Department of Transportation,
Communication and Infrastructure
Federated States of Micronesia

PREPARATORY SURVEY REPORT

ON

THE PROJECT FOR IMPROVEMENT

OF

DOMESTIC SHIPPING SERVICES

IN

THE FEDERATED STATES OF MICRONESIA

JULY, 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

FISHERIES ENGINEERING CO., LTD.

PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Fisheries Engineering Co., Ltd.

The survey team held a series of discussions with the officials concerned of the Government of the Federated States of Micronesia, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Federated States of Micronesia for their close cooperation extended to the survey team.

July, 2013

Kazunori MIURA
Director General,
Economic Infrastructure Department
Japan International Cooperation Agency

Summary

① Country Profile

The Federated States of Micronesia (the FSM) is a free association state that became independent as a result of the 1986 conclusion of the Compact Agreement between the four regions that had been ruled by the United States as a trust territory of the United Nations, namely, Phonpei, Yap, Chuuk and Kosrae, and the United States. It is a typical island nation consisting of 607 islands and atolls that are spread from 130 to 172 degrees east longitude and from the equator to 22 north latitude. Although it has a vast Exclusive Economic Zone covering 2.98 million km^2, its land area is only 7.01 km^2, which is almost the same as that of Amami Oshima. As the preamble of the Constitution of the FSM declares “Micronesia nation is born in an age when men voyage among stars; our world itself is an island.”, the people take a great pride in the island culture and life and the Federal and State Governments make due consideration to the life and the culture of the residents of the Islands.

The population in the FSM is 111,542 (2011 projection), 47% of the population live in Chuuk State, 36% in Phonpei State, 11% in Yap State and 6% in Kosrae State. The population growth rate declined from 2.62% (1980 to 1994 is) to – 0.42% (2000 to 2010’s), the projected population in 2015 fell to less than 106,000. 17.4% of the population in FSM live in the outer Islands. The people in the outer islands accounts for 35.2% in Yap State, 25.7% in Chuuk State and 3.9% in Phonpei State. There is no outer Islands in Kosrae.

Main industries in the FSM are limited to fisheries and agriculture. Gross domestic product (GDP) depends on the expenditure by the National Government, State Governments and public authorities and GDP per capita was US$3,016 (IMF, 2012). Primary industries such as agriculture, forestry and fisheries account for 24% of GDP, secondary industries and tertiary industries account for 6% and 70%, respectively.

② Background, history, and basic concept of the project

The key objectives of The Strategic Development Plan 2004 – 2023, the national development plan of the FSM, economic development and self-supporting structure, was further elaborated by the DOTCI (Department of Transportation, Communication, and Infrastructure) in the Infrastructure Development Plan, which says in the maritime transport sector, “to provide the facilities necessary to enable market opportunities to be realized for all areas of the country, including labor market opportunities, and to enhance the level of integration of state economies and the national economy.” and thereby emphasizes, “to facilitate the provision of modern, safe and efficient inter-state and inter-island cargo passenger vessels.”

The fleet of the domestic shipping services in the FSM, belonging to the National and State Governments, had been total six vessels at most, and had been serving as the lifeline for people in the outer islands. Around 1976 to 1978, the shipping services in the FSM were prospering with five vessels (hereinafter called Micro class vessels) procured under Japanese Grant Aid Scheme to the National and State Governments. Anticipating the aging and subsequent retirement of these five vessels, Caroline Voyager (hereinafter called C/V) was provided to the National Government under the Japanese grant aid scheme in 1998. Accordingly, a total of six vessels were in operation for four years between 1998 and 2002.

However, the Micro class vessels became inoperable one after another after 2002 due to deterioration and submersion and all the five vessels became nonoperational in 2005 with Micro Glory (hereinafter called M/G) being the last to be inoperable. As a result, the maritime transport functions were significantly lowered. At present, the National Government took the place of the State Government after disengagement of five vessels and has continually operated C/V as the only vessel for domestic shipping services in the FSM with an aim of securing the minimum necessary means of public transportation for the outer island people, shipping necessities for their life and providing transport for homecoming trips.

Consequently, C/V has no choice but transport much more passengers than the licensed passenger capacity at such times as before and after long school holidays, which poses a serious problem to the vessel safety. Also, as the shipping services that used to be operated by six vessels are now operated by only one vessel, maintenance work of the vessel at the home port, which is required between voyages, cannot be properly carried out, which may cause a serious failure in future.

To support the life and the medical care of the outer island people and to ensure opportunities for them to study, the fleet of the domestic shipping services should be operated safely and stably. Therefore, it is necessary to procure a new cargo passenger vessel, thereby strengthening the cargo and passenger transport in the FSM.

Recognizing the situation, the National Government of the FSM has requested the Japan's Grant Aid to procure one cargo-passenger vessel to the Government of Japan in 2010.

③ Summary of survey results and contents of the project

In response to the request, the Government of Japan decided to implement the survey and JICA dispatched a preparatory survey team to the FSM from March 5th to March 20th, 2013.

As a result of the survey and discussion with the officials in the FSM, it was found that C/V owned by the National Government is solely undertaking the domestic shipping services in the FSM.

While two vessels were provided under the Chinese grant aid scheme in 2004 and 2007, they cannot offset the lowering of the maritime transport functions because of frequent breakdowns.

According to the operating record of C/V from October 2010 to October 2011, C/V called at the state capitals and outer islands of four states, in total 16 voyages, a total number of passenger and cargos are 9,753 persons and 2,021 ton, respectively. 11 voyages of total 16 voyages exceed the C/V's licensed number of passengers (150). The maximum number of passengers on board in the year was 573 persons (about 3.8 times the licensed passenger capacity of 150 persons) and maximum cargo volume was 223 tons (about one fourth of C/V's deadweight tonnage of 870 tons).

C/V is obliged to operate about 250 days per year. The current situation of C/V, where it continues to operate in such a harsh condition that it is difficult to allocate sufficient time for maintenance, raises fears for the occurrence of critical equipment failures. Therefore, it is urgently required to procure a new cargo passenger vessel in order to establish a safe domestic operational structure in the FSM.

Even if the Plan vessel is granted, the vessel would have to operate in parallel with C/V during the periods of excessive congestion to avoid dangerous overload. Therefore, it will be necessary to operate C/V in an appropriate manner even after the turn-over of the Plan vessel. C/V is already 15 years old and without implementing the Preventive Maintenance Policy (PMP[1]), it will most likely be difficult to continue with the parallel operation in an appropriate manner for the future. For this reason, The National Government makes an additional request for the PMP spare parts of C/V to the delegation.

Based on the results of the survey, the preparatory survey team carried out a outline design study in Japan including hull design and specifications, shipbuilding schedule and cost estimation of the project, and then dispatched a team to the FSM for the explanation of the outline design, procedures of the project implementation including the responsibilities on the FSM side in the Project, for the period from June 10 to June 15. The National Government was agreed with the explanation.

Outline of the project are shown below.

- Cargo passenger vessel (Domestic water of the FSM) : 1 vessel
- Equipment : Workboat (1), PMP spare parts for C/V (1 set)

[1] PMP calls for maintenance regardless of functioning or malfunctioning overhauling and changing parts as necessary. PMP manual shows periodical maintenance schedule on weekly, monthly, quarterly, annual and long term for onboard machinery and equipment. Life of machinery and besides life of spare parts are expected elongated, and sudden failure can be minimized.

Principal particular :

Type of the vessel	Cargo passenger vessel (Domestic water of the FSM)
Length overall	59.00m
Breadth, molded	10.80m
Depth, molded	4.60m
Service draft	3.50m
Gross tonnage（international）	920 tons
Main engine	368kW(500ps) x 2
Loaded speed	10.5 knots
Number of Passenger	Indoor pax（16 persons）, Outdoor pax（407 persons）, Treatment room（1 person）, Owner（1 person）, total 425 persons
Cargo hold	About 700m^3
PMP spare parts for the Plan vessel	1 set

Equipment :

Workboat etc.	Workboat : 1（FRP、Length 7.4m、Breadth 1.8m） Outboard motor 3 sets including 1 spare motor
PMP spare parts for C/V	1 set

④ Project period and project cost estimation

The schedule and the Project cost to implement the project on the basis of Japan's Grant Aid cooperation will be:

Schedule		
	Detail design phase, From the Exchange of Notes/Grant Agreement to the tendering/shipbuilding contract	7.0 months
	Building phase, From the contract to the delivery in the FSM, including shipbuilding and transport to the FSM	15.0 months
	Total timeframe	22.0 months

Project cost to be borne by the FSM side will be limited to the bank commission and charges estimated JPY 1.11 Million, equivalent to about US$ 11 thousand.

⑤ Project Evaluation

Reviewing deteriorated condition of the sea transportation as the lifeline of FSM people, urgency of the Plan Vessel is understood pressing. The Project agrees also with the object of The Strategic Development Plan 2004 – 2023, the national development plan of the FSM, which is "to facilitate the provision of modern, safe and efficient inter-state and inter-island cargo passenger vessels".

As the Plan Vessel must be designed and constructed to realize navigation safety, onboard comfort, environment friendliness, fuel economy thereby operation economy, as well as improving inconveniences of C/V and M/G, it is concluded appropriate to implement the Project under the grant aid cooperation by Japan employing shipbuilding technology and industries of Japan.

Aim of the Project is to contribute the development of society and economy through improving stability and safety of the sea transportation inside FSM. After the implementation of the Project, increase of the total operation days, increase of the ports of calls and decrease of voyage cancellation are expected. Besides, as qualitative effects, stabilization of lifeline, increased convenience and safety of FSM people and improved amenity for passengers are expected.

According to above, it is concluded that the appropriateness of the project is high and thereby effective result is expected.

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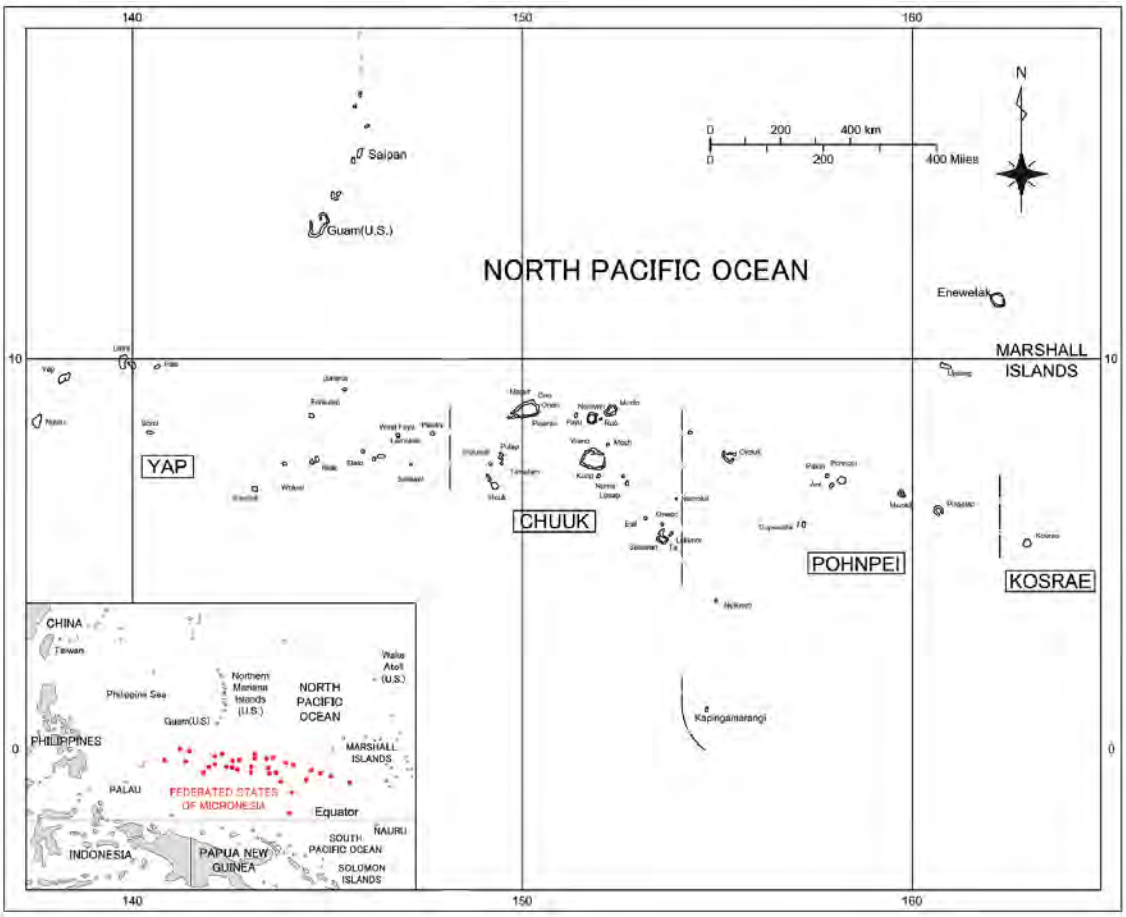

Location Map

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Abbreviations

AC	Anti Corrosive paint
AF	Anti Fouling paint
BNWAS	Bridge Navigation Watch Alarm System
CPax	Cargo Passenger Vessel
CPU	Central Processing Unit
DOTCI	Department of Transportation, Communication and Infrastructure
EMR	Engine Monitor Room
EPIRB	Emergency Position Indicate Radio Beacon
FRP	Fiber Reinforced Plastics
FSM	Federated States of Micronesia
GDP	Gross Domestic Product
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
HF	High Frequency
IMO	International Maritime Organization
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MARPOL	International Convention for the Prevention of Pollution from Ships
MF	Medium Frequency
NAVTEX	Navigational Telex
NK	Nippon Kaiji Kyokai
NOx	Nitrogen Oxide
ODA	Official Development Assistance
PA	Public Address
PC	Personal Computer
PMP	Preventive Maintenance Policy
RoCPax	Roll on Roll off Passenger Vessel

SART	Search and Rescue Transponder
SOLAS	The International Convention for the Safety of Life at Sea
SPC	Self polishing Copolymer
SPC	Secretariat of the Pacific Community
SRNCV	Safety Regulation for Non-Convention Vessels
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
SUA	Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation
SWR	Steel Wire Rope
VDP	Video Display Panel
VHF	Very High Frequency
WC	Water Closet

CHAPTER 1. Background of the Project

1-1 Background of the Project

In the Federated States of Micronesia (the FSM), inter-state shipping services had been undertaken by the National Government and inter-island services within each State had been undertaken by the State Governments.

FSM fleet vessels from the 1970s to now are as listed below.

Table 1-1 FSM fleet vessels

Vessel name	Type	DWT	Year built	Builder	Funded by	Operated by	Status
Micro Glory	CPax	638	1978	Japan	Japan	Pohnpei	Decomm, 2005
Micro Trader	CPax	559	1978	Japan	Japan	Chuuk	Sunk, 2002
Caroline Islands	RoCPax	845	1976	Japan	Japan	FSM	Decomm, 2003
Micro Dawn	CPax	560	1978	Japan	Japan	Chuuk	Sunk, 2002
Micro Spirit	CPax	631	1978	Japan	Japan	Yap	Decomm
Caroline Voyager	RoCPax	870	1998	Japan	Japan	FSM	Working
Chief Malio	RoCPax	681	2004	China	China	Chuuk	Poor, repairing
Hapilmohol #1	RoCPax	680	2007	China	China	Yap	Poor

CPax: Cargo Passenger Vessel, DWT:Dead Weight Tonnage, RoCPax: Roll-on Roll-off Cargo Passenger Vessel

In order to offset the decline in transport capacity caused by the aging of Caroline Islands that was operated by the National Government for inter-state shipping services and transportation of heavy machinery and materials to the outer islands as well as four inter-island vessels to the State Governments between 1976 and 1978 (hereinafter called Micro class vessels), Caroline Voyager (hereinafter called C/V) was provided to the National Government under the Japanese grant aid. Consequently, from 1998 to 2002, a total of six vessels were in operation as the inter-state and inter-island vessels.

However, as all the five Micro class vessels eventually became nonoperational in 2005, leaving C/V as the only vessel in operation, the maritime transport capacity in the FSM was significantly lowered. Accordingly, the National Government took the place of the State Government and has regularly operated C/V as not only an inter-state vessel but also an inter-island vessel with the aim of securing the minimum means of public transportation needed for the Island people for the delivery of daily commodities and the provision of transport for homecoming trips. On the other hand, the Chuuk and Yap State Governments each started to operate a vessel provided under the Chinese grant aid scheme in 2004 and 2007, respectively, but these two vessels stopped operation one after another due to frequent breakdowns and poor fuel efficiency, they cannot offset the declining of the inter-island transport capacity. In effect, the domestic shipping services in the FSM are currently undertaken solely by C/V. This has increased the burden on C/V, making its operating schedule extremely hectic.

Consequently, it is not properly maintained for such reasons as being unable to schedule the servicing of the vessel's engine at the home port, which raises concerns for the occurrence of critical failures. As it is considered necessary to improve the transport capacity and alleviate the burden on C/V in order to ensure the shipping functions to the outer islands, the National Government requested for the grant aid of a vessel for domestic shipping services.

The request from the National Government comprises a cargo passenger vessel of the same type as Micro class vessels. The operating record of C/V in FY2011 shows that in two out of 16 voyages, C/V carried about three times as many passengers as the licensed capacity (150 persons). Most of the passenger demand consists of students and teachers travelling for the new school terms and demand inevitably concentrates on those periods. As the size of the Plan vessel makes it difficult to triple the passenger capacity, even if the Plan vessel is granted, the vessel would have to operate in parallel with C/V during the periods of excessive congestion. Therefore, it will be all the more necessary to operate C/V in an appropriate manner even after the turn-over of the Plan vessel.

Nevertheless, C/V is already 15 years old and without implementing the Preventive Maintenance Policy (PMP: replacing the parts with well-maintained spare parts at regular intervals for servicing), it will most likely be difficult to continue with the parallel operation in an appropriate manner for the future. For this reason, the National Government makes an additional request for the PMP spare parts of C/V to the delegation.

According to the operating record of C/V in 2011, the licensed passenger capacity (150 persons) was exceeded in 11 out of 16 voyages and two voyages with 573 passengers (about 3.8 times of the licensed passenger capacity). It is highly necessary and valid to procure a new cargo passenger vessel to improve the maritime transport capacity. This situation cannot be disregarded for the sake of safety. C/V has already been in operation for 15 years and the frequency of equipment failure has been increasing. However, with no substitutes, C/V is obliged to operate about 250 days per year. The current situation of C/V, where it continues to operate in such a harsh condition that it is difficult to allocate sufficient time for maintenance, raises fears for the occurrence of critical equipment failures. Prolonged suspension of the service by C/V could be a serious blow to the life, medical care and education of the Island residents. Therefore, it is urgently required to build a new cargo passenger vessel in order to establish a safe domestic operational structure of the inter-island vessels.

1-2 Summary of Discussion on Request Details

It was confirmed that the design of Micro Glory (hereinafter called M/G) meets the requirements for cargo passenger transport to outer islands, the new cargo passenger vessel should be designed in accordance with the following specifications, making adjustments based on the design of M/G.

- Passenger capacity: 425 persons (It is essential to operate the Plan vessel in parallel with C/V during the periods when the passenger demand is the highest. The capacity was determined by subtracting the passenger capacity of C/V from the actual number of on-board passengers of C/V and adding one person each for the owner room and treatment room for the sick.)
- Improvement of deck passenger facilities: passenger facilities commensurate with the capacity (Securing sufficient number of passenger toilets, installation of showers and a shop, adoption of anti-rolling system, etc.)
- Increase of fresh water tank capacity: Since fresh water cannot be replenished in the outer islands or in Chuuk, the tank capacity should be determined in accordance with the passenger and crew capacities and a fresh water generator should be adopted.
- Improvement in stability: The width should be increased by about 0.7 m to increase the stability.
- Size of cargo hold: About 700 m^3 (Equivalent to M/G)
- Improved service speed: About 10.5 kt (0.5 kt higher than M/G)
- Ensuring safety: Improvement of navigation equipment, radio apparatus, etc.
- Environmental measures (adoption of the main engine conforming to the MARPOL Convention and LED lighting equipment)

Following table shows the principal particulars of M/G and C/V.

Table 1-2　principal particulars of M/G and C/V

	M/G	C/V
Service area	Domestic	International
Type of the vessel	Cargo passenger vessel（CPax）	Landing craft type cargo passenger vessel（RoCPax）
Length overall	56.40 m	57.50 m
Length bp	53.34 m	53.00 m
Breadth, molded	10.10m	11.00 m
Depth, molded	4.60 m	7.00 m
Service draft	3.60m	3.95m
Gross tonnage	789 tons	1,335 tons
Complement(Passengers)	139 p	150 p
Complement(Crews)	27 p	23 p
Deadweight	631 t	870 t
Cargo hold capacity (Dry)	690m^3	1,200 m^3
Cargo hold capacity (Refrigerated)	-	20 m^3
Loaded speed	10.0 knots	10.5 knots
Main engine	335 kW×2（total 670 kW）	735 kW×2（total 1,470 kW）

It was confirmed with the Minister of Transportation, Communications and Infrastructure that the request of the National Government consists of a cargo passenger vessel to substitute for the Micro class vessel and PMP spare parts for C/V, which is the only vessel currently in operation.

With respect to the passenger capacity of the Plan vessel, since passenger demand inevitably concentrates on certain periods of the seasons, it was confirmed that the capacity should be large enough to accommodate the number of passengers greater than the capacity of C/V during the periods of peak demand and it should also be able to ensure the safe operation of C/V.

With respect to the cargo capacity, the National Government requested to provide the same size of cargo hold as those of M/G and to separate two spaces depend on the type of cargos. It was confirmed that the roll on/off function that C/V had when it was built is not required as the demands for transportation of heavy machinery and construction materials to the outer islands have declined.

With respect to the specifications, it was basically requested to apply and adjust the specifications of M/G to the above-described vessel size, adding modifications for the resolution of operational problems. In connection with the long distance voyage, as the service speed tends to be the cause of passenger dissatisfaction, in particular, it was requested that it should be higher than 10 knots, which is the service speed of M/G, the number of toilets should be more than enough for the passengers and that passenger facilities should be installed to provide some comfort to on-board passengers despite the space constraint.

With respect to the spare parts to maintain the vessel capability of C/V, items that are needed for the implementation of the Preventive Maintenance Policy (PMP) were requested in the quantities needed.

1-3 Natural condition of the project site

Having found no statistical data on wave height in the seas around the FSM because the Government of the FSM does not carry out wave height measurement around the country, the wave height statistics were obtained from the database provided by the National Maritime Research Institute of Japan. The wave height was measured by the GEOSAT and TOPEX/POSEIDON satellites, which supply wave height statistics around the world.

Domestic vessels of the FSM are sailing deep seas among islands of the FSM, scattered widely in the South Pacific. Distance between islands is within 200 nautical miles, which is equivalent to sea area of “Limited Greater Coasting” in the maritime regulations of Japan.

Wave statistics of sea areas around the FSM and Hachijyo Island in Japan are shown below. The most probable significant wave height in the FSM sea area and Hachijyo Island in Japan are 1.9 m and 2.2 m, respectively. Therefore, compared with the sea areas around Japan, it was assumed that the sea areas around the FSM are a bit calm.

