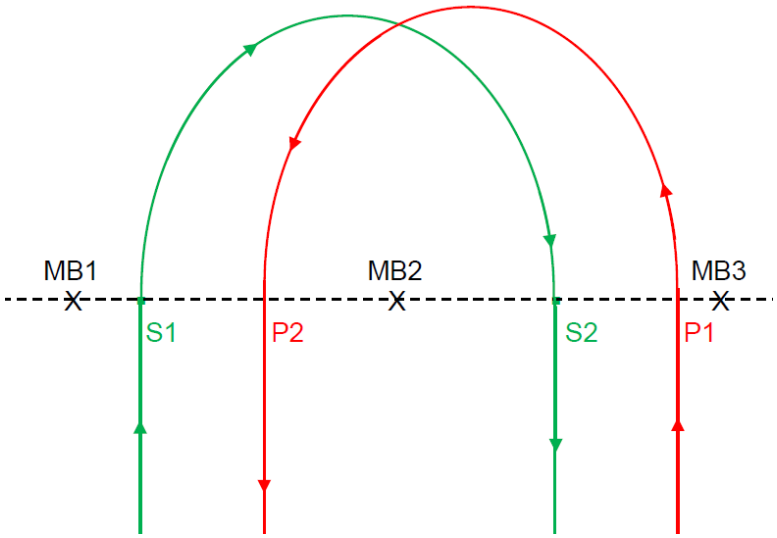
a) Accelerate from stationary to the maximum speed of not less than fifty (50) knots at Intermediate Operational Load Condition with full throttle. At any time during this assessment, the bow of the test vessel shall not rise above the horizon line with the trim control system (if fitted) turned off. If the test vessel does not achieve this, it shall be deemed that no score will be obtained on this test.
b) While maintaining the same course and settings, if the test vessel does not maintain the maximum speed of not less than fifty (50) knots for a period of no less than one (1) minute, or during which the bow of the test vessel rise above the horizon line with the trim control system (if fitted) turned off, it shall be deemed that no score will be obtained on this test.

2.2.2. Avoidance Line Assessment

An avoidance line test shall be conducted in accordance with the test procedures as in ISO 6185-4, except the loading condition and the distance from the point of start-to-turn to the imaginary line of maximum distance being seventy (70) metres. The vessel shall be required to demonstrate a maximal manoeuvring speed at no less than fifty (50) knots.

2.2.3. U-Turn Test

a) The test vessel shall make a straight line course in a direction perpendicular to an imaginary line with three (3) collinear marker buoys on the imaginary line, as shown in the diagram below. MB1, MB2 and MB3 are the marking buoys each being twenty five (25) metres apart.
b) When the test vessel crosses the imaginary line at S1 which is anywhere between MB1 and MB2, the speed of the test vessel shall be not less than fifty (50) knots, turning to the starboard side with any speed that is safe to drive and making a U-turn with the test vessel crossing the imaginary line again at S2 which is anywhere between MB2 and MB3. The speed of the test vessel shall be not less than fifty (50) knots at S2 or after crossing the imaginary line again. The time measured from S1 to the point at or after the test vessel crosses the imaginary line and regain a speed of fifty (50) knots shall not exceed twenty eight (28) seconds.
c) When the test vessel crosses the imaginary line at P1 which is anywhere between MB2 and MB3, the speed of the test vessel shall be not less than fifty (50) knots, turning to the port side with any speed that is safe to drive and making a U-turn with the test vessel crossing the imaginary line again at P2 which is anywhere between MB1 and MB2. The speed of the test vessel shall be not less than fifty (50) knots at P2 or after crossing the imaginary line again. The time measured from P1 to the point at or after the test vessel crosses the imaginary line and regain a speed of fifty (50) knots shall not exceed twenty eight (28) seconds.


MB1
MB2
MB3
S1
P2
S2
P1

PART VII - ANNEX 9 WORLD METEOROLOGICAL ORGANIZATION (WMO) - STATE OF THE SEA

State of the Sea

Sea State	Descriptive Terms	Significant 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.

PART VII - ANNEX 10 BEAUFORT SCALE

Beaufort Scale

Beaufort Number	Description	Wind Speed (knots)	Significant Wave Height (metres)	Seastate
0	Calm	<1	0	0
1	Light air	1-3	0.1	1
2	Light breeze	4-6	0.2	2
3	Gentle breeze	7-10	0.6	3
4	Moderate breeze	11-16	1.0	3-4
5	Fresh breeze	17-21	2.0	4
6	Strong breeze	22-27	3.0	5
7	Near gale	28-33	4.0	5-6
8	Gale	34-40	5.5	6-7
9	Strong gale	41-47	7.0	7
10	Storm	48-55	9.0	8
11	Violent storm	56-63	11.5	8
12	Hurricane	≥64	≥14	9

Notes:

(1) Wave heights refer to well-developed wind waves of the open sea

(2) The lag effect between the wind getting up and sea increasing should be borne in mind

(3) The official term for Beaufort number 9 is Strong gale, however the Met Office uses the descriptive term severe gale

Taken from Met Office, https://www.metoffice.gov.uk/weather/guides/coast-and-sea/beaufort-scale, accessed on 04/11/2019.