Area No.	Spring	Summer	Autumn	Winter	Year
↑ Wave Height ↓	Appearance rate				
Sum	Number of Sample				
	The most probable significant wave height				

Table 1-3 Sea area around the FSM

A71	Spring	Summer	Autumn	Winter	Annual
19.75-	0.0000	0.0000	0.0000	0.0000	0.0000
18.75-	0.0000	0.0000	0.0000	0.0000	0.0000
17.75-	0.0000	0.0000	0.0000	0.0000	0.0000
16.75-	0.0000	0.0000	0.0000	0.0000	0.0000
15.75-	0.0000	0.0000	0.0000	0.0000	0.0000
14.75-	0.0000	0.0000	0.0000	0.0000	0.0000
13.75-	0.0000	0.0001	0.0000	0.0000	0.0000
12.75-	0.0001	0.0002	0.0000	0.0000	0.0001
11.75-	0.0002	0.0004	0.0001	0.0001	0.0002
10.75-	0.0004	0.0009	0.0003	0.0003	0.0005
9.75-	0.0005	0.0007	0.0006	0.0004	0.0005
8.75-	0.0005	0.0006	0.0004	0.0004	0.0005
7.75-	0.0004	0.0006	0.0002	0.0002	0.0004
6.75-	0.0003	0.0009	0.0003	0.0003	0.0005
5.75-	0.0007	0.0026	0.0006	0.0007	0.0011
4.75-	0.0012	0.0030	0.0011	0.0010	0.0015
3.75-	0.0024	0.0121	0.0018	0.0078	0.0060
2.75-	0.0203	0.0863	0.0264	0.0340	0.0403
1.75-	0.5653	0.4686	0.4062	0.6267	0.5279
0.75-	0.4074	0.4227	0.5576	0.3273	0.4194
0-	0.0003	0.0004	0.0044	0.0007	0.0012
TOTAL	72572	54835	47867	64300	239574
	1.8823	2.0020	1.7458	1.9527	1.9013

Table 1-4 Sea area around Hachijyo Island in Japan

A29	Spring	Summer	Autumn	Winter	Annual
19.75-	0.0000	0.0000	0.0000	0.0000	0.0000
18.75-	0.0000	0.0000	0.0000	0.0000	0.0000
17.75-	0.0000	0.0000	0.0000	0.0000	0.0000
16.75-	0.0000	0.0000	0.0000	0.0000	0.0000
15.75-	0.0000	0.0000	0.0000	0.0000	0.0000
14.75-	0.0000	0.0000	0.0000	0.0000	0.0000
13.75-	0.0000	0.0000	0.0001	0.0000	0.0000
12.75-	0.0000	0.0000	0.0000	0.0000	0.0000
11.75-	0.0001	0.0000	0.0004	0.0001	0.0001
10.75-	0.0001	0.0002	0.0008	0.0004	0.0003
9.75-	0.0002	0.0004	0.0009	0.0001	0.0003
8.75-	0.0002	0.0011	0.0004	0.0004	0.0004
7.75-	0.0001	0.0008	0.0014	0.0014	0.0009
6.75-	0.0002	0.0005	0.0012	0.0031	0.0013
5.75-	0.0000	0.0012	0.0031	0.0052	0.0024
4.75-	0.0052	0.0027	0.0083	0.0233	0.0110
3.75-	0.0283	0.0072	0.0497	0.0886	0.0479
2.75-	0.1297	0.0559	0.1383	0.2441	0.1552
1.75-	0.5226	0.2503	0.3589	0.4870	0.4362
0.75-	0.3043	0.6026	0.4195	0.1442	0.3246
0-	0.0092	0.0772	0.0172	0.0023	0.0192
TOTAL	18204	8475	10985	16792	54456
	2.1409	1.6072	2.1127	2.6416	2.2066

1-4 Environmental and social considerations

FSMEIA is not required to apply to the Plan Vessel. FSM has not yet ratifying MARPOL (International Convention for the Prevention of Pollution from Ships). But it is not relevant to provide sub-standard vessel for environmental protection, thereby the Plan Vessel is to comply with the following measures to prevent pollution.

- Against pollution by oil: Oily water separating equipment must be installed on board.
- Against pollution by sewage: Sewage holding tank must be installed not to discharge sewage in the restricted seas.
- Against air pollution Diesel engines installed on board must of type complying with the NOx emission control

CHAPTER 2. Contents of the Project

2-1 Basic Concept of the Project

(1) Objectives of the Government development plan and the Project

The key objectives of The Strategic Development Plan 2004 – 2023, the national development plan of the FSM, economic development and self-supporting structure, was further elaborated by the DOTCI (Department of Transportation, Communication, and Infrastructure) in the Infrastructure Development Plan, which says in the maritime transport sector, “to provide the facilities necessary to enable market opportunities to be realized for all areas of the country, including labor market opportunities, and to enhance the level of integration of state economies and the national economy.” and thereby emphasizes, “to facilitate the provision of modern, safe and efficient inter-state and inter-island passenger and cargo vessels.”

The fleet of the domestic shipping service, belonging to the National and State Governments, had been total six vessels at most, and had been serving as the lifeline for people in the outer islands, but now only one vessel is operational after disengagement of five vessels and thereby the capacity of domestic shipping services has been retrograded and frequent overloading of passengers are observed. Domestic shipping services in the FSM are currently impoverished in capacity and in hazardous conditions.

Under these circumstances, this Project aims at building of a new cargo passenger vessel, to enhance maritime transport capacity of the FSM fleet linking principal islands and outer islands, thereby to improve safety of domestic shipping services and to promote socioeconomic development of the FSM.

(2) Outline of the Project

In the FSM, inter-states shipping services had been undertaken by the National Government and inter-islands shipping services within each State had been undertaken by the State Governments. FSM fleet vessels from the 1970s to now are as listed Table 1-1.

During the four years between 1998 and 2002, total six vessels had been operated for the inter-states and inter-islands shipping services. However, the vessels have been superannuated and five vessels, all built in the 1980s, have decommissioned. As two vessels from China are not working well, only C/V which belongs to the National Government has been solely supporting the FSM domestic shipping services, not only for inter-states shipping services but also for inter-islands shipping services.

With virtually no commercial shipping, which is very limited in the FSM, the capability of domestic shipping services relying almost only on C/V is degrading, and life of FSM people especially those living in the outer islands are afflicted. Adversity is even in the education sector, as shipping services for the students and teachers traveling between home islands and schools in school holidays are not

able to maintain proper shipping schedule. Most passengers are students and teachers in school holidays, patients visiting to hospital in the principal islands for treatment, people visiting to relatives, etc. who may be seasonally concentrated and travel at the same time. The operating record of C/V in FY2011 shows the percentage of the carriages of passengers more than the passenger capacity is 69% of the voyages. From the standpoint of securing passengers' safety in navigations, it is recommended that one vessel must be added in the domestic shipping services in the FSM, so that C/V and the Plan vessel will jointly provide shipping services without overload passengers on board.

The cargo carrying capacity of the Plan vessel needs to be equivalent to that of M/G operated by the Pohnpei State Government. Roll on/off function will not be necessary for the Plan vessel under the situation that demands of transporting heavy machineries and construction materials, etc. have become low. Passenger carrying capacity of the Plan vessel should not be such an excessive capacity to accommodate the concentrated peak demands, but should be moderate capacity assuming C/V and the Plan vessel jointly operate to match such peak demands. Accordingly, the Plan vessel should be basically of same specifications as M/G albeit adding modifications to allow necessary passenger capacity and further improvements to solve the problems on M/G.

Even in the case the Plan vessel be added, C/V must maintain her operation steadily and safely, but C/V is already over 15 years old, to which special care for maintenance is significantly important to ascertain safe and steady operations. It is therefore recommended to adopt PMP[2] (Preventive Maintenance Policy) necessary for C/V, to maintain and overhaul machinery regularly under the established maintenance program and avoid sudden breakdown in advance. The Project is therefore required to include supply of spare parts for C/V together with the Plan vessel to the extent necessary to carry out PMP for securing both vessels steady operations so that the goal of the Project will be accomplished.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Fundamentals

The Plan vessel should be so designed as to improve sea transport services in FSM; as to have appropriate passenger and cargo transport capacity; as to navigate safely at sea; as to be environment friendly; as to be economical in operation; as to have appropriate passenger facility; as to be efficient in cargo operation; as to be durable; and as to be maintenance friendly, as outlined followings.

[2] PMP calls for maintenance regardless of functioning or malfunctioning overhauling and changing parts as necessary. PMP manual shows periodical maintenance schedule on weekly, monthly, quarterly, annual and long term for onboard machinery and equipment. Life of machinery and besides life of spare parts are expected elongated, and sudden failure can be minimized.

(1) Passenger and cargo carrying capacity

Studying statistics of the existing FSM vessel, on number of passengers and volume of general cargo, the capacity for the Plan vessel will be deliberated.

(2) Safety

The Plan vessel will be designed applying safety standards as required by the National Government for a vessel engaging on domestic shipping services.

(3) Environment Friendliness

MARPOL regulations (International Convention for the Prevention of Pollution from Ships, 1973) will apply for the control of oil discharge, control of sewage water discharge, and control of NOx emission from diesel engines of the Plan vessel.

(4) Operation Economy

In designing the Plan vessel, her hull form will be so optimized as to minimize water resistance, and the propulsion efficiencies will be improved by adopting slower spinning large diameter propeller, thereby lower fuel oil consumption.

(5) Passenger accommodation

Despite long sailing days, adequate spaces are not arranged in the existing vessel and passengers are suffering severe ship journey. In the Plan vessel, the passenger spaces will be of adequate areas corresponding to the number of passengers.

(6) Durability and Maintenance

Durability of vessels depends on material itself and/or on maintenance.

Rusting of seawater pipes represents the former case. In the Plan vessel, inside of all seawater cooling steel pipes should be of plastic coated to prevent rusting.

Diesel engine represents the latter case. In the Plan vessel, PMP should be adopted. PMP calls for overhauling and maintenance regularly notwithstanding breakdown or malfunction, aiming for no sudden machinery breakdown thereby longer life. Machinery parts necessary for PMP should be procured under the Project.

2-2-1-2 Study on the Capacity of the Plan vessel

(1) Operation record of C/V

Shown below are the Sailing routes of C/V from Oct. 2010 to Oct. 2011.

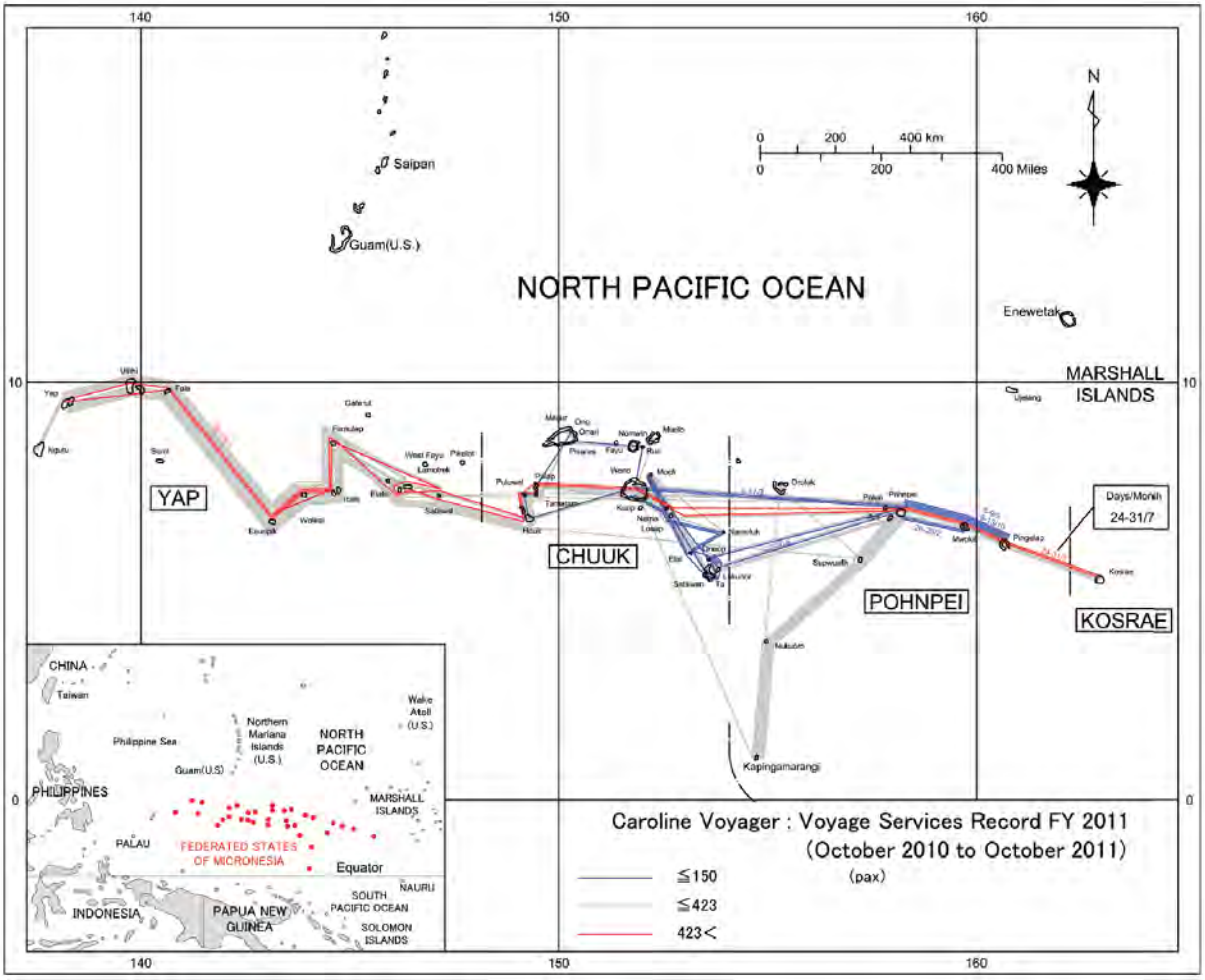


Fig. 2-1 Sailing routes of C/V (Oct. 2010 - Oct. 2011)

As such, C/V called at the state capitals and outer islands of four states, in total 16 voyages from October 2010 to October 2011. A voyage called at a number of islands, boarding and off-boarding passengers as well as loading and off-loading cargos.

Shown below is the graph of number of passengers and cargos on board C/V in one section of navigation. The graph shows maximum number of passengers 573 persons (about 3.8 times the licensed passenger capacity of 150 persons) and maximum cargo volume of 223 tons (one fourth of C/V's deadweight tonnage of 870 tons).

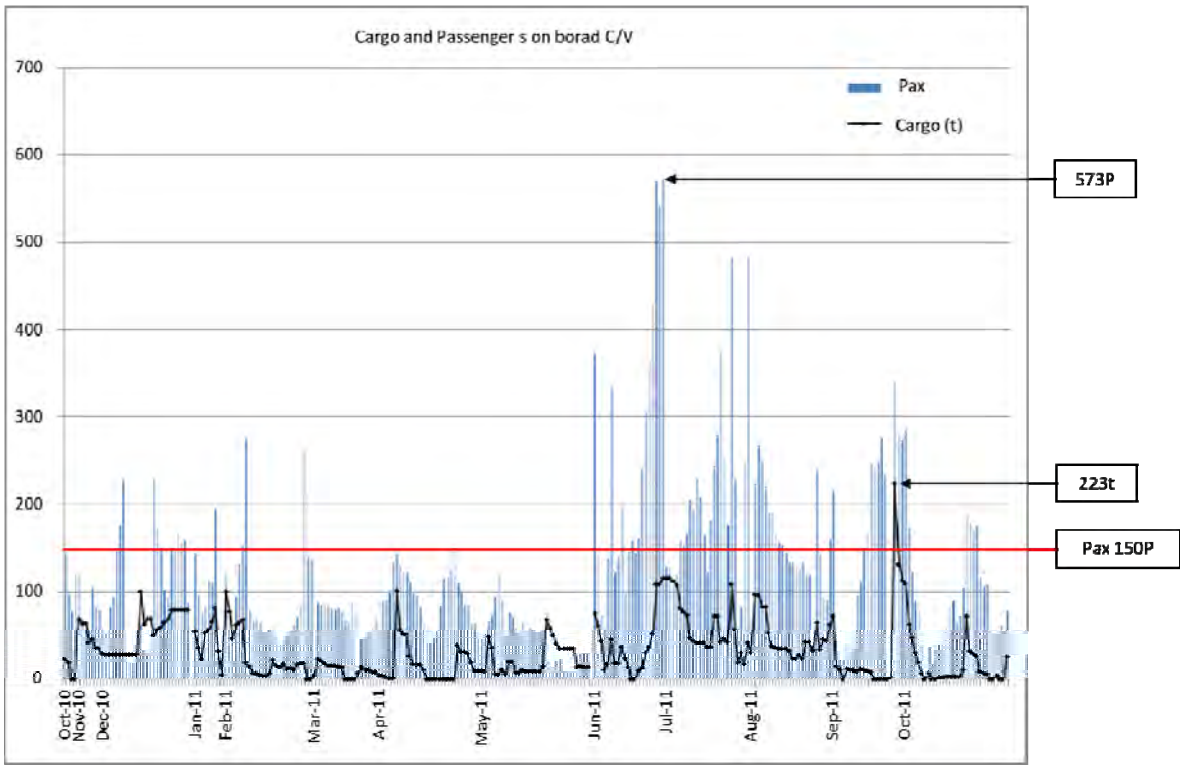


Fig. 2-2 Cargo and passenger on board C/V (Oct. 2010 ~ Oct.2011)

(2) Passenger capacity

Passenger capacity of the Plan vessel will be determined to eliminate the current over-loaded situation of passengers.

Shown below is the summary of passenger transport record of C/V from Oct. 2010 to Oct. 2011.

Table 2-1 Passenger transport record of C/V (Oct. 2010 ~ Oct. 2011)

	Voyage (pax)	1	2	3	4	5	6	7	8	9
A	≦150	2010 08/10-12/10 Pingelap	2011 26/2-27/2 Mwokil	2011 7/3-15/3 Weno	2011 22/5-30/5 Weno	2011 6/9-8/9 Pingelap				
B	≦423	2010 23/11-20/12 Yap	2011 12/1-22/1 Kapingamarangi	2011 1/2-8/2 Kosrae	2011 16/2-23/2 Weno	2011 27/3-5/5 Yap	2011 7/6-13/6 Kapingamarangi	2011 9/8-21/8 Weno	2011 26/8-1/9 Kapingamarangi	2011 13/9-25/10 Yap
C	423<	2011 16/6-17/7 Yap	2011 24/7-30/7 Kosrae							

C/V conducted 16 voyages in the year, among which 5 voyages are with passengers of 150 (C/V's licensed number of pax) or below, 9 voyages are with passengers up to 423, and 2 voyages with passengers over 423 persons.

The maximum number of passengers on board in the year was 573 persons. In order to eliminate the current overloaded situation, the passenger capacity of the Plan vessel will be deliberated based on this recorded maximum number of passengers. Considering that such peak number of passengers will be matched jointly by the Plan vessel and C/V during the such short peak time periods, C/V carries 150 passengers (licensed capacity of C/V) and the Plan vessel carries 423 passengers, thus 573 passengers in total. Further, considering boarding of senior officials of the Government, ambulance duty for transport of patient, etc., a state room and a treatment room will be added. Number of crew on board should be 28, same

as crewing scale of C/V. Thus the Plan vessel's total complement capacity will be 453 persons (423 pax + 2 + 28 crew).

From the table 2-2, it is considered reasonable for C/V and the Plan vessel to operate as follows:

- Two sailing routes where the passenger demand may exceeds passenger capacity of the Plan vessel(423 persons), C/V and the Plan vessel operate jointly to match large passenger demands;
- In the sailing routes where passenger demand may be below the capacity of C/V(150 persons), C/V alone can accommodate them;
- In the sailing routes where passenger demand may be over the capacity of C/V(150 persons) but below that of the Plan vessel(423 persons), the Plan vessel will operate, but such voyages may be eleven times in a year which may be a little burden for the Plan vessel; therefore,
- Short distance sailing routes may have to be undertaken by C/V by sailing two times. Then the number of voyages will be ten times by the Plan vessel and nine times by C/V, which is considered reasonable, warranting two vessels reasonable allowance time for crew rest and maintenance operation in the home port.

Population of FSM is slightly decreasing but in future when potential passenger demand is to be included, such greater demand will be met by additional voyage by two vessels provided by China.

(3) Cargo capacity

Cargo transport on board C/V is currently within a small range. If this cargo volume situation continues, demand of cargo transport on the Plan vessel is deemed not be so heavy. However, considering possible changes in the life of the Plan vessel say 25 years and considering responsibility of DOTCI for meeting the future demand, capacity of the cargo hold shall duly remain same as M/G and Micro class vessels [3], i.e. 700 m^3.

(4) Fresh water and fuel oil tank capacity

Capacity of the fresh water tank will be 160 m^3, equivalent to that of C/V, considering big number of passengers on board and possibility of supplying water to the islands affirmed by DOTCI.

Fuel oil tank of the Plan vessel will be 160 m^3, equivalent to that of C/V, considering supply of diesels to the islands and procurement of diesels in the foreign ports where diesel price is low e.g. in Japan for dry-docking.

(5) Scale of the Plan vessel

Studying the Plan vessel design to satisfy abovementioned transport capacity, main features of the Plan vessel are judged as appropriate as shown on the table 2-2.

[3] Five cargo passenger type vessels grant aided by Japan on 1976 ~ 78 and working until 2002 ~ 2005.

Table 2-2 Scale of the Plan vessel in comparison with M/G and C/V

		M/G	C/V	Plan vessel
Length overall		56.40 m	57.50 m	59.00 m
Breadth, molded		10.10 m	11.00 m	10.80 m
Depth, molded		4.60 m	7.00 m	4.60 m
Design draft		3.60 m	3.95 m	3.50 m
Maximum draft		-	-	3.60 m
Gross tonnage		789 t	1,335 t	920 t
Main engine output		335 kW x 2	735 kW x 2	368 kW x 2
Service speed		10.0 knot	10.5 knot	10.5 knot
Complement	Pax	139	150	425
	Crew	27	28	28
	Total	166	178	453
Cargo hold capacity		690 m^3	1,200 m^3	700 m^3

2-2-1-3 Rules to apply and Classification Society

(1) Maritime regulations of FSM for domestic vessel

In general, safety standard of passenger vessels[4] is more stringent than that of cargo vessels. As passengers are not familiar with the safety behavior on board ships unlike seamen, besides many people are involved in case of sea accident, higher safety standard at vessels' side is required. For passenger vessels and cargo vessels engaging on international services, SOLAS[5] regulations adopted by IMO[6] are imposed, while safety standard for domestic service vessel depends on national regulations.

On board the FSM vessels many passengers are sitting on the exposed deck area, which is common in many South Pacific Countries, but such way of carrying passengers on board is not allowed in the safety regulations of major shipping countries.

In the South Pacific, SPC[7] supported by the IMO has adopted Safety Regulations for Non-Convention Vessels (SRNCV) 2002, which is the text of safety standard common for the South Pacific countries. The SRNCV introduced the "cargo-passenger vessel" category in addition to the "cargo vessel" and "passenger vessel" categories, considering actual status of passenger transport in the South Pacific.

It is found that SRNCV is of safety standard, systematic in various areas, i.e. construction, stability, fire safety, lifesaving, safety radio, etc., appropriate for the Project.

4 Merchant vessel comprises cargo vessel and passenger vessel. Merchant vessels carrying more than 12 passengers fall under passenger vessel category. Vessels carrying cargoes and passengers fall under passenger vessel category.

5 SOLAS (Safety of Life at Sea): An international convention rule adopted by IMO dealing with vessel safety measures. Without SOLAS certificate, no vessel can call foreign port for trading purpose.

6 IMO (International Maritime Organization): An organization under UN, to deal with maritime safety matters and marine environment matters, etc.

7 SPC (South Pacific Commission): An regional organization formed by the South Pacific countries, dealing with economy and technical development of the South Pacific. Its maritime unit had been working to establish SRNCV.

As of January 2013, status of FSM to ratify international maritime conventions is limited only to STCW and SUA and major convention such as SOLAS and MARPOL are not yet ratified. The Plan vessel, as the vessel grant aided by the Government of Japan, must be designed and constructed complying with a recognized safety standard.

As the recognized safety standard, there are two options, i.e. Japanese maritime regulations and South Pacific SRNCV. The former, basing on severe winter seas, is very stringent to passenger vessels and found not appropriate to the FSM domestic vessels, i.e. ship design like Micro class vessels[8] is not viable (small subdivided watertight compartments to withstand collision and flooding, and inboard passenger spaces for all overnight passengers, etc.). Therefore it is considered practicable to design and build the Plan as a "cargo passenger vessel" applying SRNCV which is recognized by IMO.

In this Preparatory survey, application of SRNCV for the Plan vessel has been confirmed by the FSM Government and recorded in the Memorandum.

(2) Classification Society

New vessels must be inspected by the inspector of the flag Administration during construction. For vessels constructed abroad, the flag Administration may entrust the inspection to classification society as a third party authority. When vessel has completed, a classification certificate will be issued by the classification society. The flag Administration will confirm the classification certificate, accept registry in the flag state and issue a certificate of nationality.

Major shipping countries have their classification societies, i.e. NK classification in Japan, American Bureau classification in USA. C/V is classed in NK and DOTCI maintains favorable relation with NK, and thereby in this Project, NK classification has been accepted and confirmed by DOTCI.

2-2-1-4 Improvement based on feedback from existing vessels

(1) Feedback from survey of existing FSM vessels

The survey team surveyed M/G and C/V and found following points to be improved. Countermeasures will be taken in the design and construction of the Plan vessel.

Table 2-3 Feedback from survey of existing FSM vessels

No.	Problems on the existing vessels	Countermeasures on the Plan vessel
1	On board M/G the steering gear is placed below the waterline. Leakage of water from the rudder shaft makes floor of the steering gear room always with standing seawater.	The Plan vessel's steering gear flat is placed above the waterline.

[8] Five vessels grant aided by Japan to FSM on 1976 ~ 1978, and working until 2002 ~ 2005.

No.	Problems on the existing vessels	Countermeasures on the Plan vessel
2	Due to disengagement of other vessels, C/V is obliged to repeat dangerous operation carrying excessive number of passengers, sometimes over 500 persons, where the licensed capacity is only 150 persons.	The passenger capacity of the Plan vessel will be determined based on the peak number of passengers on board C/V, and based on the joint operation with C/V to match peak demands.
3	Diesel generators of C/V and M/G are of such insufficient capacity that one generator set cannot bear all electric loads but two generators must run always in parallel thereby no sufficient time for servicing.	Each of two diesel generators will be of capacity to bear all electric loads, leaving one generator always in standby allowing servicing.
4	C/V has not fuel oil purifier and thereby main engine filter has to be hanged frequently. In FSM where fuel oil contains a lot of sludge, fuel oil purifier is necessary on board.	To install a fuel oil purifier.
5	Cargo hatch-covers of C/V are of hydraulically operated type. Once hydraulic system became out of order, cargo operation became impossible. Maintenance of the hydraulic system is not simple, and partial opening is not practicable.	To adopt cargo hatch-covers, same type as M/G, using wooden board and waterproof tarpaulin, which is easy in maintenance and partial opening is possible.
6	Stability of M/G was not good and inclination was sometimes excessive.	Ship's breadth will be widened from 10.00m to 10.80m, and the center of gravity will be down by positioning height of deck houses from 2.60 m to 2.30m.
7	Shipside overboard discharge valves of C/V are fitted below the waterline, not allowing maintenance of the valves except in the dock.	Shipside overboard discharge valves are generally fitted above the light waterline.
8	Refrigerant of the air-conditioner and refrigeration compressors are Freon type of which availability is limited. Besides, lack of tools makes servicing difficult in the FSM.	Non-Freon type refrigerant readily available in the market will be applied. Tools necessary for maintenance and spare charges will be supplied under the Project.
9	Passages to/from the treatment room are so narrow in the existing vessels which make passage of stretcher difficult.	The treatment room will be placed close to the upperdeck entrance door to facilitate passage of stretcher easy.
10	Sling rope lifting operation of workboat has a risk of boat sliding and dropping.	The workboats with lifting eyes for lifting hook diminish the risk of sliding.
11	C/V has no dry provision store on board which makes foods place inside the mess room and the refrigerated food chamber is located inconveniently far from the galley.	The dry provision store and the refrigerated provision chamber will be placed adjacent to the galley.

No.	Problems on the existing vessels	Countermeasures on the Plan vessel
12	FSM vessels sail the unsheltered ocean, where ship experiences severe rolling and passengers may suffer from sea sickness.	Roll stabilizing system will be installed.
13	When many passengers are on board, fresh water on board C/V is devoured quickly by heavy consumption with showers.	Desalination water maker will be installed and shower head will be of water saving type.
14	Anti-corrosive paint of the outside shell and material of steel pipes in the engine room for the C/V are of conventional specifications, which are common specifications for Japanese coastal vessels that have easy access to servicing and repairing in Japan.	Higher grade specifications will be adopted considering FSM where servicing and repair is not readily available. Epoxy paint will be adopted as the outside shell anti-corrosive paint, which is durable and credible in the anti-corrosiveness. Inside of the seawater pipes in the engine room will be of steel pipe lined with polyethylene for rust-free.
15	Engine room of C/V has partially single bottom area, where bilge water stands and quickly corroded locally by a dropped metal, e.g. bolt, nut or tool, and pierced with a hole to flooding into the engine room.	Engine room will be all double bottom construction. Routine maintenance and countermeasure against corrosion will be instructed in the PMP.
16	C/V, built originally as a cargo vessel with passenger capacity of 12 persons only[9] and later converted to 150 passenger capacity, has toilets insufficient in number of passengers and not separated for men and women.	Toilets of suitable number, separated for men and women, will be arranged near the passenger area.

(2) Feedback from interview with passengers

Table 2-4 Interview with passengers

No.	Comments by interviewees	Countermeasures on the Plan vessel
1.	Passenger space is very narrow	As C/V had been originally designed with passenger capacity of 12 persons and later licensed to 150 passengers. Passenger areas for 500 persons on board are quite limited. The Plan vessel will have adequate passenger area corresponding to the passenger capacity.
2.	Insufficient number of toilets	Adequate number of toilets will be arranged on board the Plan vessel, in line with the number of toilets on board passenger for a commercial air plane.

[9] A cargo vessel which has passenger capacity up to 12 persons falls under the category of “cargo vessel”. Vessel which carries more than 12 passengers shall fall under the category of “ passenger vessel”.

No.	Comments by interviewees	Countermeasures on the Plan vessel
3.	Suffering from sea sickness	Roll stabilizing system will be fitted to reduce rolling motion.
4.	Insufficient number of showers	Subject to rigid control of the fresh water consumption, greater number of showers than C/V will be installed.

2-2-1-5 Maintenance of FSM vessels

FSM is situated far from industrial countries and access to spare parts and manufacture's services are not readily available. Once importance machinery should fail, the ship is obliged to stop operating. Therefore, among others daily and planned maintenance is important for stable and reliable operation of the Plan vessel.

It is strongly recommended for the Plan vessel to adopt PMP (Preventive Maintenance Policy) for establishing daily and periodical maintenance system. PMP calls for overhauling and reconditioning regularly in exchanging working parts with conditioned parts stored. The PMP parts are those parts to be used for the regular overhauling regardless of the condition of machinery (i.e. whether it is in order or out of order) at a planning time intervals according to the PMP program. Working parts will be removed from the machinery and replaced with stowed spare parts. The removed parts shall be cleaned, reconditioned and stowed in the workshop shelf. In the next maintenance of the same part, reconditioned and stowed parts will be used and same work will be repeated. This procedure requires initial investment to procure a set of spare parts, but reduces breakdown due to wear and tear and elongates life of parts. PMP program will be prepared and recommended by the Consultant.

FSM vessel's crew and workshop are conceived to be competent sufficient to conduct the PMP.

Under the PMP, a set of spare parts to be used as the recycling parts for periodical maintenance will be supplied under the Project.

On board the Plan vessel, suitable parts store will be provided. The FSM side is required to prepare suitable stowage ashore for stowing large spare parts unsuitable to be kept on board. The shore stow should be of size suitable to stow the Plan vessel's parts as well as C/V's.

On top of adopting PMP, consideration shall also be paid for the material and equipment of the Plan vessel being of durable and maintenance friendly, e.g. plastic coated steel pipes for seawater use.

It is strongly recommended that the PMP should apply on C/V in addition to the Plan vessel for effecting better management of the overall FSM fleet. (For PMP on C/V refer to 2.3.3.)

2-2-1-6 Transportation from Japan to FSM

The Plan vessel will be built in Japan, inspected by a classification society, registered in FSM flag provisionally, and sail from Japan to the homeport Pohnpei, FSM by her own propulsion.

Transportation will be all undertaken by the shipbuilding contractor including crewing, fuel, foods, and insurance.

All vessels sailing in the high seas must raise the flag and keep the certificate of nationality. The Plan vessel, even before final delivery in Pohnpei, must be registered in FSM after the completion of the construction

and before sailing.

From Japan to Pohnpei, the Plan vessel will run about 2,200 nautical miles (about 4,100 km) taking about nine days. Capacity of the fuel oil tank is 160 kL, sufficient for fuel oil consumption of about 5 kL per day direct to Pohnpei without refueling on the way.

On board the Plan vessel to Pohnpei, FSM crews who have been dispatched to the shipyard for familiarization training will board to continue training.

2-2-1-7 Country of origin

FSM has no infrastructure of shipbuilding industry thereby no option to procure machinery or equipment in FSM. Further, all onboard machinery and equipment are available in Japan thereby no option to procure machinery or equipment from third countries.

2-2-2 Basic Plan

2-2-2-1 Main particulars of the Plan vessel

Main particulars of the Plan vessel are as follows.

Table 2-5 Main particulars of the Plan vessel

		M/G	Request by FSM	Plan vessel
Length overall		56.40 m	56.00 m	59.00 m
Breadth, molded		10.10 m	10.80 m	10.80 m
Depth, molded		4.60 m	5.40 m	4.60 m
Design draft, molded		3.60 m	4.00 m	3.50 m
Max. draft, molded		-	-	3.60 m
Gross tonnage		789 t	1,090 t	920 t
Main engine output		335 kW x 2	735 kW x 2	368 kW x 2
Speed		10.0 kt	11.5 kt	10.5 kt
Complement	Pax	139	173	425
	Crew	28	44	28
	Total	166	217	453
Cargo hold capacity		690 m^3	410 m^3	700 m^3

2-2-2-2 Vessel design policy

(1) Gross tonnage

Gross tonnage of the Plan vessel, according to the international tonnage measurement system as adopted by the FSM maritime law, will be about 920 tons, which is measured after establishing the design with larger accommodation space for larger number of passengers, larger fresh water and fuel oil tanks, etc.

The consultant team designs the Plan vessel having in mind that the gross tonnage would not be as large as

influencing operation cost.

(2) Speed and main engine

Design of the Plan vessel is made for the sea speed of 10.5 knots, equivalent to that of C/V, to allow optimum planning of inter-island services jointly operated with C/V.

The main engine horsepower is determined aiming at low fuel oil consumption, adopting optimum hull shape and propulsion system of low-revolution large-diameter

(3) Passenger accommodation

Passenger accommodation with all passengers staying in cabins makes the vessel large and costly for building and maintenance. Therefore, similar to the Micro class vessels and C/V, passenger accommodation is prepared mainly for deck passengers and cabins for limited number of passengers. Through discussions with DOTCI, eight passenger cabins with two bunks have been decided.

A treatment room as the sick bay for patient transport ambulance duty from outer island, as same as the existing vessels, is provided. The treatment room will be placed near the entrance door of the upper deck so that passage of stretcher is easy. Lavatory fitted with water closet and shower for washing wound, is attached to the room.

An owner's state room for VIP passenger is also provided as same as the existing vessels.

For deck passengers, number of toilets is considerably increased than the existing vessels, suitable for number of passengers. Several showers are also fitted. A canteen is arranged in the deck passenger area to provide simple foods and drinks to passengers. Deck passenger areas are paved with artificial timber, and fitted with overhead rails for hanging hammock brought by passengers.

(4) Roll damping control

The Plan vessel sails in the open sea where swells are often high and severe ship rolling makes passengers suffering from severe seasickness. Ship rolling is often as high as 30 degrees to either side. Sea sickness is always a problem for passengers traveling on board ship.

In response to the strong request from the FSM side to ease severe rolling, it is decided to install "rudder roll stabilizing system" for the Plan vessel.

The system does not occupy large space for the device and the price is reasonable. Heading input for the stabilizer use heading data of the satellite GPS compass, this is of less risk of failure than the gyro compass.

(5) Crew accommodation

Discussing with DOTCI and considering current crewing of C/V, 28 crew complement is decided. Female crew and boarding of trainee are not considered. When female crews be employed in future, passenger cabin would be assigned for them. Based on discussing with DOTCI, the mess room and the galley are arranged larger than C/V but crew cabins are arranged a little smaller.

(6) Cargo holds, etc.

A Micro class vessel, a model vessel for the Plan vessel, has cargo hold of total 690 m3 (main cargo holds). Considering DOTCI's view that the cargo holds should have a capacity equivalent to the main cargo holds of the Micro class vessel considering future increase in cargo demand, the Plan vessel has about 700 m3 cargo hold capacity. The maximum loaded cargo of C/V during 2011 was only 223 ton, but same as cargo

hold capacity, the Plan vessel's deadweight is designed 690 ton equivalent to Micro class vessel.
Small reefer cargo hold is added on board the Plan vessel to allow stowage of reefer cargoes.
On board the C/V, the refrigerated provision store is inconveniently located far from the galley and no dry provision store is arranged. On board the Plan vessel, the refrigerated provision store and the dry provision store are arranged conveniently next to the galley.
In the forward of the No.1 cargo hatch, wide space for stowage of fuel oil drums is arranged and deck fittings for lashing drums are provided. In that place provisions are made to allow fitting of timber pound boards separating the area into sections for carriage of livestock such as pigs. C/V carries many livestock sometimes, but after the Plan vessel comes into service the situation of livestock stowage on board will be improved as two vessels can share livestock transport.
Cargo hatch-covers of C/V are hydraulically operated type. The FSM side considers C/V type cargo hatch-cover is not suitable for the Plan vessel from the facts that once malfunction occurs on hydraulic cylinder or other mechanical part, cargo operation becomes impossible, it takes time for procuring of spare parts, it is indispensable of regular maintenance, the hydraulic pipeline connection is complicated, etc., thus concludes that conventional cargo hatch-covers using tarpaulin (canvas cover) shall be applied. Tarpaulin type hatch-covers can be opened partially convenient for stowing small cargoes and easy to maintain.
Over the cargo hatchways are retractable canvas tent awnings like C/V to protect cargo from direct sunlight. Luggage of passengers, chickens in basket, etc. can be stowed in better conditions.

(7) Cargo gear

The cargo gear for lifting cargo and workboat must be installed. Alternative of cargo gear are the jib crane type and the derrick boom type. The Plan vessel adopts the derrick boom type gear, which is better in cargo hook movement in the swell sea and the crew are familiar with it.

(8) Workboat

Outer islands where accessible through the lagoon for the Plan vessel are limited. In many outer islands, vessels must stay offshore, where swells may be high, a small boat runs between the vessel and shore carrying passengers and cargo. FSM has been so far using different type of workboats on board the Micro class vessels and C/V. DOTCI recognizes that the workboat which at first delivered for C/V was the best, thereby two workboats of the same favorite type are supplied for the Plan vessel.

(9) Maneuverability

In the sailing routes of the Plan vessel, there are narrow/shallow passages. Good maneuverability is necessary for the Plan vessel to navigate in such narrow/shallow passages especially under strong winds. The Plan vessel is configured twin propeller and twin rudder, by which the Plan vessel have favorable maneuverability. Course keeping characteristic is also important for the safe operation, to which hull shape and design of rudder are determined carefully.

(10) Navigation equipment

The Plan vessel is fitted with navigation equipment (compass, radar, GPS, echo sounder, etc.) in accordance with the SRNCV standard. As the life of spinning gyro compass being short, the static GPS compass is additionally installed as a backup. S-band radar is also installed in addition to the ordinary X-band radar set,

to cope with heavy rain which sometimes occurs in the sailing routes of FSM vessels.

(11) Radio apparatus

Vessel must have safety radio apparatus on board, e.g. VHF, MF/HF, satellite communication, as required by GMDSS (Global Maritime Distress and Safety System) and also by SRNCV, and those radios are utilized for daily use. As some area of the sailing routes of the Plan vessel are far from MF radio coverage (150 sea miles), the sea area of the Plan vessel is in the category A-3 according to GMDSS, and necessary radio apparatus based on A-3 are installed. Satellite communication system is INMARSAT C. NAVTEX is not installed as NAVTEX broadcasting is not available in the sailing area, which has been agreed on by DOTCI.

(12) Generator

Two identical generator sets of such suitable capacity as not causing blackout leading to the dead ship situation will be installed. However, considering the risk of confusion on many passengers in case of the blackout, the emergency generator is installed in the outside of the engine room. The electric load on generators of C/V is very high due to the large electric motors for the hydraulic system and others, and thereby electric generators must be frequently run in parallel so that generator could not be well maintained. In the Plan vessel, the electric system on board is allowing one generator normally taking the load and the other generator is in standby.

(13) Countermeasures against corrosion

Ageing of vessels come mainly from: in the hull part, the corrosion wear of the steel structure and in the machinery part the wearing of diesel engine. Wearing of the diesel engine may be recovered by changing engine parts or changing a whole engine, but the hull which had been corroded extensively may have to be given up.

As such, the definitive life of vessels depends on the life of hull corrosion. The hull corrosion is the electrolysis action of steel in seawater, which can be considerably controlled by the vessel design, anti-corrosion equipment and crew maintenance.

1） Zinc anode plates on outside shell

The steel in contact with seawater corrodes and wears, but zinc or aluminum placed near the steel material corrode and wear first and steel does not corrode. Zinc anode plates fitted on the outside shell protect the steel hull from corrosion. Outside shell of C/V has been well protected to a good condition by the zinc anode plates, which had been replaced with new ones at every dry-docking. The zinc anode plates to be fitted must be of size and number corresponding to the period of time to the next dry-docking.

2） Zinc anode plates in ballast water tanks

Same as the outside shell, the steel structure inside the ballast seawater tanks are subject to seawater corrosion. There are cases of corrosion hole from inside the ballast water tanks. Zinc anode plates are not always fitted in the ballast water tanks just relying on the paint coating inside the tank, but in the Plan vessel, zinc anodes are fitted in the ballast water tanks.

3）Engine room bottom

There are leakage of seawater from the water seals of the stern tube and the seawater pump, and leaked seawater bilge may stand in the engine room bottom. If such metal as bolt, nut or tool had dropped onto the engine room bottom, the steel hull and the dropped metal in the seawater start local electrolysis action and the steel bottom plate can corrode down in conical shape. When the engine room bottom is single bottom construction, such corrosion can result in piercing a hole, flooding and finally sinking. C/V has a single bottom area in the engine room where seawater bilge had been standing and corrosion had been found sometimes. Small scale flooding had been occurred ever. In the Plan vessel, the engine room will be all double bottom construction eliminating dangerous single bottom construction. Bilge water will all be led to the bile wells, which are easy to clean.

4）Routine maintenance

In the engine room, the bottom must be cleaned discharging bilge water (through the oily water separator for not to discharge oily water to the outside) and removing rubbish as a part of the routine work of the engine crew. In the exposed deck part, de-rusting and touch-up of anticorrosive must be a part of the routine work of the deck crew.

2-2-2-3 PMP spare parts for C/V

C/V was grant aided from Japan on 1998, and now undertaking almost all sea transport in FSM. The Plan vessel intends to serve jointly with C/V, and thereby C/V must continue working long years after the Plan vessel comes into service. On 2012, JICA Follow-Up project was carried out to rehabilitate the condition of C/V, who had been working hard for 15 years and main engines and other machinery were reconditioned. For C/V's longer operation together with the Plan vessel, however, it is necessary to support maintenance of C/V so strongly as to elongate useful life of C/V, and thereby comes to conclusion to apply the PMP for C/V similar to the PMP of the Plan vessel.

DOTCI sharing the idea with the Survey Team, has requested supply of the spare parts for C/V under the Project and submitted a list of spare parts as shown on the Appendix-2.

To study adequacy and necessity of the FSM request, the Consultant Team collected information on the conditions of C/V from the dockyard, who has been undertaking dry-dock and repair work of C/V regularly, and following information were obtained.

- C/V has been working so hard without a break as not afford to have a spare time for diesel engine maintenance of medium scale which should be conducted every 5,000 hours of engine running, and thereby such medium scale maintenance of main and auxiliary diesel engines, which were not usually conducted in the dry-dock, had to be completed during the dry-dock. (Operation of C/V is about 4,700 hours per annum.)
- Length of dock period allowed for C/V was limited due to the tight operation schedule in FSM, and thereby works in the dock had to be limited. Works in the engine room were almost for overhauling of main and auxiliary diesels.
- Due to limited period and budget, works originally planned at FSM side could not be all done, and

works were limited to indispensable items leaving many working items not dealt with.

After the Plan vessel will come into service, C/V will become free from severe working schedule, thereby allowing time for maintenance. The C/V crew have the technical level and morale sufficient to conduct PMP, but FSM may be difficult to establish PMP only by themselves due to difficulty in purchasing necessary set of the spare parts. It will solve the constraint if PMP spare parts and program are prepared by the Project. Medium scale overhaul and maintenance will be conducted in FSM, thus reducing work load of the main and auxiliary diesels in the dock, which allows servicing of other machinery and system. Direct benefit of the PMP will be stable operation and long life of the vessel, but in the C/V case, there will be consequential benefit, i.e. wide range of the works in the dock which could not take care of will be practicable.
As above it is strongly recommended that PMP must be established in order to prevent ageing of C/V so that two vessels can jointly operate for longer time in the FSM shipping services.

Establishment of the PMP on C/V will be planned on the following policy.

- PMP spare parts should be determined considering the current condition of C/V and repairs in the past.
- Spare parts which were procured by the JICA follow-Up project on 2012 and are still kept by FSM will be utilized.
- Overhauling of the main engines, consisting of identical two sets, should be conducted every two years for one set, i.e. two main engines will complete overhauling at every two years. Same system applies the auxiliary diesels.

According to the above policy, PMP spare parts for the main and diesel auxiliaries are listed as follows.

(1) For the main engines

- Cylinder head assembly x 4 (2 of 6 cylinders had been supplied in 2012)
- Suction valve, exhaust valve and valve seat x 12
- Fuel oil injection pump x 4 (2 already supplied in 2012)
- Fuel oil injection nozzle x 24
- Cooling fresh water pump x 2
- Piston ring x 12
- Remote control valves, packing necessary for overhauling work, anticorrosive chemical, etc.

(2) For the generator engines

- Cylinder head assembly x 2
- Suction valve, exhaust valve and valve seat x 6
- Fuel oil injection pump set x 1
- Fuel oil injection nozzle x 24
- Cooling fresh water pump x 2
- Cylinder liner x 12
- Fresh water cooler and lube oil cooler x 1

- Air motor x 2
- Packing necessary for overhauling work, anticorrosive chemical, filter element, etc.

(3) Air compressor

- Suction and exhaust valve x 8
- Packing necessary for overhauling work, etc.

(4) Reduction gear

- Repair kit x 2
- Packing necessary for overhauling work, etc.

2-2-2-4 Specifications of the Plan vessel

Table 2-6 Specifications of the Plan vessel

Item		Specifications
1) Principal particulars		
Type of the vessel		Cargo passenger vessel
Service area		Domestic water of the FSM
Cargoes		General cargoes
Flag		Federated States of Micronesia
Classification		Nippon Kaiji Kyokai (NK)
Rules to apply		Maritime rules of the FSM
		Safety Regulations for Non-Convention Vessels (SRNCV)
		International Convention on Tonnage Measurement of Ships (TM69)
		International Convention on Load Line (ICLL)
		International Convention for the Prevention of Collisions at Sea (COLREG)
		International Convention for the Prevention of Pollution from Ships (MARPOL)
		Rules of the Classification Society
Length overall		59.00 m
Length bp		53.00 m
Breadth, molded		10.80 m
Depth, molded		4.60 m
Service draft		3.50 m
Scantling draft		3.60 m
Gross tonnage, international		About 920 tons
Deadweight (scantling)		About 690 t (metric)
Loaded speed		About 10.5 knots at service draft
Main engine		368 kW (500 ps) x 2
Complement		453 p total
Pax	Indoor pax (1st)	4 p

Item			Specifications
		Indoor pax (2nd)	8 p
		Indoor pax (4 p)	4 p
		Treatment room	1 p
		Owner	1 p
		Outdoor passengers	407 p
		Total pax	425
	Crew		28 p
	Total complement		453 p
	Tank Capacity		
	Fuel oil tank		About 160 m^3
	Fresh water tank		About 160 m^3
	Water ballast tank		About 160 m^3
	Cargo hold		About 700 m^3
	Reefer cargo hold		-25^oC 12 m^3
2) Accommodation			
	1st class pax		Two bunk x 1
	2nd class pax		Two bunk x 1
	4 persons pax cabin		Two bunk x 2
	Outdoor passenger space		Nos. pax: 407 p Area : 1 m^2 / person Deck: Artificial timber grating Shipside: Plastic plated up to handrail height and roll-up canvas above
	Senior officer cabin		Single bunk, with toilet facility
	Junior officer cabin		Single bunk
	Crew cabin		Double bunk
	Owner room		Single bunk, with toilet facility
	Treatment room		Single bunk, with toilet facility
	Crew mess room		Mess table for 21 crew
	Passenger mess room		Mess table for 10 passenger
	Galley equipment		1 x Electric cooking range(3 x hot plate @4 kW) 1 x Hot water boiler (10lit, 1 kW) 1 x Fridge (about 450 lit) 1 x Microwave 1 x Rice cooker (3.6 lit) 1 x Ice cube machine (20 kg /day) x 1 Furniture, e.g. sink, shelves, storage complete
	Canteen equipment		1 x Hot water boiler (10lit, 1 kW) 1 x Microwave

Item		Specifications
		2 x Fridge (Low counter type) 2 x Chilled water fountain (outside) Furniture, e.g. wash basin, shelves, storage, etc
	Washing equipment	2 x Washing machine, about 6 kg 2 x Dryer
	Crew toilet	Private toilet: (WC + shower) x 2 Common toilet: WC x 4, shower x 4
	Pax toilet	Common toilet: WC x 22, shower x 8 Owner's room toilet: (WC + shower) x 1 Treatment room toilet: (WC + shower) x 1
	Ref Prov. Store	$8m^3$:-25℃, $8m^3$:+3℃ Ref. compressor Hermetically sealed type 100% x 1 Spare compressor x 1 Maintenance Kit*: Vacuum Pump x 1, Portable Leak Detector x 1, Manifold Kit x 1 (*: Common use for A/C, Ref. cargo hold and Ref. Prov)
	Dry Prov. Store	$8m^3$
	Structural fire protection	According to the SRNCV regulations
	Sewage handling	Direct discharge and holding tank Discharging pump: Cutter type 6 m3/h x 8m x 2 Holding tank capacity: 14m3 x 1
3) Dry cargo hold		
	Number of cargo hold	2
	Cargo hatchway	7.15 mL x 6.0 mW x 1 6.05 mL x 6.0 mW x1 Hatch cover: Steel hatch beams + timber hatch boards + tarpaulin (2) + battens and wedges
	Cargo hold lining	Tanktop: None Shipside: 30mmT timber sparring Transverse bulkhead: none
	Double bottom tanktop strength	Axle load: not specified Area load: per Rule load
	Cargo lashing	Inside cargo hold: none Upper deck: D-rings in the area in front of No.1 hatch and eye plates on steel bulwark
	Cargo protection awning	Canvas awning for No.1&No.2 cargo hatch

Item		Specifications
	Ventilation	Natural supply from No.1 hold fore > mechanical exhaust from No.1 hold aft Natural supply from No.2 hold aft > mechanical exhaust from No.2 hold fore
4)	Refrigerated cargo hold	
	Refrigerated cargo hold	$12m^3$ x 1
	Refrigeration plant	100% x 1 Spare compressor x 1
5)	Workboat	
	Two workboats shall be provided under the Project, one common use rescue/work boat dealt with as a part of safety equipment and included in the Plan vessel, and the other boat being dealt with as the "Equipment" shown in the Table 2.8 "Specification of the Equipment" procured apart from the Plan vessel.	
6)	Fuel oil and fresh water supply system	
	Diesel oil supply	Filling Station: Aft of No.2 hatch Diesel oil supply pump: Centrifugal $15m^3/h$ x 1 in engine room Delivery pipe bore: 65A
	Fresh water supply	To be supplied by the engine room general service pump Delivery pipe bore: 40A
7)	Deck machinery	
	Windlass	Hydraulic driven x 1 Chain wheel: 42kN x 9m/min x 2 Hawser drum: 25kN x 15m/min x 2 (rope capacity each 30mmϕ x 140m) Warping drum x 2 Local control
	Anchor	Stockless high holding type 855kg x 2 + 1(spare) (equipment number 360 - 400)
	Anchor chain	φ30 ㎜ grade U2 14 shackle length (385m) x 1
	Towing rope	φ24 ㎜ x 180m x 1 SWR (6 x 24)
	Rule mooring rope	φ32 ㎜ x 140m x 4 polypropylene class-2
	Working mooring rope	φ50 ㎜ x 50m x 4 nylon
	Mooring Capstan	Hydraulic driven x 1 Duty: 25kN x 15m/min Local control
	Cargo derrick	SWL3/(u)2t x 2 gangs with derrick boom x 4 Cargo winch: Hydraulic 29.4/14.7kN x 10/20m/min x 4 Topping winch: Driven by the cargo winch

Item		Specifications
		Control on the winch platform
	Hydraulic pump unit	To supply hydraulic oil to the cargo derrick winches, the windlass and the mooring capstan. Pump unit: 100% x 2 Stainless steel pipe on deck and steel pipe inside
	Rudder	Balanced spade rudder x 2
	Steering gear	Electro hydraulic x 1 Pump unit: 100% x 2 Helm angle 35 deg to both sides
	Rudder roll stabilizer	1
	Sea boarding gangway	Aluminum accommodation ladder x 2
8) Lifesaving apparatus		
	Inflatable liferaft	SOLAS A PACK for 25p x 19
	Rescue boat	1xAbout 7.4mL x 1.8mB, FRP, with 40ps outboard (double deck type) Outboard motor: 40 HP x 2 (working) + 1 spare motor To use one of workboat as the non-SOLAS rescue boat outfitting as required by the SRNCV rule. Launching and recovery by lifting cargo derrick.
:	Lifejacket (solid type)	For all complement 453 For duty crew 4 For children 46 For workboat embarkation 20
	Life buoy	4 (1 with self-igniting light, 1 with buoyant line, 2 with self-igniting smoke signal)
	Parachute signal	4
	Red flare	4
	Smoke signal	4
9) Firefighting equipment		
	Fire hydrant	Type: 40A bore Nakajima type coupling
	Fire hose, nozzle and fire locker	Nozzle: Fog/jet dual nozzle 12mmφ Hose : 15m 40A bore
	Portable fire extinguisher	As per rule with 100% spare charges
	Emergency fire pump	E.motor driven 25m^3/h x 1x 1 in the sewage tank room
	Firefighter's outfit	1 set (breathing apparatus, fire cloths, safety belt, de-smoke helmet, de-smoke mask, safety lamp and fire axe)
10) Ventilation and natural lighting		
	Engine room vent	E. axial flow fan (supply/reversible) x 2
	Deck Store	E. axial flow fan (exhaust) x1

Item		Specifications
	Boatswain store	E. axial flow fan (exhaust) x1
	Cargo hold	E. axial flow fan (exhaust) x 2
	Steering gear room	E. axial flow fan (exhaust) x1
	Sewage tank space	E. axial flow fan (exhaust) x1
	Galley	E. axial flow fan (exhaust) x 1
	Toilet	E. pipe fan
	Air conditioning	Served area: Crew and pax cabins, wheelhouse and galley/mess room (passage and toilet are not served) Temp cond.: Outside 32 deg C/80%RH → inside 27 deg C/50%RH 70% recirculation Compressor 60% x 2
	Window	Aluminum frame
11) Engine room machinery		
	Main engine	4 stroke cycle trunk piston marine diesel engine x 2 Rated output ≥ 368 kW (500ps) Rated rev. ≤ 1,500 rpm Fuel oil Marine diesel oil Starting By air
	Reduction reversing gear	Output rev About 300 rpm Clutch Wet multi-plate
	Propeller and shafting	Propeller 4 blades solid, about 1940 mm x 1 Tailshaft Forged steel Stern tube Cast iron Water seal Mechanical lip seal Bearing Seawater lubricated EVR Rotation Outward
	Main generator	Generator 130 kVA (104 kW) x 450V x 3φ x 60Hz x 2 Fuel oil Marine diesel oil Starting By air
	Emergency generator	33kW x 450V x 3φ x 60Hz x 1
	Main air compressor	E.driven 2 sets
	Auxiliary air compressor	Diesel driven 1 set
	FO transfer pump	E. horiz. gear 2 m^3/h x 0.2 MPa x 0.75 kW x 2
	Fire/bilge/ballast/general service pump	E. horiz. centr. 35/25 m^3/h x 0.2/0.40 MPa x 7.5 kW x 2
	Fresh water pump	E. water pump 5 m^3/h x 0.16 MPa x 0.75kW x 2
	Sewage discharge pump	Cutter type 6 m3/h x 8m x 2
	Sludge discharging pump	E. horiz. screw 1.0 m^3/h x 0.39 MPa x 1.5kW x 1

Item		Specifications
	Diesel oil supply pump	E. horiz. centr. 15 m^3/h x 0.12 MPa x 1.5kW x 1
	Engine room bilge pump	E. piston 0.25 m3/h x 0.2 MPa x 1.5 kW x 1
	Oily water separator	≤ 15ppm x 1
	Fuel oil purifier	Electric x 1
	Lub. oil purifier	Electric x 1
	Fresh water sterilizer	UV type x 1
	Water maker	Reverse osmosis 5.0 t/day x 1, at 30 deg C nylon module To attach 2 sets of spare modules (Important to operate continuously without stopping)
	Flow meter	For main engine x 2 (digital reading and remote monitoring) For gensets x1 (digital reading and remote monitoring)
	Engine room tanks	Diesel oil service tank Lube oil sump tank Lube oil storage tank Sludge tank (double bottom) Wash oil tank Fresh water hydrophore tank
12) Engine monitor room		
	Installation	Main switchboard, engine monitor console, air conditioning unit
	Monitor computer	2 CPU, 2 VDU Remote monitor PC in Chief Engineer cabin
13) Engine Workshop		
	Machine tools	Lathe 0.5 mL x 0.4 kW, grinder 200 mm x 0.4 kW, drilling machine 13 mm x 0.4 kW, e.arc welding machine 250 A, gas cutting set, Chain block 0.9 t x 1, hand tools, workbench, shelves, etc.
14) Electric supply		
	Main switchboard	Deadfront Generator panel, feeder panel (AC440V and AC110V), starter panel, earth alarm Auto synchronizing and auto load sharing
	Transformer	450/115 V 15 kVA
	Charging discharging board	Place on upper deck or above, with rectifier
	Storage battery	For general use 200 AH x 2 For radio use supplied by radio maker
	Shore supply	440V 3φ 40 kVA
15) Inboard communication		
	Engine telegraph	2:2
	Common battery telephone	1 set: DC24V wheelhouse, mess rooms, engine room, engine monitor

Item		Specifications
		room captain's room, chief engineer's room and steering gear room
	Public addressor	1 set: amplifier and speakers
	General alarm	1 set
	Alarm bell	1 set
16) Lighting		
	On board lights	LED
	Navigation lights	1 set per COLREG
	Floodlight	400W Halogen x 9
	Searchlight	500W incandiscent light x1 local contriol
	Day light signal	1
17) Navigation equipment		
	Magnetic compass	1 x desktop type 150mmφ, spare bowl x 1
	Gyro compass	1
	GPS compass	1
	Steering control	1 (Gyro and GPS autopilot))
	Radar	1 abt 19” LCD, X-band 1 abt 19” LCD, S-band
	Echo sounder	1 x LCD
	GPS	1 x GPS with 10” LCD plotter
	Air horn	1
	M/E rev indicator	2 + 2(EMR)
	Prop shaft rev indicator	2 + 2(EMR)
	Helm indicator	1 +1(EMR)
	Window wiper	2
	Wind vane anemometer	1
	Bridge console	Main engine control and alarm Telephone PA microphone Engine telegraph
18) Radio apparatus (Based on GMDSS A3)		
	VHF radiotelephone	2: with DSC and DSCWR
	MF/HF radio telephone	1: 150W with DSC and DSCWR
	Inmarsat C	1
	EPIRB	2
	NAVTEX	None (No NAVTEX broadcasting in the South Pacific region. Letter of exemption from Gov. of FSM).
	SART	2

Item		Specifications
	Two-way portable VHF	3
	Aircraft rescue radio	1
	AIS	1
	Walkie talkie	4
19) Alarms		
	General alarm	1 set
	Engine room bilge alarm	1 set
	Bridge navigation watch alarm system（BNWAS）	1 set
20) Materials		
	Hull	Mild steel (NK class)
	Pipe material	
	Engine room seawater	Polyester resin lined inside
	Fresh water	Steel in engine room and stainless steel or plastic in accommodation
	Hydraulic oil	Stainless steel (exposed part) and steel (inside)
	Piping installation	Pipe sections with flange connection at suitable interval allowing easy dismantling
	Paint	
	Bottom	Epoxy AC + Tin-free SPC AF at 2 years life
	Ship side	Epoxy
	Cargo hold	Epoxy
	Superstructure	Modified epoxy
	Exposed deck	Modified epoxy for deck
	Engine room bottom	Epoxy
	Deckhouse inside	Alkyd resin
	Fresh water tank	Epoxy for drinking water
	Ballast water tank	Epoxy
	Sacrifice anode	Zn plates

Table 2-7 Specification of PMP spare parts

1) MAIN ENGINE	
Cylinder head assembly	1 engine
Piston and connecting rod assembly (with crank pin metal)	1 engine
Piston ring	1 engine
Cylinder liner assembly (with seal, ring, etc.)	1 engine
Main bearing (base and center) and thrust bearing metal	2 engine
Crank pin metal	2 engine
Connecting rod bolt	2 engine
Fuel injection pump complete	1 engine

Fuel injection valve	2 engine
Nozzle assembly	2 engine
Fuel oil injection pipe	1 engine
Suction valve, valve seat and valve guide	1 engine
Exhaust valve, valve seat and valve guide	1 engine
Governor	1 engine
Turbocharger	1 engine
Exhaust line bellow	2 engine
Gasket for turbocharger	1 engine
Engine driven pumps (FW, SW, FO, LO)	1 engine
Cooling fresh water thermostat and seal	1 engine
Engine attached cooling seawater pipes (steel and rubber)	1 engine
O ring and seal packing for special survey overhaul	4 engine
LO and FO filter element (in case of paper filter)	12 engine
Pressure gauge	2 engine
Thermometer	2 engine
Pressure switch and temp switch	2 engine
Tachometer	2 engine
Cooling fresh water chemical and test kit	1
Tool for piston ring insert	1
Cylinder liner withdrawing tool	1
2) GEAR BOX	
LO pump	1 engine
LO cooler side cover	1 engine
Pressure gauge	2 engine
O ring, seal packing for special survey overhaul	4 engine
LO filter element (in case of paper filter)	12 engine
3) SHAFTING	
Propeller (port and starboard, no cap required)	1 ship
Mechanical seal ring and associated parts	1 ship
O ring for propeller	1 ship
4) MAIN GENERATOR ENGINE	
Cylinder head assembly	1 engine
Piston ring	1 engine
Main bearing (base and center)	1 engine
Crank pin metal	1 engine
Fuel injection pump complete	1 engine
Fuel injection valve	2 engine
Nozzle assembly	2 engine
Governor	1 engine
Turbocharger	1 engine
Exhaust line bellow	2 engine
Gasket for turbocharger	1 engine

Engine driven pumps (FW, SW, FO, LO)	1 engine
Cooling fresh water thermostat and seal	1 engine
Engine attached cooling seawater pipes (steel and rubber)	1 engine
O ring and seal packing for special survey overhaul	4 engine
LO and FO filter element (in case of paper filter)	12 engine
Pressure gauge	2 engine
Thermometer	2 engine
Pressure switch and temp switch	2 engine
Tachometer	2 engine
5) SHELL AND TUBE COOLERS Including engine mounted coolers	
O ring and seal packing	2 ship
6) ANODES	
Anodes for bottom hull and ballast tank	1 ship
Anode plate and bar for engine room cooling seawater system	4 ship
Engine attached anode plate and bar for cooling seawater	4 ship
Packing for above	2 ship
Zinc anodes for propeller shaft	2 ship
Sacrifice pipe piece	1 ship
Zinc round bar 1m	2
7) GENERATOR	
Ball bearing	1 ship
8) LIGHTING	
Navigation light	100%
Projector bulb	100%
Search light bulb	100%
LED light	10%
Glass glove	Each size 2
Fuse element	Each size 5
Receptacle and plug (waterproof))	1 set
Receptacle and plug (non-waterproof))	1 set
Switch (waterproof)	1
Switch (non-waterproof)	1

2-2-2-5 Specification of the Equipment

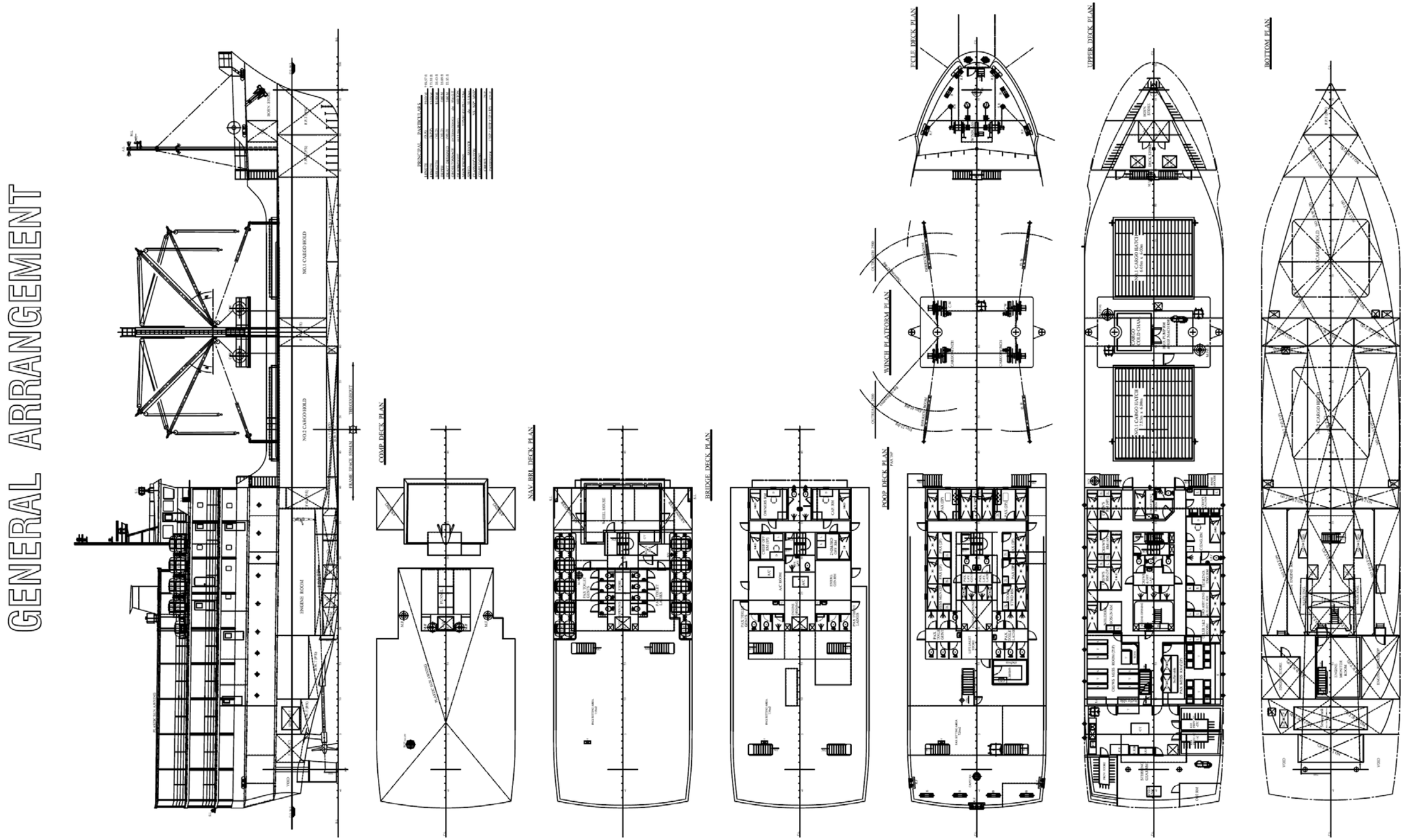
Table 2-8 Specification of the Equipment

1) Workboat		
	Boat hull	FRP material, about 7.4 mL x 1.8 mB x 1 boat
	Outboard motor	40 HP x 2 + 1spare motor: total 3 sets
2. PMP spare parts for Caroline Voyager		
	For main engine	- Cylinder head assembly x 4 - Suction valve, exhaust valve and valve seat x 12 - Fuel oil injection pump x 4 - Fuel oil injection nozzle x 24 - Cooling fresh water pump x 2 - Piston ring x 12 - Remote control valves, packing necessary for overhauling work, anticorrosive chemical, etc.
	For generator engine	- Cylinder head assembly x 2 - Suction valve, exhaust valve and valve seat x 6 - Fuel oil injection pump set x 1 - Fuel oil injection nozzle x 24 - Cooling fresh water pump x 2 - Cylinder liner x 12 - Fresh water cooler and lube oil cooler x 1 - Air motor x 2 - Packing necessary for overhauling work, anticorrosive chemical, filter element, etc.
	For air compressor	- Suction and exhaust valve x 8 - Packing necessary for overhauling work, etc.
	For reduction gear	- Repair kit x 2 - Packing necessary for overhauling work, etc.

2-2-3 Outline Design Drawing

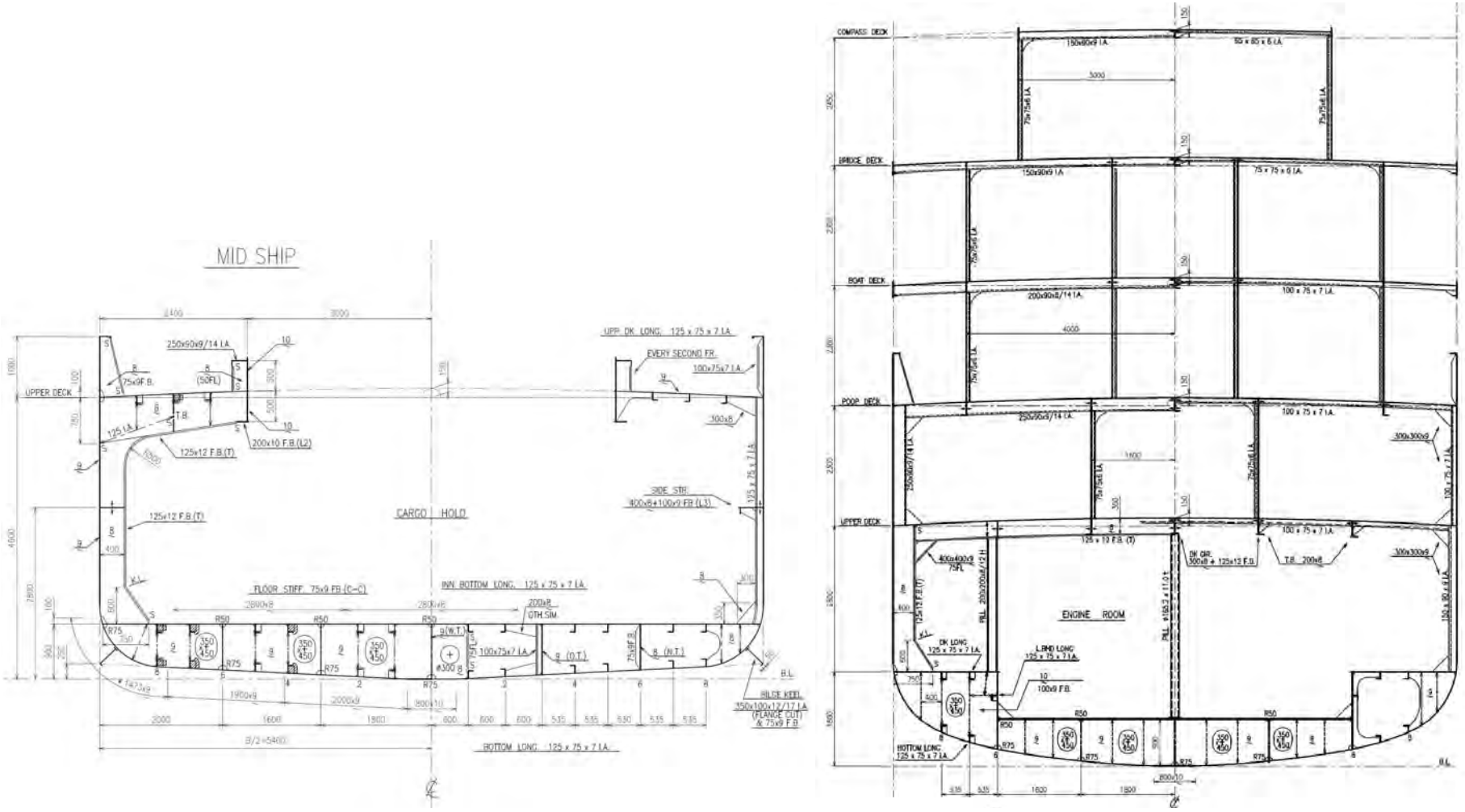
(1) General Arrangement

Fig. 2-3 General arrangement plan



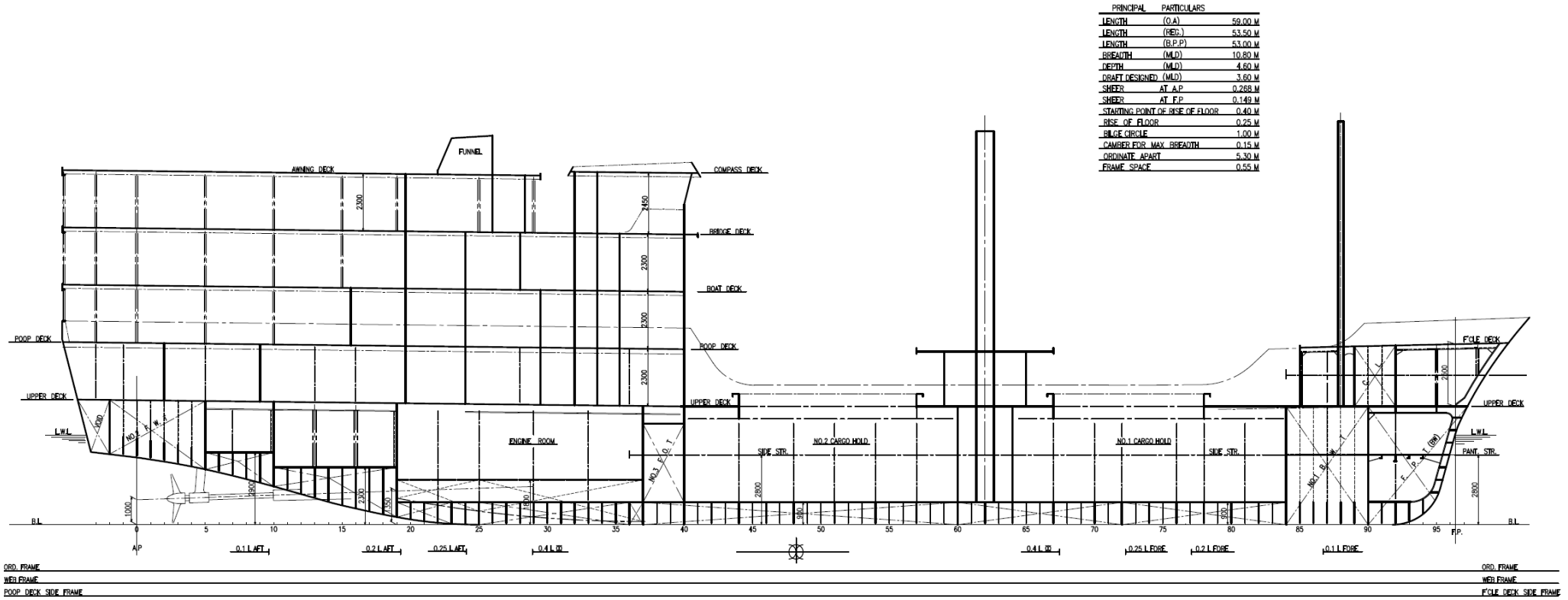
(2) Structural section

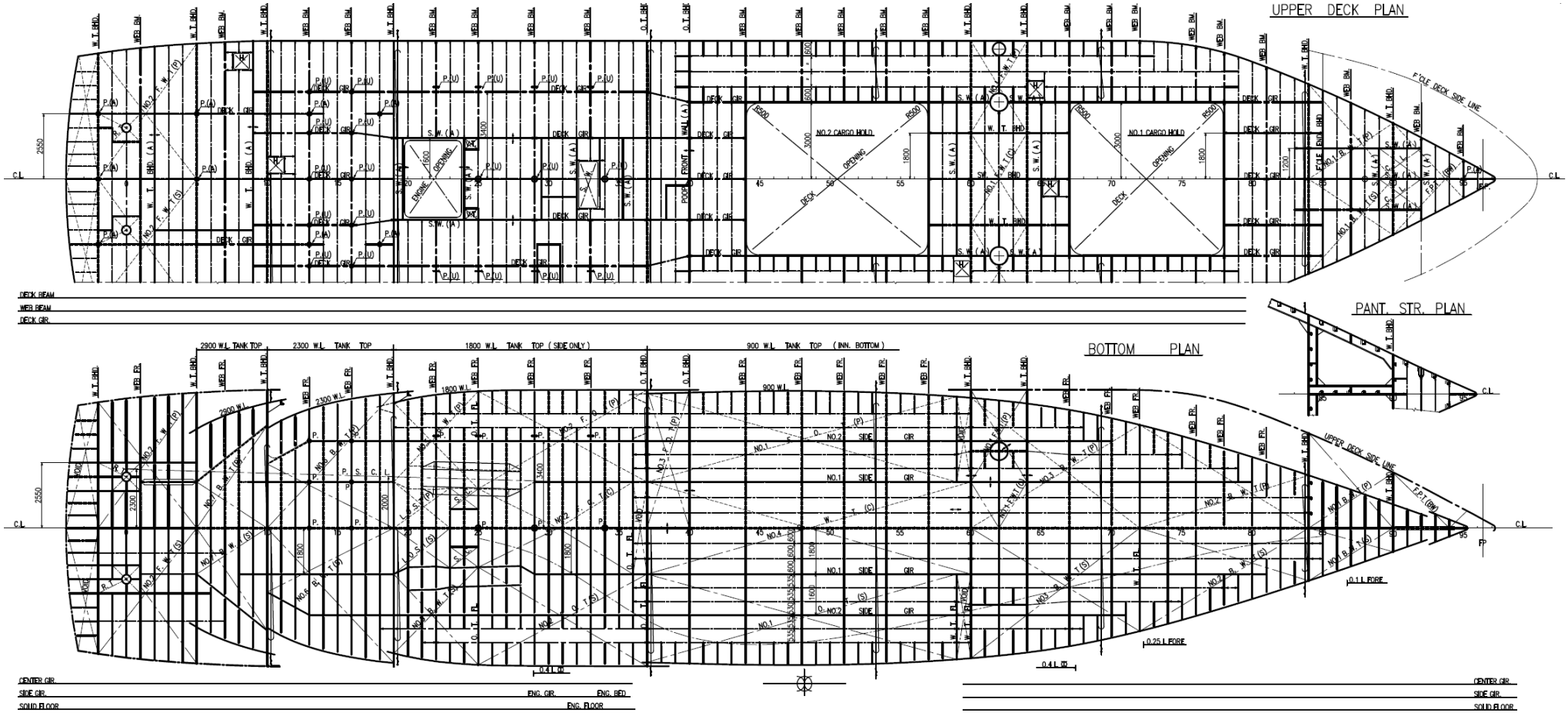
Fig. 2-4 Midship section plan

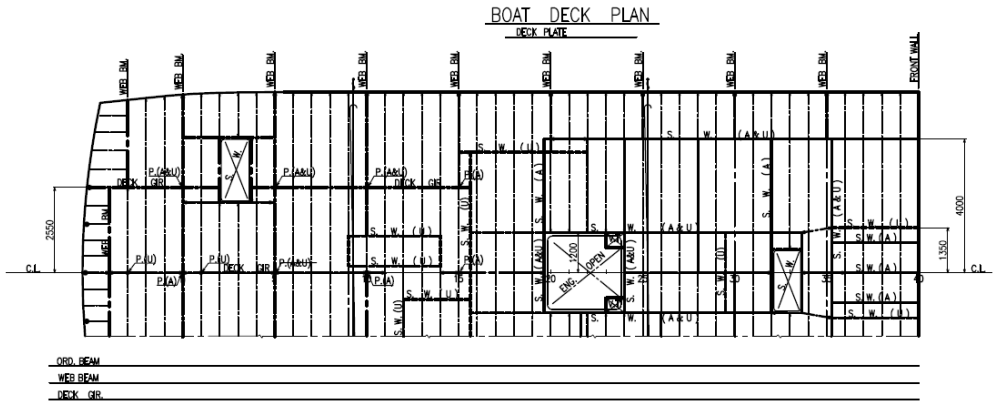


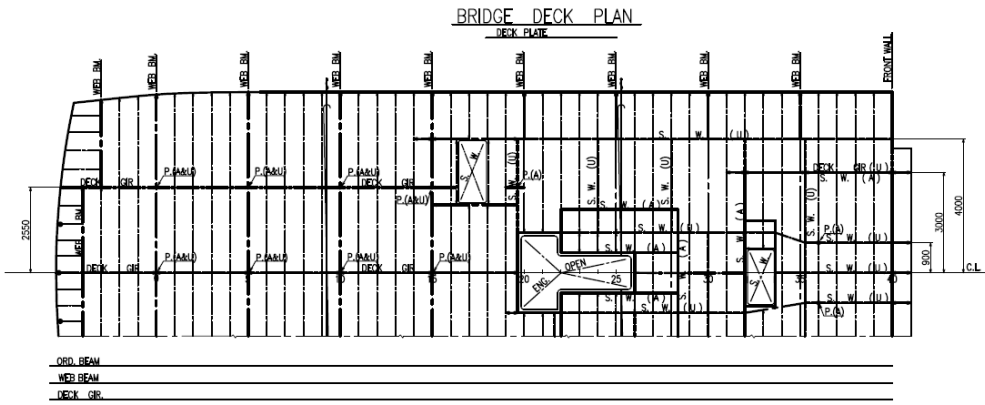
(3) Construction profile and deck plans

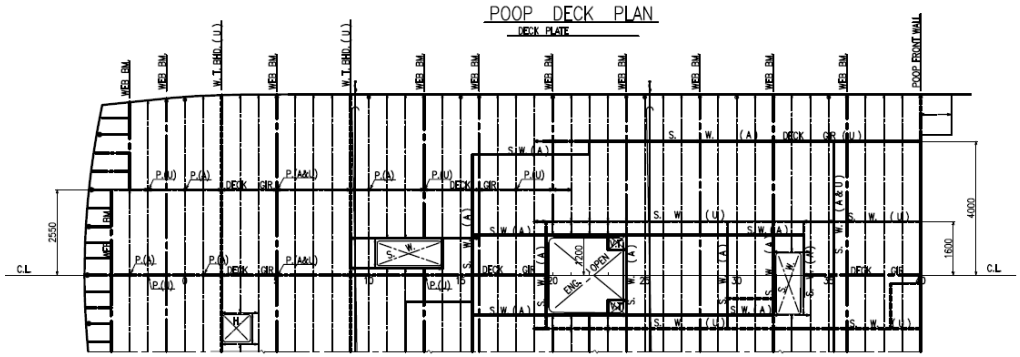
Fig. 2-5 Construction profile and deck plans

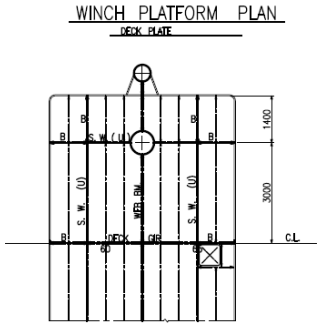


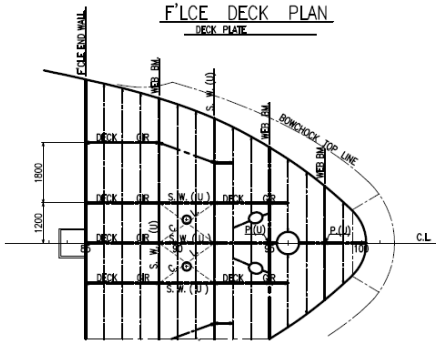

UPPER DECK PLAN
PANT. STR. PLAN
BOTTOM PLAN
NO.2 CARGO HOLD
NO.1 CARGO HOLD
DECK BEAM
WEB BEAM
DECK GIR.
CENTER GIR.
SIDE GIR.
SOLID FLOOR
ENG. GIR.
ENG. BED
ENG. FLOOR

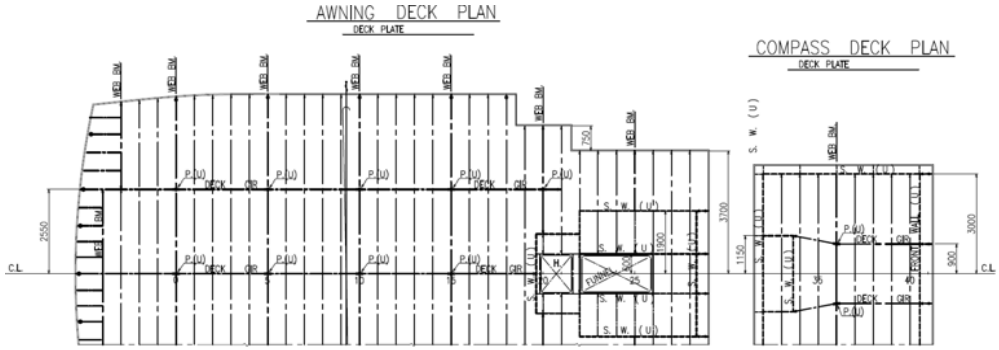

BOAT DECK PLAN
DECK PLATE
ORD. BEAM
WEB BEAM
DECK GIR.


BRIDGE DECK PLAN
DECK PLATE
ORD. BEAM
WEB BEAM
DECK GIR.


POOP DECK PLAN
DECK PLATE


WINCH PLATFORM PLAN
DECK PLATE

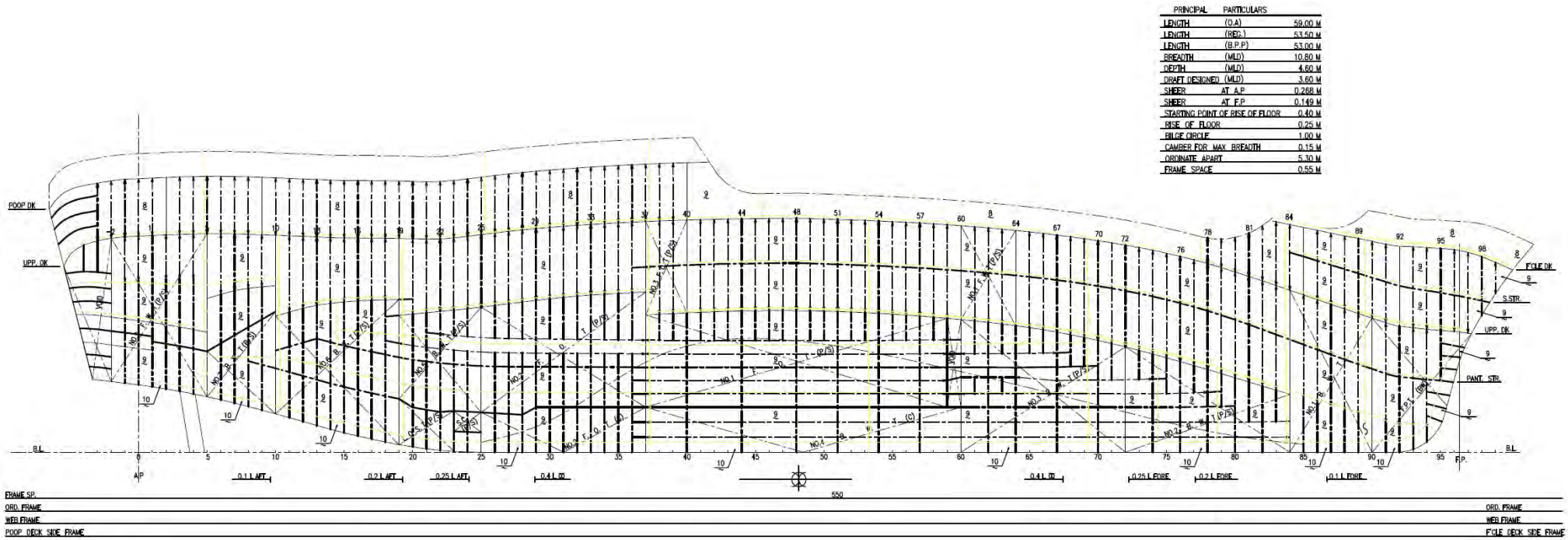

F'LCE DECK PLAN
DECK PLATE


AWNING DECK PLAN
DECK PLATE

COMPASS DECK PLAN
DECK PLATE

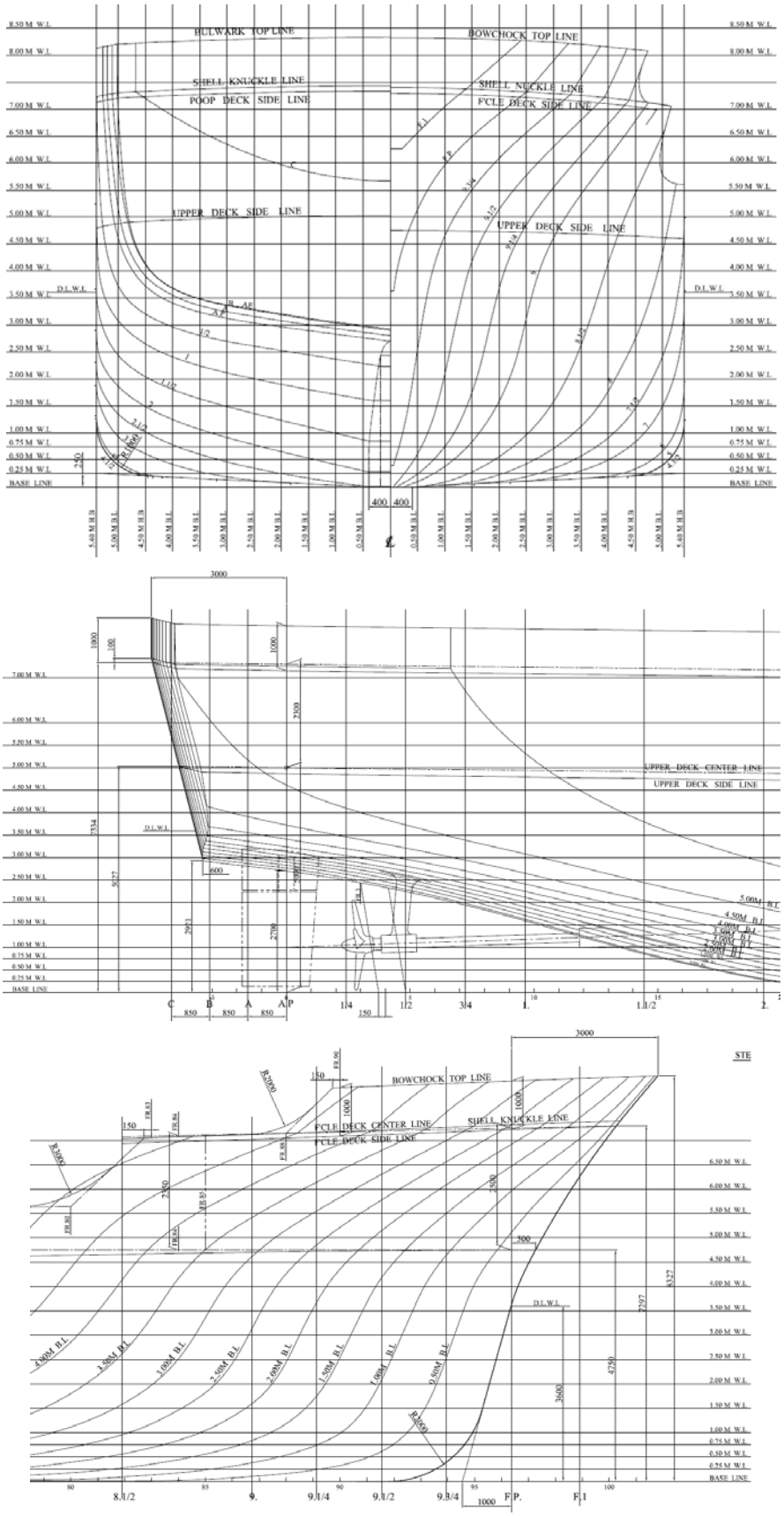
(4) Shell expansion

Fig. 2-6 Shell expansion plan



(5) Hull lines

Fig. 2-7 Lines plan



2-2-4 Implementation Plan

2-2-4-1 Implementation policy

(1) Procedure

The Plan vessel will be planned, documented and constructed along following procedure under the Japanese Grant Aid scheme of the Government of Japan.

1) Exchange of Notes between the Government of Japan and the Government of FSM and Grant Agreement between JICA and the Government of FSM, for the implementation of the Project.
2) Conclusion of a Consultant Agreement between a Consultant recommended by Japan International Cooperation Agency (JICA) and the Project Implementing Agency established by the Government of FSM, for the Consultant's work to implement the Project.
3) Verification of the Consultant Agreement by JICA.
4) The Consultant prepares detail designs and draft tender documents, and obtains approval by the Government of FSM. These include methods of pre-qualification, technical specifications, general arrangement plan, project cost estimates, and draft shipbuilding contract.
5) Based on the approved Tender Qualification procedure, the Consultant conducts Tender qualification examination, obtains the approval of the Government of FSM, and selects applicants. The Applicant must be Japanese ship building firm(s).
6) The Consultant carries out the Tender process, in the presence of the Government of FSM, and examines the Tender documents submitted by the applicants. Based on the results of the applicant evaluations, the Consultant recommends the intended contractor to the Government of FSM.
7) The Consultant assists in contract negotiations with the Government of FSM and witness the Contract.
8) Verification of the signed contract by JICA.
9) Based on the shipbuilding contract, the Contractor builds and conducts sea trials of the Vessel, and hand-over the Vessel together with the Equipment. The Consultant, in accordance with the Consultant Agreement, provides construction supervision, conducts sea trial, and witness the hand-over of the Vessel.
10) The Vessel with Equipment on board departs Japan to Pohnpei, FSM for turnover.

(2) Basic provisions related to the Project procedures

Basic items related to the Project procedures under Japan's Grant Aid scheme are as follows.

1) Responsible Agency and Project implementing Agency for the Project

   The Responsible Agency and Project implementing Agency are the same organization, Department of Transportation, Communication, and Infrastructure (DOTCI), the Government of FSM.

2) Consultant

Following the Exchange of Notes and the Grant Agreement, a Consultant Agreement will be concluded between the Government of FSM and the Consultant, which is Japanese firm recommended by JICA. As the proxy of the Government of FSM, the Consultant will prepare the Tender documents including technical specifications and give assistance as necessary in the tender bidding and contractual phases, and further provide continuous supervision of the Vessel construction. For the purposes of carrying out this supervisory function, the Consultant will dispatch responsible engineers and outfitting experts to the shipyard, as necessary during the construction process.

3) The Plan vessel building and Equipment procurement

For the Vessel building and related equipment procurement, qualification data submitted by Japanese firms will be evaluated first, and those who had passed the qualification appraisal are allowed to participate in the tender bidding. The tender is conducted along with the procedure established in advance. The successful tenderer signs the Contract for building the Vessel and procurement of related Equipment. The Contractor builds the Vessel, and conducts sea trial, procures the Equipment and transports the Vessel with the Equipment on board to FSM for turnover.

4) Building plan of the Plan vessel

To build the Vessel, the Contractor, pursuant to the contract and technical specifications, designs the hull and outfitting for building in the Contractor's yard facilities. Following preparation of the construction design by the Contractor, the Vessel is built along shipbuilding process: steel hull construction, outfitting (deck, machinery and electrical), tests, and then transport to FSM. The following areas must be given careful consideration when examining the Construction Plan.

a) As this Project is being implemented under the Japanese Grant Aid scheme, strict adherence to the construction schedule is the major premise. The building plan must be prepared so as to fulfill all contract conditions within the term validity stipulated in the Exchange of Notes.
b) With regard to the delivery deadlines for machinery and equipment, careful consideration must also be given to preventing disruption of the construction work flow by maintaining tight control of machinery and equipment procurement and linking the hull construction and outfitting program to delivery schedules of the relevant machinery and equipment.
c) Various tests must be performed, as required by FSM and Classification Society. The required sea trial must be performed upon completion of the construction phase to confirm vessel performance.
d) In the final stage of construction, three engineers (captain, chief engineer and 1st engineer of the Vessel) appointed for the Vessel are invited to Japan to participate in the final outfitting work and sea trials as well as receiving instructions from various makers, all for familiarization with the vessel systems and performance. These engineers travel aboard the Plan vessel back to FSM, for further familiarization.
e) Receiving the Provisional Certificate of Nationality from the Government of FSM, the Contractor

transports the Vessel, at his own responsibility, from the Contractor's quay (wharf) to the Vessel's homeport. After arrival at the homeport, final inspection will be immediately conducted and thereafter the Vessel with the equipment will be turned over to the Government of FSM.

5) Procurement plan of the Equipment

The Contractor procures the equipment for the Project based on the Contract and technical specification.

6) Dispatch of engineers

After turning-over the Vessel, two engineers, deck and machinery part, shall be dispatched each by the shipbuilding Contractor to FSM for 15 days as the guarantee engineers to cope with machinery malfunctions which usually concentrate in the early time after the delivery. Those engineers will be give instructions on PMP, operation of machinery, system and maintenance as far as possible.

2-2-4-2 Special consideration with regard to Construction and Procurement

a) The procedure of hull assembly and outfitting should be established taking into consideration of the Vessel layout and special features.
b) For those materials, machinery and equipment, whose delivery is not very firm, delivery possibility should be followed up frequently and reflect the change in the work schedule promptly.
c) Quay tests for various machinery and equipment and sea trials should be in detail planned and included in the work schedule.
d) The work schedule should be regularly (at least once in a week) followed up and updated.

2-2-4-3 Scope of Works

Scope of Works at Japanese side and FSM side are generally as follows.

a) Building of the Vessel, procurement of the Equipment and their transportation from Japan to FSM are all undertaken by the Japanese side.
b) FSM side is to undertake arrangement of all licenses and certificates necessary for the execution of the Project.

After completion of the delivery of the Plan vessel in FSM, FSM side is to undertake all arrangements necessary to operate the Vessel, i.e. crew, operator, running costs, insurance, government subsidy, etc., to operate the Vessel safely and smoothly.

Following is the further breakdown of the works at Japanese side and FSM side.

1) Scope of work at Japanese side

The followings are the scope of work at Japanese side, as the Project under the Japan's Grant Aid scheme.

・ Design and construction of the Plan vessel.

・ Procurement of the related equipment for the Project.
・ Transportation of the Plan vessel from Japan to FSM with the equipment on board.
・ Consultant services for detail design, assistance in tender and supervision during shipbuilding and equipment procurement.

2) Scope of work at FSM side

The followings are the scope of work at FSM side.

(Arrangement during implementation of the Project)

・ Conclusion of Banking Arrangement with an authorized foreign exchange bank in Japan, issuance of a authorization to pay, and bearing necessary commissions to the bank, for the contracts verified by JICA in relation with this Project
・ Acquisition of all licenses and certificates of the Government of FSM, necessary for the Project, e.g. Provisional Certificate of Nationality, Radio Station License etc.

(Arrangements when each vessel has arrived at FSM)

・ Exemption of the new Vessel and equipment from customs duties, internal taxes and fiscal levies, and prompt customs clearance.
・ Exemption of Japanese nationals from customs duties, internal taxes and fiscal levies for their services in FSM.

(Other)

・ Any other items which are not covered under the Project.

2-2-4-4 Consultant Supervision

(1) Basic Concept of the Consultant Supervision

The Consultant will verify that the construction and procurement schedule have been designed based on the Japan's Grant Aid system. Supervision plan of both shipbuilding and equipment procurement will be prepared on this basis. The Consultant will check whether the quantities, plans, and specifications satisfy the contract documents. The supervision programs will be conducted as follows.

a) Approvals of drawings and technical specification

The Consultant should examine, approve and/or gives instructions to correct the construction plan, work schedule, production design drawings and specifications promptly, and should reply to the questions from the Contractor promptly as well, so as to prevent disruption in the project schedule.

b) Work schedule supervision

The Consultant should always grasp progress of the work schedule, and order whenever necessary to adjust working schedule to ensure on-time completion.

c) Quality inspection

Along with building progress, the supervisor(s) in charge of outfitting and equipment should be dispatched for the necessary periods to workshops and the shipyard to inspect construction at site, checking machinery and outfitting work with the contract drawings, specifications, and approval documents. The supervisor(s) should conduct inspections of the equipment and outfitting work, based on the approved test procedure and the Contractor's in-house standards.

d) Turnover business

After transporting the Vessel to the homeport, FSM, the Consultant should be present at all inspections at the wharf and issue the certification documents required for local turnover.

e) Construction report

The Consultant should make monthly reports on construction progress and schedules work for the succeeding month, appending factory photos. These reports should be submitted to both the Government of FSM and JICA.

(2) Supervisory arrangement

The Consultant should establish a project team consisting of the project manager, naval architect, outfitting staff, machinery staff, electric staff, joiner work staff and equipment procurement staff, and prepare implementing detail design and exercise supervision over the construction and procurement activities.

2-2-4-5 Quality Control Plan

Quality control of raw materials and installed machinery/equipment for the Vessel and the equipment for the Project should be conducted as follows.

Table 2-9 Quality Control Plan

Items		Quality control
Materials	Structural steel	To use steel materials with certificate of inspection (mill sheet) for every plate and every bar section according to the Class NK standard.
	Pipes and valves	To use pipes and valves with JIS certificate.
	Timber	Consultant to inspect on arrival of the materials.
	Fire protection	Fireproof bulkhead, lining, insulation, fire door etc., for structural fire protection to be of SOLAS and ClassNK standards, for which prototype tests had been conducted and have type approval.
On board equipment and outfitting	Diesel engine	Designed according to Class NK standards, prototype tests had been conducted, type-approved, and manufactured in the qualified by Class NK. Completed diesel engines to be load-tested including overload for necessary duration on test bench according to the standard program of Class NK.
	Auxiliaries	Designed according to Class NK standards, manufactured in the factory qualified by Class NK, and have certificate of Class NK.

Items		Quality control
	Fire extinguishers /Lifesaving appliances	Designed according to SOLAS regulation, and have type-approval No. of HK (The ship Equipment Inspection Society of Japan).
	Inventories	Type-approved by HK (The Ship Equipment Inspection Society of Japan).
	Deck outfitting	Designed according to JIS, and the Consultant to inspect the equipment.
Equipment	Workboat hull	Designed according to JCI (Japanese Craft Inspection Organization) standard
	Outboard motor	JCI type-approved motor

2-2-4-6 Equipment Procurement Plan

Machinery and equipment to be on board the Vessel and associated Equipment will be in general of Japanese products, which are stable in quality, delivery and price.

2-2-4-7 Operational Guidance Plan

(1) Operation training

One month before the Plan vessel departure from Japan to FSM, three senior crew (navigation officer and engine officers) are invited to Japan from FSM to have operation training from shipyard engineers and maker engineers. Those three crew will board the Plan vessel from Japan to FSM to continue onboard training. All necessary costs, i.e. airfare, domestic transport, accommodation, daily allowance and insurance, are to be borne by the shipbuilder as a part of the shipbuilding contract.

(2) Guarantee engineer

After turning-over of the Plan vessel, two engineers, deck and machinery part, shall be dispatched by the shipbuilding Contractor to FSM for 15 days including the first island trip service as the guarantee engineers to cope with machinery malfunctions which usually concentrate in the early time after the delivery. Those engineers will be given instructions on PMP, operation of machinery, system and maintenance as far as possible.

2-2-4-8 Soft Component (Technical Assistance) Plan

No soft component and technical assistance are included in the Project.

2-2-4-9 Implementation Schedule

(1) Portion of work at FSM side for the Project

After the shipbuilding and equipment procurement contracts, the Project implementation does not rely on the work to be shared by FSM side, except for national licenses, e.g. the Radio Station License and the Provisional Certificate of Nationality, which must be issued by the Government of FSM. Undertakings at

FSM side are the works necessary for the operation of the Plan vessel including preparation of spare parts store.
Refer further to section 2-2-4-3 2) Scope of Works, regarding detail of work at Japan side and FSM side.

(2) Detail of building schedule of the Plan vessel

In building the Plan vessel, the shipbuilding Contractor first carries out production designs of steel hull structures and various outfitting based on the contract and associated technical specifications, and besides based on the shipbuilder's own facility. With the completed production design drawings, hull construction, deck outfitting, machinery outfitting and electric outfitting follow as below.

a) Hull construction

Hull is the watertight structure with internal volume as buoyancy, and with strength to withstand water pressure, wave pressure, cargo loads in static and dynamic conditions. The work starts from marking on raw steel material, cutting, sub-assembly and block assembly on shipbuilding berth.

b) Deck outfitting

This work is performed after completion of the hull work. It comprises mooring arrangements, steering system, accommodation work, lifesaving apparatus, firefighting equipment, cargo gears, etc.

c) Machinery outfitting

This work comprises installation, piping and associated work of main engines, diesel generators, pumps, etc. mainly in the engine room

d) Electric outfitting

This work is for installation of electric apparatus, control panels, etc. and for electric cable installation to supply electric power to all electric equipment on board.

e) Transport

After completion of the construction work at the shipyard and necessary tests, the new Vessel will be delivered to the Government of FSM. The procured Equipment is loaded on board the Plan vessel. Transport of the vessel with the Equipment to FSM is carried out under the responsibility of the shipbuilding Contractor.

Three engineers who had been dispatched from FSM are to return to FSM on board the Plan vessel sailing from Japan to FSM for the purpose of familiarization with the Plan vessel.

Implementing schedule of the Vessel is as shown below.

Table 2-10 Implementing schedule overview

From Exchange of Notes/Grant Agreement to the Contract	From the Contract to the completion of construction work	Preparation of the transport, transport sailing, local inspection and turn-over	Total schedule From the Contract to turn-over to FSM
6 months	14 months	1 months	15 months

The projected building schedule of the Vessel is shown on the next page.

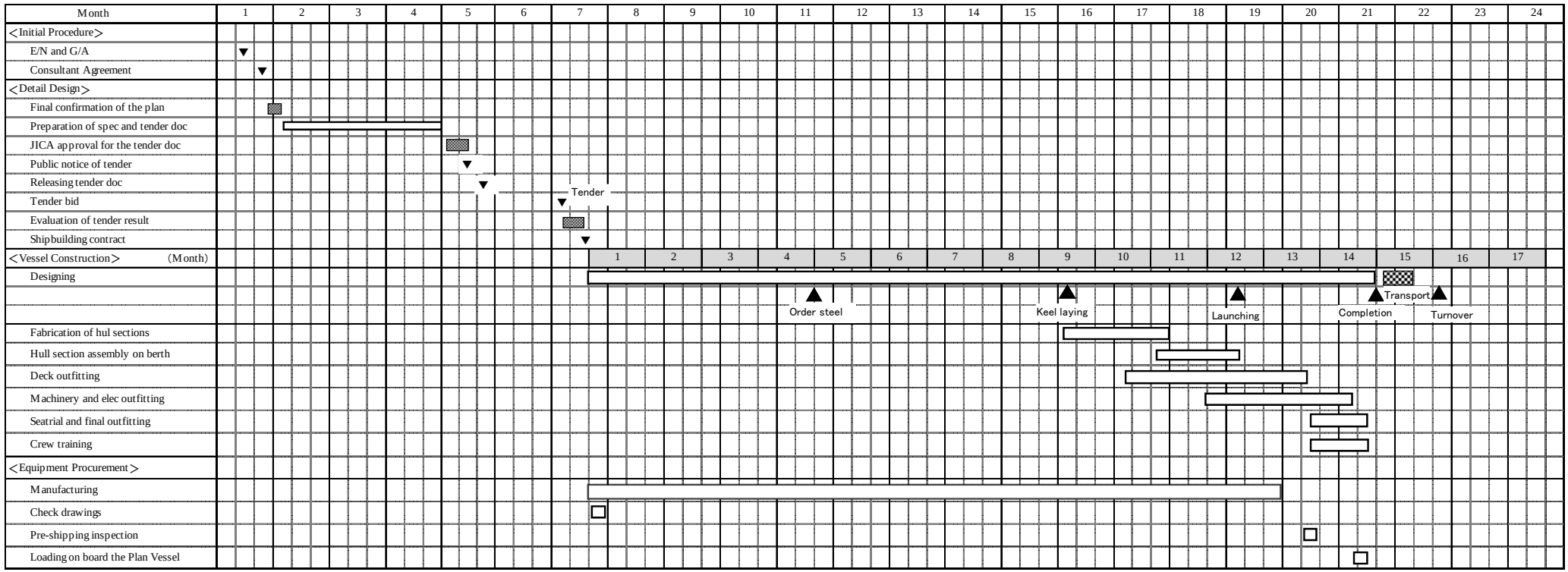


Fig. 2-8 Project schedule

2-3 Obligations of the Recipient Country

As the building of the Plan vessel and the procurement of the Equipment are all undertaken by the Japan side, FSM side is not necessary to take part in the shipbuilding work.
Shore facilities, which the Plan vessel will use in their operation, need not be modified or improved.
Accordingly, obligation of FSM side is limited to documentation, vessel operation and maintenance, exemption from custom duties and banking arrangement including payment of bank commissions as referred to in the Minutes of Discussion signed on March 11, 2013.

2-4 Project Operation Plan

2-4-1 Vessel operation body

The Plan vessel will be managed and operated by the Marine Transportation Division of the Department of Transportation, Communication, and Infrastructure. The Division has currently four branches, i.e. Safety & Inspection Branch, Operation Branch, Technical Branch and Caroline Voyager. The Plan vessel, when commissioned, will form a new branch there.
The Operation Branch, who will be responsible for the operation and scheduling of C/V and the Plan vessel, will so allocate vessels that high passenger demand over each vessel's capacity be cleared by two vessels at a time, that overworking of two vessels be avoided as far as possible, that adequate time for maintenance be available in the homeport between voyages, and that leave for docking be adequately available. It is expected further that services to islands which were not served well before have better services after the Plan vessel comes into service.
The Plan vessel's crew, comprising officers and ratings of deck part, engine part and catering part, will be filled by new employment and/or change from C/V. In FSM, the number of available seafarers is sufficiently over the necessary number for the Government vessels thereby no problem on the new employment is expected.

2-4-2 Vessel maintenance

Maintenance of the Plan vessel will be planned together with C/V by the Marine Transportation Division and executed. Docking schedule of two vessels for the classification survey will be planned avoiding two vessels docks at a time.

Daily maintenance will be undertaken by the crew of each vessel. FSM has no workshop ashore but the maintenance will be carried out without any problem in the machinery workshop on board by the engine crew who are considered having sufficient skill for maintenance work. Deck crew are

familiar with the hull maintenance, e.g. de-rust and oiling to deck machinery.
For the Plan vessel and C/V, PMP will be established according to the following, aiming at no breakdown due to poor maintenance.

- To draw up maintenance program (weekly, monthly and annual) for machinery and also daily de-rusting.
- To procure spare parts necessary to conduct PMP.
- To procure tools necessary to conduct PMP, e.g. machinery tools and de-rusting power tools.
- To arrange machinery workshop and parts store on board the Plan vessel.
- To invite crew of the Plan vessel (two senior crew: deck officer and engine officer) to have instruction of PMP.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

All shipbuilding cost including transportation of the Plan vessel from Japan to Pohnpei is to be borne by the Japan side. As no shore facility which need be newly erected by the FSM side is intended, the cost which FSM Government has to bear will be only for the bank commission and charges estimated about JY1,110 thousand, equivalent to about USD11 thousand (at a rate of JY100 compared to one USD on May 2013).

2-5-2 Operation and Maintenance Cost

Marine Transportation Division of the Department of Transportation, Communication, and Infrastructure spends about USD120 thousand every year for the maintenance of C/V, for purchasing e.g. spare parts and annual classification fee. Besides, C/V goes to drydock of Japan every 2.5 years for intermediate and special survey of classification, and renews her classification.
The Plan vessel maintenance, with budget allocation, regular docking and classification survey similar to those for C/V, will assure her safe and steady operation.

The following table shows estimate expenditure of C/V and the Plan Vessel for the period 2012 through 2019. The study is basing on the record of DOTCI, and assuming no fuel oil price change and no inflation.

Table 2-11 Projection of Expenditure

Caroline Voyager

1,000 US$

Year		2012	2013	2014	2015	2016	2017	2018	2019	Remark
Expenditure	Crew Wage	284	284	284	284	284	284	284	284	Assumption base: US$1 = JPY100 (2013-)
	Maintenance	1,061	158	858	158	823	158	788	158	
	Daily Maintenance	41	41	41	41	41	41	41	41	After receiving PMP Spare,
	Class Survey	15	12	12	12	15	12	12	12	Dock working cost for main
	Dock	900	-	700	-	662	-	630	-	engine and generator engine
	Spare Parts, etc.	105	105	105	105	105	105	105	105	will be reduced 30%
	Fuel, Lub. Oil	580	580	580	527	367	367	367	367	
	Victuring, Canteen	61	61	61	55	39	39	39	39	
	Insurance	94	94	94	94	94	94	94	94	
	Misc.	131	131	131	131	131	131	131	131	
	Total	**2,211**	**1,308**	**2,008**	**1,249**	**1,739**	**1,073**	**1,704**	**1,073**	
Revenue	Cargo	35	35	35	29	22	22	22	22	
	Passenger	38	38	38	31	24	24	24	24	
	Total	**73**	**73**	**73**	**60**	**46**	**46**	**46**	**46**	
Remark										

Plan Vessel

Year		2012	2013	2014	2015	2016	2017	2018	2019	Remark
Expenditure	Crew Wage	-	-	-	95	284	284	284	284	2015: 3 month of operation
	Maintenance	-	-	-	37	100	557	116	634	
	Daily Maintenance	-	-	-	10	21	27	27	27	
	Class Survey	-	-	-	-	10	10	10	13	
	Dock	-	-	-	-	-	441	-	516	
	Spare Parts, etc.	-	-	-	26	69	79	79	79	
	Fuel, Lub. Oil	-	-	-	58	232	232	232	232	
	Victuring, Canteen	-	-	-	11	43	43	43	43	
	Insurance	-	-	-	19	78	78	78	78	
	Misc.	-	-	-	33	131	131	131	131	
	Total	**0**	**0**	**0**	**252**	**868**	**1,325**	**884**	**1,402**	
Revenue	Cargo	-	-	-	6	25	25	25	25	
	Passenger	-	-	-	7	27	27	27	27	
	Total	**0**	**0**	**0**	**13**	**52**	**52**	**52**	**52**	
Remark										

Summary

Year	2012	2013	2014	2015	2016	2017	2018	2019
Caroline Voyager	2,211	1,308	2,008	1,249	1,739	1,073	1,704	1,073
Plan Vessel	0	0	0	252	868	1,325	884	1,402
Total	**2,211**	**1,308**	**2,008**	**1,501**	**2,606**	**2,398**	**2,587**	**2,476**

CHAPTER 3. Project Evaluation

3-1 Preconditions and Necessary Inputs by the Recipient Country

- Conclusion of Banking Arrangement with an authorized foreign exchange bank in Japan, issuance of a authorization to pay, and bearing necessary commissions to the bank, for the contracts verified by JICA in relation with this Project.
- Acquisition of all licenses and certificates of the Government of the FSM, necessary for the Project, e.g. Provisional Certificate of Nationality, Radio Station License etc.
- Exemption of the new Vessel and equipment from customs duties, internal taxes and fiscal levies, and prompt customs clearance.
- Exemption of Japanese nationals from customs duties, internal taxes and fiscal levies for their services in FSM.
- Preparation of spare parts store for large PMP spare parts.

3-2 Project Evaluation

3-2-1 Relevance

Relevance of the Project, as the Grant Aid Cooperation Project of the Japanese Government, is considered as follows.

(1) Current sea transport system of the FSM is solely supported by C/V which is 15 years old now. To maintain the FSM lifeline, C/V frequently overloaded passengers on board. The Project aims at restoring such sea lifeline to a safe and stable condition by supplying one CPax vessel and spare parts for preventive maintenance of C/V. The benefits of the Project will extend to the entire population in the FSM (111,542 person, 2011).

(2) The Project supports and promote the target task “to facilitate the provision of modern, safe and efficient inter-state and inter-island passenger and cargo vessels” shown in the Infrastructure Development Plan of the DOTCI and "The Strategic Development Plan 2004-2023" of FSM.

(3) This project supports the Plan Vessel and C/V maintenance by adopting PMP (Preventive Maintenance Policy) and providing necessary spare parts for PMP. The systemized vessel maintenance work extends the life of hull and machinery of both vessels and secures their

operation.

(4) Design and construction of the new vessels are made laying importance on safety at sea, onboard comfort, eco-friendliness, fuel economy, etc. and besides improving specific points of existing vessels. The new vessels will work showing such favorable performance.

It is concluded from above that the relevance of the Project is found quite high.

3-2-2 Effectiveness

(1) Quantitative effect

Quantitative indicators to measure the effectiveness of the Project are proposed below.

Table 3-1 Quantitative indicators to measure effectiveness of the Project

Indicator	Standard indicator (2011)	Target indicator (2019, 4 years after the Project completion)
Operation days	232 days/year	311 days/year (total of 2 vessels)
No. of ports of calls	275 ports/year	358 ports/year (total of 2 vessels)
Breakdown/stoppage days	About 7 days/year	1 day or less/year

The target indicators of operation days and ports of calls are determined based on estimated service schedule and route plans which are projected from 2011 C/V's service records excluding influence of harsh weathers. The estimated service schedule and route of the Plan Vessel and C/V are shown on the next page.

(2) Qualitative effect

Qualitative effects brought by the Project will be as follows.

- Cargoes are regularly transported so that daily commodities become steadily available.
- Two vessels operation will support the demands of sea transportation and improve the safety of passengers.
- Increase of the operation days will allow people to travel more frequently between outer and main islands.
- Increased passenger area and shower/toilet facilities will improve the comfort and safety of passengers.

It is concluded from above that the effectiveness of the Project is found quite high.

Table 3-2　Estimated annual service schedule

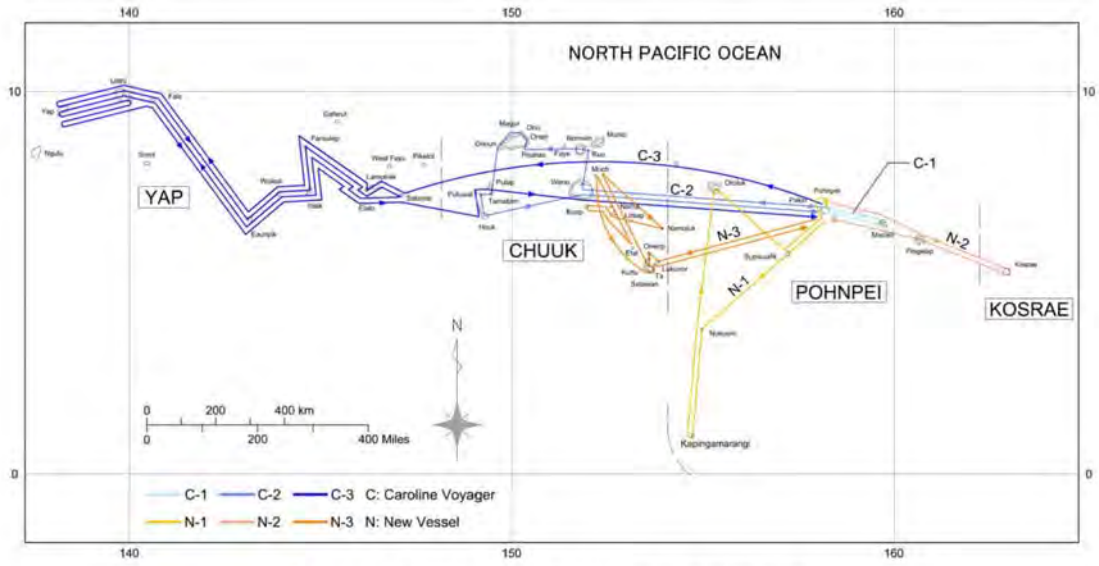
Annual Service Route Plan		January	February	March	April	May	June	July	August	September	October	November	December	Annual service days
Caroline Voyager	Destination		Mwokil Weno	Yap		Yap		Yap	Kosrae Weno	Pingelap	Pingelap			147
	Service days (ddd/mmm)		3 11 10-12/2 20-30/3	36 10/3-14/4		36 1/5-5/6		33 16/6-18/7	8 10 24-31/7 10-20/8	4 6-9/9	6 8-13/10			
	Service No.		C-1 C-2	C-3		C-4		CN-1	CN-2,C-5 C-6	C-7	C-8			
New Vessel	Destination	Kapingamarangi Kosrae Weno					Kapingamarangi	Yap	Pingelap Weno	Kapingamarangi	Yap		Yap	164
	Service days (ddd/mmm)	11 12-22/1	9 9 7-9/2 16-24/2				8 7-8/6	33 16/6-18/7	4 14 8 24-31/7 9-22/8 24-31/8		40 13/9-21/10		28 23/11-20/12	
	Service No.	N-1	N-2 N-3				N-4	CN-1	CN-2 N-5 N-6		N-7		N-8	

≦150 pax

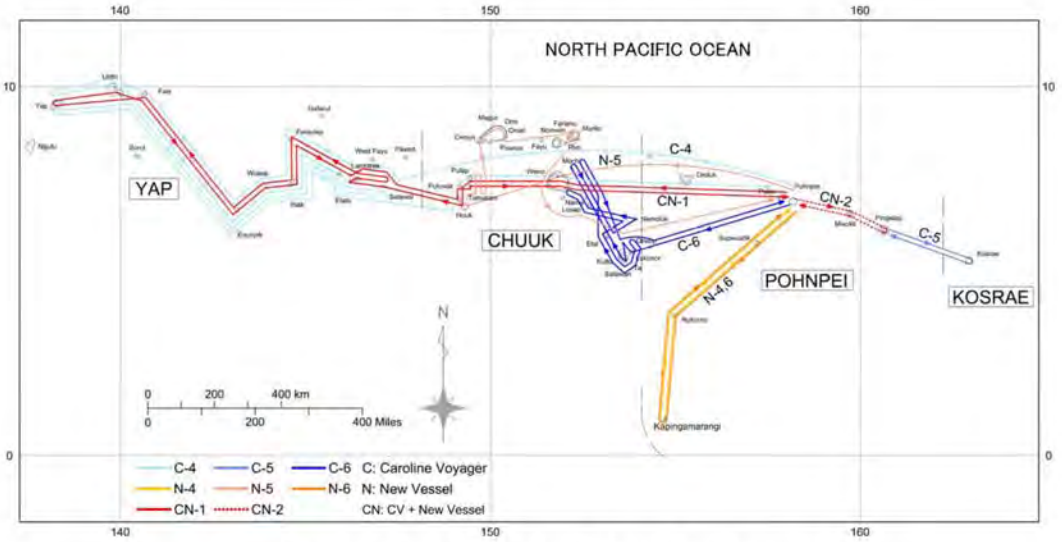
≦425 pax

425 pax ＜　(Two vessels run to same destination at the same time)

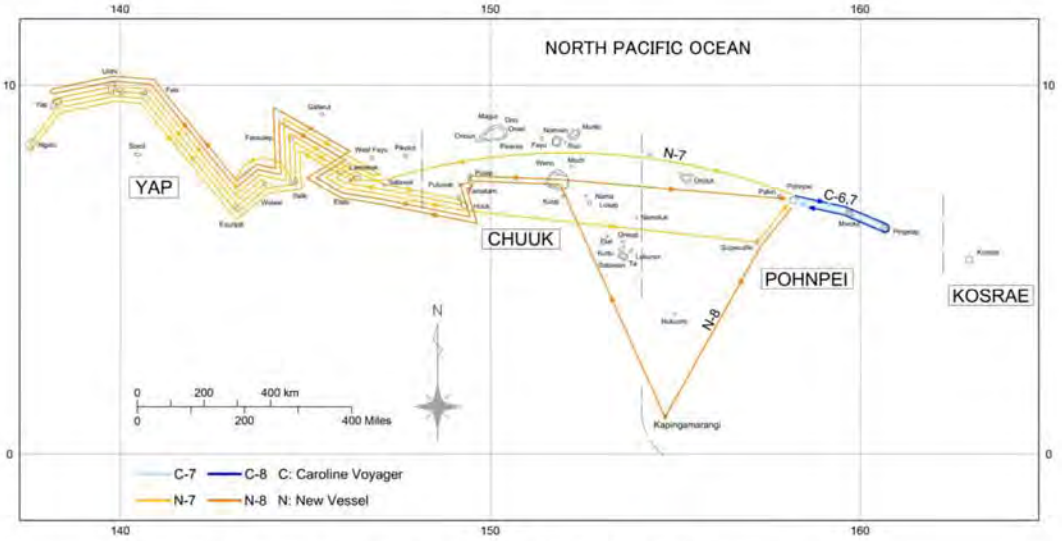
Fig. 3-1　Estimated annual service route



Service Route Plan from January to April



Service Route Plan from May to August



Service Route Plan from September to December

［APPENDICES］

1. Member List of the Study Team

2. Study Schedule

3. List of Parties Concerned in the Recipient Country

4. Minutes of Discussions

5. References

   (1) Spare parts list requested from FSM

   (2) Memorandum

1 Member List of the Study Team

1-1 Member List (Field survey)

Function	Name and Organization
Team Leader	Mr. Masahiko HURUICHI Senior Advisor Japan International Cooperation Agency (JICA)
Project Coordinar	Mr. Nobuyuki KOBE Peace Building and Urban and Regional Development Division 2 Japan International Cooperation Agency (JICA)
Project Manager / Sea transport planning	Mr. Kuniaki TAKAHASHI Fisheries Engineering Co., Ltd.
Hull and Machinery Design-1	Mr. Shuhei SOEDA Fisheries Engineering Co., Ltd.
Outfitting and Electric Design	Mr. Koji TAKESHITA Fisheries Engineering Co., Ltd.
Operation and management planning / Machinery Design-2	Mr. Akio MARUYAMA Fisheries Engineering Co., Ltd.
Equipment and procurement planning / Cost estimation	Mr. Yuichi WACHI Fisheries Engineering Co., Ltd.

1-2 Member List (Explanation of Draft Report)

Function	Name and Organization
Team Leader	Mr. Hiroshi HAYASHI Director Peace Building and Urban and Regional Development Division 2 Japan International Cooperation Agency (JICA)
Project Coordinar	Mr. Nobuyuki KOBE Peace Building and Urban and Regional Development Division 2 Japan International Cooperation Agency (JICA)
Project Manager / Sea transport planning	Mr. Kuniaki TAKAHASHI Fisheries Engineering Co., Ltd.
Hull and Machinery Design	Mr. Shuhei SOEDA Fisheries Engineering Co., Ltd.

2. Srudy Schedule

2-1 Study Schedule (Field Survey)

Date			Schedule
3	6	Wed	Ar. Pohnpei (JICA and Consultants) Courtesy call to the Japanese Embassy and meetings with JICA
	7	Thu	Courtesy call to Secretary of Foreign Affairs and Secretary of Transportation, Communication and Infrastructure Discussion with Taskforce members
	8	Fri	Discussion with Taskforce members Design of the Plan vessel Survey of Micro Glory
	9	Sat	Survey of Calorine Voyager and Micro Glory Design of the Plan vessel and data analysis of collected datas
	10	Sun	Internal meeting, Survey of Calorine Voyager, Design of the Plan vessel
	11	Mon	Signing of Minutes of Discussion Design of the Plan vessel
	12	Tue	Lv. Pohnpei (JICA) Consultants continued to discussions with Taskforce members Design of the Plan vessel
	13	Wed	Discussions with Taskforce members Design of the Plan vessel Spare parts storage survey for Calorine Voyager Survey of Micro Glory
	14	Thu	Discussions with Taskforce members Design of the Plan vessel and cost estimation
	15	Fri	Discussions with Taskforce members Design of the Plan vessel and cost estimation
	16	Sat	Design of the Plan vessel and cost estimation
	17	Sun	Survey of Calorine Voyager, Internal meeting
	18	Mon	Discussions with Taskforce members Design of the Plan vessel and cost estimation Onboard survey of Calorine Voyager (incl. unloading condition at outer islands) Report to the Japanese Embassy
	19	Tue	Final discussions with Taskforce members Signing of Memorandum Report to JICA office Lv. Pohnpei (Consultants)

2-2 Explanation of Draft Report

Date			Schedule
6	10	Mon	Ar. Pohnpei (JICA and Consultants) Courtesy call to the Japanese Embassy and meetings with JICA Courtesy call to Secretary of Foreign Affairs and Secretary of Transportation, Communication and Infrastructure Discussion with Department of Foreign Affairs and Department of Transportation, Communication and Infrastructure
	11	Tue	Survey of Micro Glory Discussion with Department of Transportation, Communication and Infrastructure
	12	Wed	Discussion with Department of Transportation, Communication and Infrastructure Signing of Minutes of Discussion
	13	Thu	Report to the Japanese Embassy Lv. Pohnpei (JICA) Discussion with Department of Transportation, Communication and Infrastructure
	14	Fri	Discussion with Department of Transportation, Communication and Infrastructure Spare parts storage survey Signing of Memorandum Report to JICA office
	15	Sat	Lv. Pohnpei (Consultants)

3. List of Parties Concerned in the Recipient Country

Name	Organization
Mr. Francis I. Itimai	Secretary, DTCI (Department of Transportation, Communication and Infrastructure)
Mr. Phillip Joseph	Deputy Secretary, DTCI
Mr. T.H. Lorin S. Robert	Secretary, Department of Foreign Affairs
Mr. T.H. Samson Pretrick	Deputy Secretary, Department of Foreign Affairs
Mr. Brendy H. Carl	Deputy Assistant Secretary, Department of Foreign Affairs
Jackson Soram	Deputy Assistant Secretary for Multilareral Affairs
Capt. Princeton Johnny	Captain Micro Glory
Member of Taskforce	
Mr. Leo Lokopwe	Assistant Secretary (Chairman), DTCI
Capt. Yoshino Welibacher	Master Caroline Voyager
Capt. Mathias Mangmog	Auxiliary Master, Caroline Islands
Capt. Patrick Peckalibe	Relief Captain Caroline Voyager
Mr. John Tiegmai	Safety Inspection Manager, Marine Trans. Div
Mr. Louis Malfin	Technical Branch Manager, Marine Trans. Div

4. Minutes of Discussions（M/D）

4-1 Field Survey

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR IMPROVEMENT OF DOMESTIC SHIPPING SERVICES IN THE FEDERATED STATES OF MICRONESIA

In response to a request from the Government of Federated States of Micronesia (hereinafter referred to as "GoFSM"), the Government of Japan decided to conduct a Preparatory Survey on the Project for "Improvement of Domestic Shipping Services in the Federated States of Micronesia" (hereinafter referred to as "the Project"). In accordance with this decision, Japan International Cooperation Agency (hereinafter referred to as "JICA") decided to commence the survey.

JICA sent the Preparatory Survey Team for the Field Survey (hereinafter referred to as "the Team"), which is headed by Dr. Masahiko FURUICHI, Senior Advisor, JICA, and is scheduled to stay in the country from March 6th to March 19th, 2013.

The Team held a series of discussions with the officials concerned of GoFSM for the new vessel and conducted a field survey at the Project site in the Federated States of Micronesia (hereinafter referred to as "the FSM").

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare a Draft Report of the Preparatory Survey.

Pohnpei, March 11th, 2013

M. Furuichi

Masahiko FURUICHI
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Phillip Joseph
Acting Secretary
Department of Transportation, Communication and Infrastructure
The Federated States of Micronesia

Witnessed by:

Samson E. Pretrick
Acting Secretary
Department of Foreign Affairs
The Federated States of Micronesia

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve safety and reliability of domestic sea transportation by building a cargo/passenger vessel (hereinafter referred to as "the new vessel"), etc..

2. Project Site

As shown in Annex-1.

3. Responsible and Implementing Organizations

The responsible and implementing organization is the Department of Transportation, Communication and Infrastructure.

The organization chart is shown in Annex-2.

4. Item requested by GoFSM

4-1. New Vessel

After discussions with the Team, GoFSM requested the items below.

- Type: Cargo/Passenger vessel
- Operation Range: Domestic waters of the FSM
- Length Overall (LOA): approx. 59m
- Breadth: approx. 10.80m
- Depth: approx. 4.60m
- Total complement capacity: 453

(16 cabin passengers, 407 deck passengers, 1 owner's room, 1 treatment room, 28 crews)

- Cargo hold: 2 separated holds, total capacity approx. 700 m^3

The Team will study further detailed specifications according to the fundamental requirements of the vessels, and JICA will assess the appropriateness of the request and prepare outline design.

4-2. Caroline Voyager

GoFSM requested the Team to further consider the necessary measures so as to extend Caroline Voyager's service life, taking the ship age of 15 years old into account. The Team will convey this request to JICA, and JICA will assess the appropriateness of the request.

5. Japan's Grant Aid Scheme

5-1. GoFSM understands the Japan's Grant Aid Scheme and necessary measures to be

taken by GoFSM. The Team explained the procedures for the Project as described in Annex-3 and Annex-4.

5-2. GoFSM agreed to take the necessary measures, as described in Annex-5 for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Study

6-1. The Team will proceed further studies in the FSM until March 19th, 2013.

6-2. JICA will prepare the draft report and the draft specification in English and dispatch a mission in order to explain their contents around June, 2013.

6-3. If the contents of the report are accepted in principle by GoFSM, JICA will complete the final report and send it to GoFSM by August, 2013.

7. Budget Allocation

7-1. GoFSM agreed to allocate necessary annual budget for the new vessel's (1) operation and maintenance, and (2) continuous vessel classification.

7-2. The Team requested GoFSM to submit the expected annual budget plan for the new vessel to JICA by the end of May, 2013, and GoFSM agreed to submit it.

8. Other Relevant Issues

8-1. Both sides confirmed that it is essential that GoFSM undertake daily and periodic maintenance (including major overhaul) for the new vessel. Also, both sides confirmed that the new vessel to adopt Preventive Maintenance Policy (hereinafter referred to as "PMP"). GoFSM agreed to implement PMP system, and carry out preventive maintenance works properly in accordance with the PMP system, to prolong the new vessel's life term.

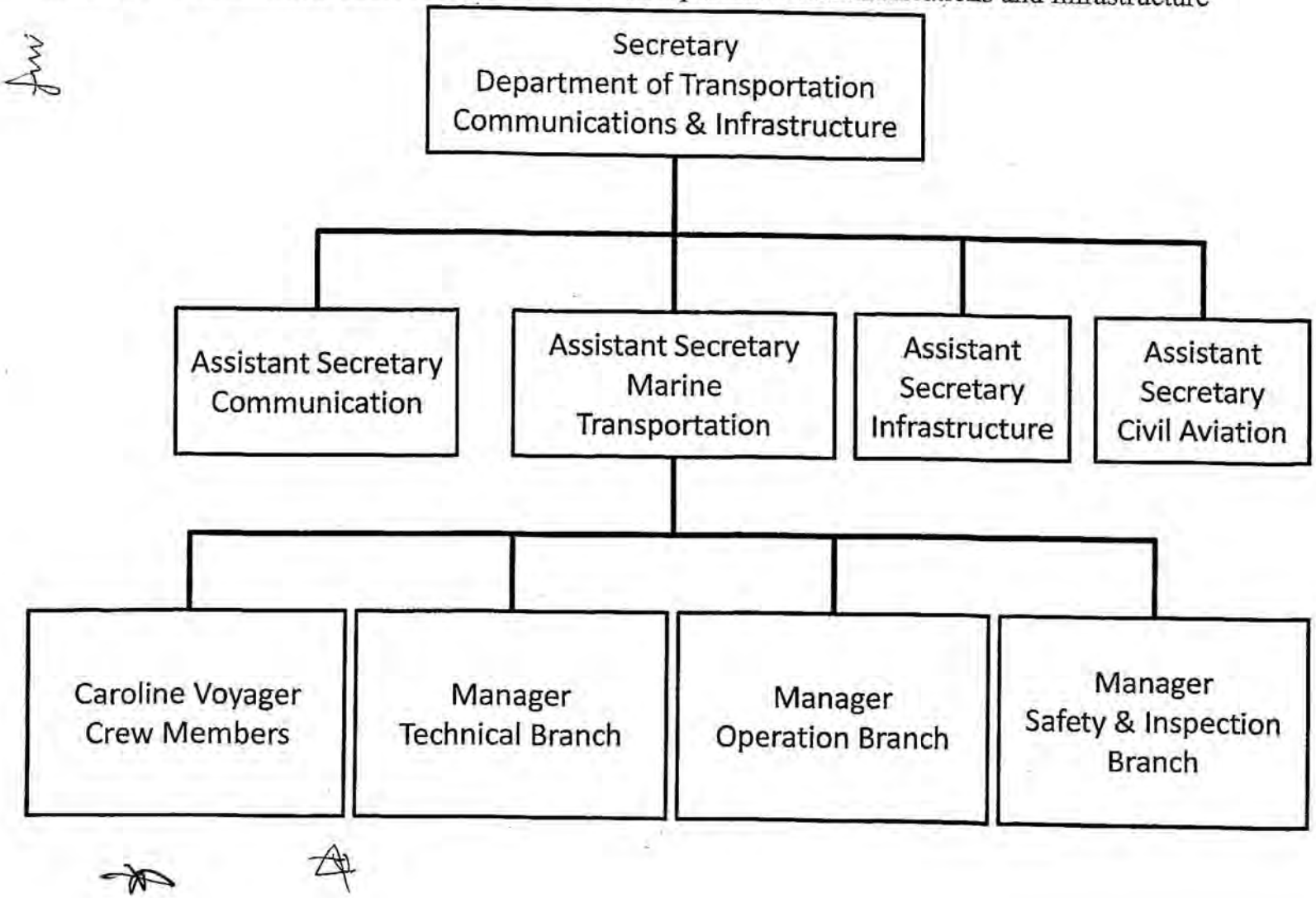
8-2. Both sides confirmed that overloaded operation of passengers onboard is not allowed, and it's safety should be controlled and secured by domestic law and regulation. Both Sides confirmed that the new vessel building and operation should satisfy domestic safety standard of the GoFSM or the Safety Regulations for Non-Convention Vessel (SRNCV), suva 2002.

8-3. Both sides agreed that GoFSM will employ sufficient number of qualified officers and crews for the new vessel in proper timing.

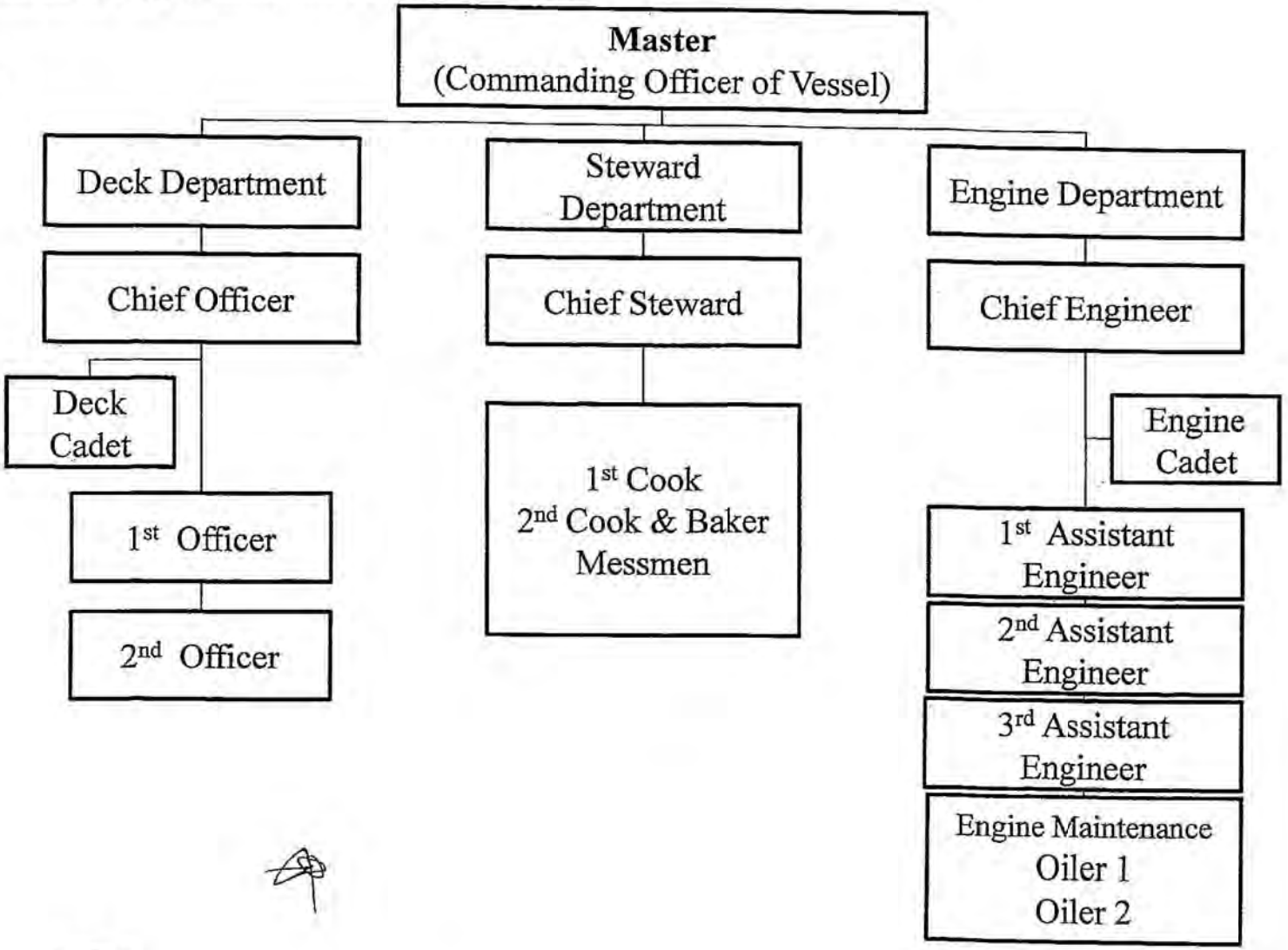
Annex-1 Project Site
Annex-2 Organization Charts
Annex-3 Japan's Grant Aid
Annex-4 Flow Chart of Japan's Grant Aid Procedures
Annex-5 Major Undertakings to be taken by Each Government

Annex1 Project Site

Annex2-1 Organization Chart of Department of Transportation Communications and Infrastructure



Annex2-2 Organization Chart of Merchant Vessel



JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants
For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey
JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A
After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants
In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country
Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"
The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country
In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"
The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"
The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

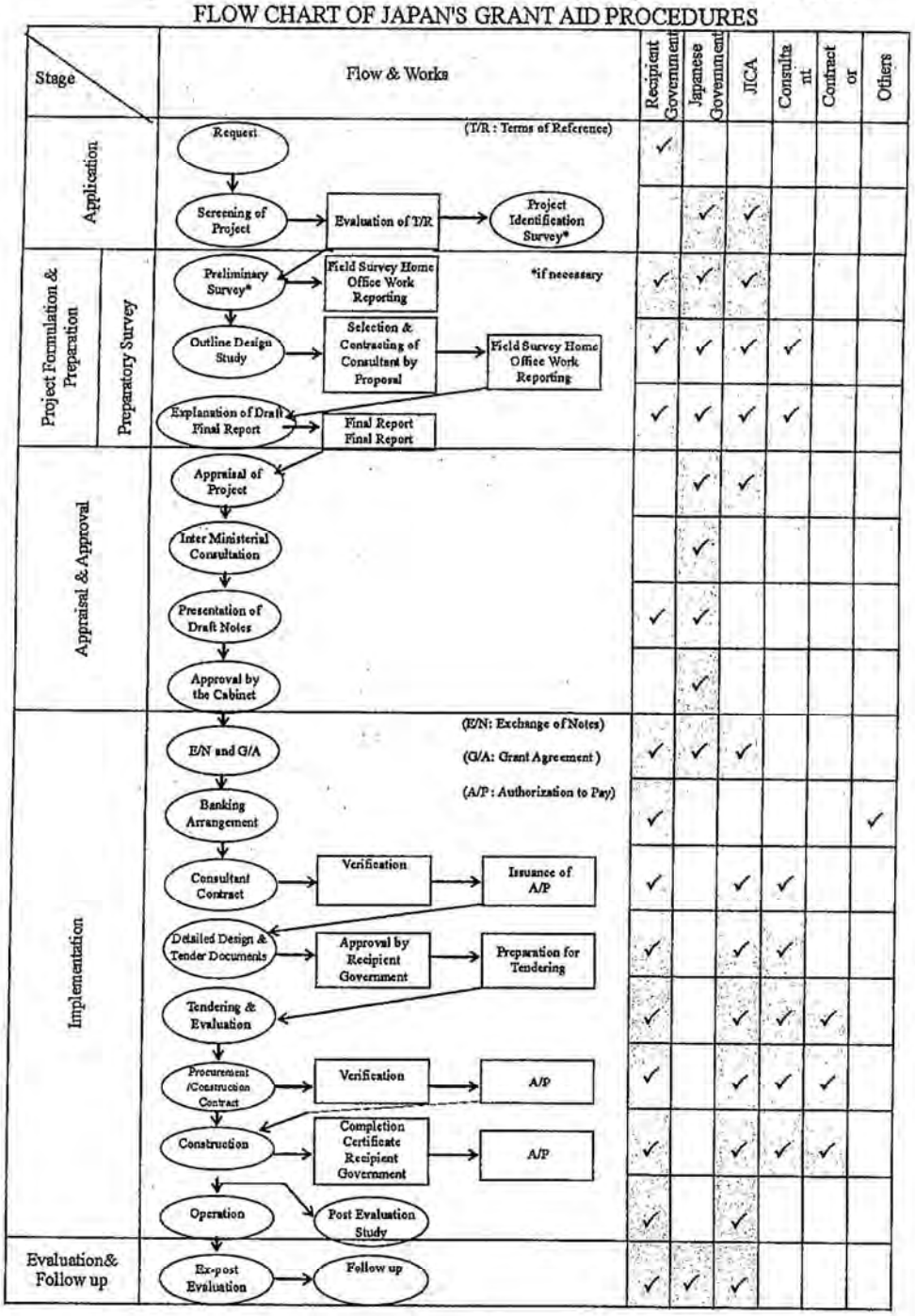
b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations
A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

Annex-4 Japanese Grant Aid Flow Chart

FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



Annex-5

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To design and construct the vessel	•	
2	To procure equipment to be covered under the Project	•	
3	Any items which are not covered under the Project, e.g. rehabilitation of existing wharf, etc.		•
4	Allocate the appropriate budget and/ or subsidies and conduct the undertakings in a timely manner necessary for proper operation and maintenance of vessel to be provided and Caroline Voyager (procurement of fuel, spare parts and overhaul of the vessel)		•
5	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the products from Japan to the recipient country (Sailing of the new vessel with equipment on board by their own propulsion)	•	
	2) Tax exemption and custom clearance of the products (vessel with equipment on board) at the port of disembarkation (homeport)		•
6	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted / be borne by the Authority without using the Grant		•
7	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
8	To ensure that the vessel be maintained and used properly and effectively for the implementation of the Project		•
9	To issue letter, certificate, license and other necessary documents necessary for designing, delivery, construction and operation of the vessel (example: exemption from ILO Maritime Labour Convention, issuance of radio station license , Provisional Certificate of Registry)		•
10	To bear all the expenses, other than those covered by the Grant, necessary for implementation of the Project		•
11	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•

(B/A : Banking Arrangement, A/P : Authorization to pay)

4-2 Explanation of Draft Report

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR IMPROVEMENT OF DOMESTIC SHIPPING SERVICES IN THE FEDERATED STATES OF MICRONESIA
(EXPLANATION OF THE DRAFT OUTLINE DESIGN REPORT)

In March 2013, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Preparatory Survey Team for the Project for "Improvement of Domestic Shipping Services in the Federated States of Micronesia" (hereinafter referred to as "the Project") to the Federated States of Micronesia (hereinafter referred to as "FSM"). The Preparatory Survey Team held a series of discussions with the concerned officials of the Government of FSM (hereinafter referred to as "the FSM side") and conducted field survey. After returning back to Japan, based on the discussions, field survey results and technical examination, JICA prepared a draft report of the survey.

In order to explain and discuss with the FSM side on the contents of the draft report, JICA sent to FSM, the Explanation Team for the Draft Outline Design Report of the Preparatory Survey (hereinafter referred to as "the Team"), which is headed by Mr. Hiroyuki Hayashi, Director, Peace Building and Urban and Regional Development Division 2, Economic Infrastructure Department, JICA, from June 10 to June 15, 2013.

As a result of the discussion, both sides confirmed the main items described in the attached sheets.

Pohnpei, June 12, 2013

Hiroyuki Hayashi

Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Phillip Joseph

Acting Secretary
Department of Transportation,
Communication and Infrastructure
The Federated States of Micronesia

Witnessed by;

Hon. Lorin S. Robert

Secretary
Department of Foreign Affairs
The Federated States of Micronesia

ATTACHMENT

1. Components of the Draft Outline Design Report
   The FSM side agreed and accepted in principle the contents of the Draft Outline Design Report of the Preparatory Survey.

2. Japan's Grant Aid Scheme
   The FSM side reconfirmed the Japan's Grant Aid scheme. The FSM side reassured to take the necessary measurements as explained by the Preparatory Survey Team and described in the Annex-3 of the Minutes of Discussions(hereinafter referred as "the M/D") signed by both sides on March 11, 2013.

3. Schedule of the Study
   JICA will complete the Final Outline Design Report of the Preparatory Survey in English, in accordance with the confirmed items and send the report to the FSM side through JICA Micronesia Office by the end of August, 2013.

4. Cost Estimation
   Both sides agreed that in order to secure a fair and equitable procurement, the Project Cost Estimation attached in Annex-I should never be duplicated or released to any third parties before the signing of all the Contract(s) for the Project.

5. Other Relevant Issues

5-1. Both sides confirmed that budget necessary for operation and maintenance of the vessels existing Caroline Voyager (hereinafter referred as "C/V") and new cargo/passenger vessel (hereinafter referred as "the plan vessel"), should be allocated by the FSM side.

5-2. Both sides confirmed that it is essential that the FSM side undertake daily and periodic maintenance (including major dry-dock overhaul) for both C/V and the plan vessel, and also confirmed to adopt PMP (Preventive Maintenance Policy) for both vessels. The FSM side agreed to implement PMP system properly, exchange and clean parts as scheduled, in order to prolong the vessel's life term.

5-3. Respond to the additional request of the FSM side on spare parts for C/V, dated March 12, 2013, JICA considered necessity and basic responsibility on maintenance of the FSM side and agreed to include them into the Project scope. Both sides confirmed that operation in order to satisfy transport demands in FSM, the role of C/V is indispensable. Both sides agreed on the spare parts for C/V those have been selected by the viewpoint of necessity for newly introducing PMP for the C/V.

5-4. Both sides confirmed that the adequate storage for spare parts to introduce PMP for C/V and the plan vessel will be prepared by the FSM side in proper time schedule.

5-5. Both sides agreed on changing the Project name from "Project for Improvement of Domestic Shipping Services in the Federated States of Micronesia" to "Project for Improvement of Domestic Shipping Services" complying to the general rule of project naming.

5-6. Both sides confirmed that 3 members, Captain, Chief Engineer and 1st Assistant Engineer will participate to the operational training in Japan and the cost of the training will be covered by Japanese side.

Annex-1 : Project Cost Estimation

Annex – 1 : Project Cost Estimation

This page is closed due to the confidenciality.

5. References

(1) Spare parts list requested from FSM

Government of the Federated States of Micronesia
Department of Transportation, Communication & Infrastructure
P.O. Box PS-2 Palikir, Pohnpei FM 96941

Office of the Secretary

March 12, 2013

TH Furuichi Masahiko
Senoir Advisor
Japan International Cooperation Agency
5-25, Niban-Cho,Chiyoda-ku
Tokyo, Japan 102-8012

Dear Furuichi-San:

Attached hereto, please find additional extremely needed replacement parts for the Caroline Voyager.

Thank you.

Sincerely,

Phillip Joseph
Acting Secretary

Tel. No. (691) 320-2381/2865/5829 Fax No: (691) 320-5853 E-mail: transad@mail.fm

M/V CAROLINE VOYAGER

For Generator Engines Yanmar 6 HAL-HTN Diesel engines

Item	Description	Part#	Qty	Unit Price
1	LO Cooler Assy		4set	$5,300.00
2	Fresh Water Cooler Assy		2set	$8,640.00
3	Inter Cooler		6set	$4,850.00
4	Gasket, Inter Cooler		10set	$43.00
5	O-ring, Inter Cooler		20set	$13.00
6	Gasket, Air Duct		20set	$24.00
7	CoverA,FW Cooler	126664-44310	4set	$330.00
8	O-ring, FW Cooler	24321-002100	20set	$7.00
9	Sanitary pump assembly	50-PCSL2-2P	2set	$11,000.00
10	Fuel Oil Elements	41650-502330	50set	$28.00
11	Oil/Water Separator Element	120324-55760	50set	$30.00
12	Fuel Filter(Generator engine)		100set	
13	Shell sets, main crankshaft bearings		28	
14	Shell sets, Connecting rod bearings		28	
15	Gasket kit, overhaul		4	
16	Fuel Injection nozzle		48	

MAIN ENGINES YANMAR M220-UN

17	Fuel Filter Elements		100set	
18	Shell sets, main bearing		28	
19	Shell sets, connecting rod bearing		28	
20	Piston assembly		10	
21	Piston ring sets		24	
22	Cylinder liner		10	
23	Gasket kit, overhaul		4	
24	Fuel injection pumps		12	
25	Fuel injection nozzles		48	
26	Cylinder heads assembly		10	

(2) Memorandum

Memorandum

Subject: The Project for Improvement of Domestic Shipping Services in the Federated States of Micronesia
Date: 07 Mar. – 19 Mar. 2013
Place: Palikir, Pohnpei, FSM

1. Working Group members and JICA Survey Team discussed the design of the new cargo/passenger vessel and established a base design as shown on the Appendix-2 CPax Vessel Design which shall be approved by JICA.

2. Working Group requested for training of the following members before the delivery of the new cargo/passenger vessel, and the Survey Team agreed to convey the request to JICA.

   First Engineer in addition to Captain and Chief Engineer at the shipyard and/or the engine manufacturer.

3. Working Group agreed that items and numbers of the spare parts necessary for the Preventive Maintenance Policy system of Caroline Voyager will be studied in Japan by the JICA Survey Team and submit to JICA for approval.

4. Working Group agreed to prepare the adequate storage space for the new vessel's spare parts and Caroline Voyager's spare parts, which can be accommodated in the storage under construction at Palikir and the Government Storage in the Port.

5. Working Group and JICA Survey Team agreed that $14m^3$ holding tank is suitable and sufficient considering the new vessel's operation.

Date: March 19, 2013

Kuniaki Takahashi
Project Manager
JICA SURVEY TEAM

Francis I. Itimai
Secretary
Department of Transportation, Communication and Infrastructure
The Federated States of Micronesia

1

Appendices:

Appendix - 1	List of Participant
Appendix - 2	CPax Vessel Design

Appendix-1: List of Participant of the technical discussion

Assistant Secretary, DTCI	Mr. Leo Lokopwe (Chairman)
Master Caroline Voyager	Capt. Yoshino Weilbacher
Auxiliary Master Caroline Island	Capt. Mathias Mangmog
Relief Captain Caroline Voyager	Capt. Patrick Peckalibe
Safety Inspection Manager, DTCI	Mr. John Tiegmai
Technical Branch Manager, DTCI	Mr. Louis Malfin

Preparatory Survey Team

Project Manager, JICA Survey Team	Mr. Kuniaki Takahashi
Member, JICA Survey Team	Mr. Shuhei Soeda
Member, JICA Survey Team	Mr. Akio Maruyama
Member, JICA Survey Team	Mr. Koji Takeshita
Member, JICA Survey Team	Mr. Yuichi Wachi

Appendix - 2 CPax Vessel Design (ver.3)

1) Principal particulars	
Type of the vessel	Cargo passenger vessel
Service area	Domestic water of the FSM
Cargoes	General cargoes
Flag	Federated States of Micronesia
Classification	Nippon Kaiji Kyokai (NK)
Rules to apply	Maritime rules of the FSM
	Safety Regulations for Non-Convention Vessels (SRNCV)
	International Convention on Tonnage Measurement of Ships
	International Convention on Load Line
	International Convention for the Prevention if Collisions at Sea
	International Convention for the Prevention of Pollution from Ships
	Rules of the Classification Society
Length overall	59.00 m
Length bp	53.00 m
Breadth, molded	10.80 m
Depth, molded	4.60 m
Service draft	3.50 m
Scantling draft	3.60 m
Gross tonnage, international	About 890 tons
Deadweight (serv. d)	About 640 t (metric)
Deadweight (sct. d)	About 690 t (metric)
Loaded speed	About 10.5 knots at service draft
Main engine	368 kW (500 ps) x 2
Complement	453 p total
Indoor passenger	16 p
Outdoor passengers	407 p
Crew	28 p
Owner	1 p
Treatment room	1 p
Tank Capacity	
Fuel oil tank	About 160 m^3
Fresh water tank	About 160 m^3
Water ballast tank	About 160 m^3
Cargo hold	About 700 m^3
Reefer cargo hold	-25°C 12 m^3

2) Accommodation		
	Indoor passenger room	Two bunk room x 8
	Outdoor passenger space	Nos. pax: 407 p Area : 1 m^2 / person Deck: Artificial timber grating Shipside: Plastic plated up to handrail height and roll-up canvas above
	Captain's cabin	Single bunk, with toilet facility
	Chief Engineer's cabin	Single bunk, with toilet facility
	Crew cabin	1 bunk room x 2 2 bunk room x 4 4 bunk cabin x 4
	Owner room	Single bunk, with toilet facility
	Treatment room	Single bunk, with toilet facility
	Crew mess room	Mess table for 21 crew
	Passenger mess room	Mess table for 10 passenger
	Galley equipment	1 x Electric cooking range(3 x hot plate @4 kW) 1 x Hot water boiler (10lit, 1 kW) 1 x Fridge (about 450 lit) 1 x Microwave 1 x Rice cooker (3.6 lit) 1 x Ice cube machine (20 kg /day) x 1 Furniture, e.g. sink, shelves, storage complete
	Canteen equipment	1 x Hot water boiler (10lit, 1 kW) 1 x Microwave 2 x Fridge (Low counter type) 2 x Chilled water fountain (outside) Furniture, e.g. wash basin, shelves, storage, etc
	Washing equipment	2 x Washing machine, about 6 kg 2 x Dryer
	Crew toilet	Common toilet: WC x 2, shower x 2 x 2 Shared toilet: WC + shower x 1 x 1
	Pax toilet	WC x 23, shower x 4
	Ref Prov. Store	$8m^3$:-25℃, $8m^3$:+8℃ Ref. compressor 100% x 2
	Dry Prov. Store	8m3
	Structural fire protection	According to the SRNCV regulations
	Sewage handling	Direct discharge and holding tank Discharging pump: Cutter type 6 m3/h x 8m x 2 Holding tank capacity: 14m3 x 1

3) Cargo hold		
	Cargo hatchway	7.15 mL x 6.0 mW x 1 6.05 mL x 6.0 mW x1 Hatch cover: Steel hatch beams + timber hatch boards + tarpaulin (2) + battens and wedges
	Cargo hold lining	Tanktop: None Shipside: 30mmT timber sparring Transverse bulkhead: none
	Double bottom tanktop strength	Axle load: not specified Area load: per Rule load
	Cargo lashing	Inside cargo hold: none Upper deck: D-rings in the area in front of No.1 hatch and eye plates on steel bulwark
	Cargo protection awning	Canvas awning for No.1&No.2 cargo hatch
	Ventilation	Natural supply from No.1 hold fore > mechanical exhaust from No.1 hold aft Natural supply from No.2 hold aft > mechanical exhaust from No.2 hold fore
4) Fuel oil and fresh water supply system		
	Diesel oil supply	Filling Station: Aft of No.2 hatch Diesel oil supply pump: Centrifugal 15m^3/h x 1 in engine room Delivery pipe bore: 65A
	Fresh water supply	To be supplied by the engine room general service pump Delivery pipe bore: 40A
5) Deck machinery		
	Windlass	Hydraulic driven x 1 Chain wheel: 42kN x 9m/min x 2 Hawser drum: 25kN x 15m/min x 2 (rope capacity each 30mm ϕ x 140m) Warping drum x 2 Local control
	Anchor	Stockless high holding type 855kg x 2 + 1(spare) (equipment number 360 - 400)
	Anchor chain	φ30 ㎜ grade U2 14 shackle length (385m) x 1
	Towing rope	φ24 ㎜ x 180m x 1 SWR (6 x 24)
	Rule mooring rope	φ32 ㎜ x 140m x 4 polypropylene class-2
	Working mooring rope	φ50 ㎜ x 50m x 4 nylon
	Mooring Capstan	Hydraulic driven x 1

		Duty: 25kN x 15m/min Local control
	Cargo derrick	SWL3/(u)2t x 2 gangs with derrick boom x 4 Cargo winch: Hydraulic 29.4/14.7kN x 10/20m/min x 4 Topping winch: Combined with the cargo winch Control on the winch platform
	Hydraulic pump unit	To supply hydraulic oil to the cargo derrick winches, the windlass and the mooring winch. Pump unit: 100% x 2 Stainless steel pipe on deck and steel pipe inside
	Rudder	Balanced spade rudder x 2
	Steering gear	Electro hydraulic x 1 Pump unit: 50% x 2 Helm angle 35 deg to both sides
	Rudder roll stabilizer	1
	Sea boarding gangway	Aluminum accommodation ladder x 2
6) Lifesaving apparatus		
	Inflatable liferaft	SOLAS A PACK for 25p x 19
	Rescue boat	1xAbout 7.5mx2mx0.8m, FRP, with 40ps outboard (double deck type) To use one of workboat as the non-SOLAS rescue boat outfitting as required by the SRNCV rule. Launching and recovery by lifting cargo derrick.
	Lifejacket (solid type)	For all complement 453 For duty crew 4 For children 46 For workboat embarkation 20
	Life buoy	4 (1 with self-igniting light, 1 with buoyant line, 2 with self-igniting smoke signal)
	Parachute signal	4
	Red flare	4
	Smoke signal	4
7) Firefighting equipment		
	Fire hydrant	Type: 40A bore Nakajima type coupling
	Fire hose, nozzle and fire locker	Nozzle: Fog/jet dual nozzle 12mmφ Hose : 15m 40A bore
	Portable fire extinguisher	As per rule with 100% spare charges
	Emergency fire pump	Diesel driven x 1 in the sewage tank room

	Firefighter's outfit	1 set (breathing apparatus, fire cloths, safety belt, de-smoke helmet, de-smoke mask, safety lamp and fire axe)
8) Ventilation and natural lighting		
	Engine room vent	E. axial flow fan (reversible) x 2
	Deck Store	E. axial flow fan (exhaust) x1
	Boatswain store	E. axial flow fan (exhaust) x1
	Cargo hold	E. axial flow fan (exhaust) x 2
	Steering gear room	E. axial flow fan (exhaust) x1
	Seawage tank space	E. axial flow fan (exhaust) x1
	Galley/mess room	E. axial flow fan (exhaust) x 1
	Toilet	E. pipe fan
	Air conditioning	Served area: Crew and pax cabins, wheelhouse and galley/mess room (passage and toilet are not served) Temp cond.: Outside 32 deg C/80%RH → inside 27 deg C/50%RH 70% recirculation Compressor 60% x 2
	Window	Aluminum frame
9) Machinery		
	Main engine	4 stroke cycle trunk piston marine diesel engine x 1 Rated output ≥ 368 kW (500ps) Rated rev. ≤ 1,500 rpm Fuel oil Marine diesel oil Starting By air
	Reduction reversing gear	Output rev About 300 rpm Clutch Wet multi-plate
	Propeller and shafting	Propeller 4 blades solid, about 1940 mm x 1 Tailshaft Forged steel Stern tube Cast iron Water seal Mechanical lip seal Bearing Seawater lubricated EVR Stern tube seal Mechanical lip seal Rotation Outward
	Main generator	Generator 130 kVA (104 kW) x 450V x 3φ x 60Hz x 2 Fuel oil Marine diesel oil Starting By air
	Emergency generator	33kW x 450V x x 3φ x 60Hz x 1
	Main air compressor	E.driven 2 sets

	Auxiliary air compressor	Diesel driven 1 set
	FO transfer pump	E. horiz. gear 2 m^3/h x 0.2 MPa x 0.75 kW x 2
	Fire/bilge/ballast/general service pump	E. horiz. centr. 35/25 m^3/h x 0.2/0.40 MPa x 7.5 kW x 2
	Fresh water pump	E. water pump 5 m^3/h x 0.16 MPa x 0.75kW x 2
	Sewage discharge pump	Cutter type 6 m3/h x 8m x 2
	Sludge discharging pump	E. horiz. screw 1.0 m^3/h x 0.39 MPa x 1.5kW x 1
	Diesel oil supply pump	E. horiz. centr. 15 m^3/h x 0.12 MPa x 1.5kW x 1
	Engine room bilge pump	E. piston 1 m3/h x 0.2 MPa x 1.5 kW x 1
	Oily water separator	<15ppm x 1
	Fuel oil purifier	Electric x 1
	Lub. oil purifier	Electric x 1
	Fresh water sterilizer	UV type x 1
	Water maker	Reverse osmosis 5.0 t/day x 1, at 30 deg C nylon module To attach 2 sets of spare modules (Important to operate continuously without stopping)
	Flow meter	For main engine x 1 (digital reading and remote monitoring) For gensets x1 (digital reading and remote monitoring)
	Machine tools	Lathe 0.5 mL x 0.4 kW, grinder 200 mm x 0.4 kW, drilling machine 13 mm x 0.4 kW, workbench, e.arc welding machine 250 A, Chain block 0.9 t x 1, MIG welding machine, gas cutting set, hand tools, shelves, etc.
	Engine room tanks	Diesel oil service tank Lube oil storage tank Sludge tank (double bottom) Wash oil tank Fresh water hydrophore tank
	Engine monitor room	Engine monitor console and air-con
	Engine monitor	Dual CPU + monitor + printer set Extension at C/E cabin using PC
10)	Electric supply	
	Main switchboard	Deadfront Generator panel, feeder panel (AC440V and AC110V), starter panel, earth alarm
	Transformer	450/115 V 15 kVA
	Charging discharging board	Place on upper deck or above, with rectifier
	Storage battery	For general use 200 AH x 2

		For radio use supplied by radio maker
	Shore supply	440V 3φ 40 kVA
11) Inboard communication		
	Engine telegraph	2:2
	Common battery telephone	1 set: DC24V wheelhouse, mess rooms, engine room, engine monitor room and steering gear room
	Public addressor	1 set: amplifier and speakers
	General alarm	1 set
	Alarm bell	1 set
12) Navigation equipment		
	Magnetic compass	1 x desktop type 150mmφ, spare bowl x 1
	Gyro compass	1
	GPS compass	1
	Steering control	1 (Gyro and GPS autopilot))
	Radar	2 abt 19" LCD
	Echo sounder	1 x LCD
	GPS	1 x GPS with 10" LCD plotter
	Air horn	1
	M/E rev indicator	2 + 2(EMR)
	Prop shaft rev indicator	2 + 2(EMR)
	Helm indicator	1 +1(EMR)
	Window wiper	2
	Wind vane anemometer	1
	Bridge console	Main engine control and alarm Telephone PA microphone Engine telegraph
13) Lighting		
	On board lights	LED
	Navigation lights	1 set per COLREG
	Floodlight	400W Halogen x 9
	Searchlight	500W incandiscent light x1 local contriol
	Day light	1
14) Radio apparatus (Based on GMDSS A3)		
	VHF radiotelephone	2: with DSC and DSCWR
	MF/HF radio telephone	1: 150W with DSC and DSCWR
	Inmarsat C	1 (Felcom 16 or equivalent)

	EPIRB	2
	Navtex	None (No NAVTEX broadcasting in the South Pacific region). Letter of exemption from GoFSM).
	SART	2
	Two-way portable VHF	3
	Aircraft rescue radio	1
	AIS	1
	Walkie talkie	4
15) Alarms		
	General alarm	1 set
	Engine room bilge alarm	1 set
	Bridge navigation watch alarm system (BNWAS)	1 set
16) Materials		
	Hull	Mild steel (NK class)
	Pipe material	
	Engine room seawater	Polyester resin lined inside
	Fresh water	Steel in engine room and stainless steel or plastic in accommodation
	Hydraulic oil	Stainless steel (exposed part) and steel (inside)
	Piping installation	Pipe sections with flange connection at suitable interval allowing easy dismantling
	Paint	
	Bottom	Epoxy AC + Tin-free SPC AF at 2 years life
	Ship side	Epoxy
	Cargo hold	Epoxy
	Superstructure	Modified epoxy
	Exposed deck	Modified epoxy for deck
	Engine room bottom	Epoxy
	Deckhouse inside	Alkyd resin
	Fresh water tank	Epoxy for drinking water
	Ballast water tank	Epoxy
	Sacrifice anode	Zn plates

PMP (Preventive Maintenance Policy) spare parts

MAIN ENGINE	
Cylinder head assembly	1 engine
Piston and connecting rod assembly (with crank pin metal)	1 engine
Piston ring	1 engine
Cylinder liner assembly (with seal, ring, etc.)	1 engine
Main bearing (base and center) and thrust bearing metal	2 engine
Crank pin metal	2 engine
Connecting rod bolt	2 engine
Fuel injection pump complete	1 engine
Fuel injection valve	2 engine
Nozzle assembly	2 engine
Fuel oil injection pipe	1 engine
Suction valve, valve seat and valve guide	1 engine
Exhaust valve, valve seat and valve guide	1 engine
Governor	1 engine
Turbocharger	1 engine
Gasket for turbocharger	1 engine
Engine driven pumps (FW, SW, FO, LO)	1 engine
Cooling fresh water thermostat and seal	1 engine
Engine attached cooling seawater pipes (steel and rubber)	1 engine
O ring and seal packing for special survey overhaul	4 engine
LO and FO filter element (in case of paper filter)	12 engine
Pressure gauge	2 engine
Thermometer	2 engine
Pressure switch and temp switch	2 engine
Tachometer	2 engine
Cooling fresh water chemical and test kit	1
Tool for piston ring insert	1
Cylinder liner withdrawing tool	1
GEAR BOX	
LO pump	1 engine
LO cooler side cover	1 engine
Pressure gauge	2 engine
O ring, seal packing for special survey overhaul	4 engine
LO filter element (in case of paper filter)	12 engine

SHAFTING

Propeller (port and starboard, no cap required)	1 ship
Mechanical seal ring and associated parts	1 ship
O ring for propeller	1 ship

MAIN GENERATOR ENGINE

Cylinder head assembly	1 engine
Piston ring	1 engine
Main bearing (base and center)	1 engine
Crank pin metal	1 engine
Fuel injection pump complete	1 engine
Fuel injection valve	2 engine
Nozzle assembly	2 engine
Governor	1 engine
Turbocharger	1 engine
Gasket for turbocharger	1 engine
Engine driven pumps (FW, SW, FO, LO)	1 engine
Cooling fresh water thermostat and seal	1 engine
Engine attached cooling seawater pipes (steel and rubber)	1 engine
O ring and seal packing for special survey overhaul	4 engine
LO and FO filter element (in case of paper filter)	12 engine
Pressure gauge	2 engine
Thermometer	2 engine
Pressure switch and temp switch	2 engine
Tachometer	2 engine

SHELL AND TUBE COOLERS

Including engine mounted coolers:

O ring and seal packing	2 ship

ANODES

Anodes for bottom hull	1 ship
Anode plate and bar for engine room cooling seawater system	4 ship
Engine attached anode plate and bar for cooling seawater	4 ship
Packing for above	2 ship
Zinc anodes for propeller shaft	2 ship
Sacrifice pipe piece	1 ship
Zinc round bar 1m	2

GENERATOR	
Ball bearing	1 ship
LIGHTING	
Navigation light	100%
Projector bulb	100%
Search light bulb	100%
LED light	10%
Glass glove	Each size 2
Fuse element	Each size 5
Receptacle and plug (waterproof))	1 set
Receptacle and plug (non-waterproof))	1 set
Switch (waterproof)	1
Switch (non-waterproof)	1