# CHAPTER 3

# BASIC DESIGN

# OF EXPLORATION VESSEL

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## 3-1 Basic Principle

The basic principles for design of the exploration vessel are as follows:

1) The ship size is 500 GT (Japanese Government tonnage).
2) The exploration vessel should be equipped with the n-cessary survey equipment.

## 3-2 Exploration Method

The desital method was adopted out of the two seismic exploration methods namely desital method and analogue's taking those advantages into consideration that the merit born in data analysis work on the ground and the continued viability as a major system in the future. The exploration vessel will not be provided with a survey boat, however a landing boat and a service boat of 6-man capacity are adopted instead.

## 3-3 Basic Design

The final plan based on detailed reviews is shown in the following.

# SPECIFICATIONS

# OF

# GEOPHYSICAL/GEOLOGICAL SURVEY VESSEL

1. General

The vessel to be designed and constructed as single screw, single rudder, twin diesel engine driven, long f'cle deck type geophysical/ geological survey vessel, and to be engaged in research at the sea of not more than 200ms depth within 200 nautical miles economical zone of the Republic of Philippines.

2. Classification

American Bureau of Shipping (A.B.S.) ✠A1 Ⓔ and ✠AMS.

3. Applied Rule

Rules and Regulations of the Classification Society

International Load Line Convention, 1966

International Tele-communication Convention (Radio Regulations)

International Convention for the Safety of Life at Sea, 1974 with exception of requirements on life boat

International Convention for the Prevention of Pollution from Ships, 1973

Inter-national Regulations for Preventing Collisions at Sea, 1972

Philippine Merchant Marine Rules and Regulations as applicable to government survey vessel

4. Flag

The Republic of the Philippines

5. Principal Particulars

| | |
|---|---|
| Length, overall | abt. 53.5 m |
| Length, b.p. | 45.00 m |
| Breadth, moulded | 10.00 m |
| Depth, moulded | 4.80 m |
| Designed fully loaded draught, moulded | 3.60 m |

| | |
|---|---|
| Gross tonnage (By Japanese measurement rule) | abt. 500 tons |
| Deadweight at designed fully loaded draught 3.6 m | abt. 280 metric ton |
| Fuel oil tanks (100% full) | abt. 90 $m^3$ |
| Fresh water tanks (100% full) | abt. 145 $m^3$ |
| Water ballast tank (100% full) | abt. 15 $m^3$ |
| Lubricating oil tank (100% full) | abt. 2 $m^3$ |

Trial speed at maximum continuous output of main engines, at about 20% deadweight condition with clean bottom in calm weather and smooth deep sea.

12.0 knots

Service speed on the designed fully loaded draught of 3.60 m, at 90% MCR of main engines with 15% sea margin.

abt. 11 knots

Endurance based on total fuel oil tank capacity and ship's speed of 11 knots.

abt. 4,200 nautical miles

Navigating period to be 30 days at sea including 7 days at service speed about 11 knots and 23 days at survey speed about 6 knots.

| Complement | | |
|---|---|---|
| | Officer | 9 |
| | Crew | 12 |
| | Scientist | 9 |
| | Guest | 1 |
| | Total on board: | 31 persons |

6. Material and Workmanship

Steel and other material, machinery and equipment to be Japanese make and in accordance with Classification Society Requirement in general.

7. Hull Construction

The vessel to be constructed of steel, and electric welding to be adopted for the entire hull structure.

The scantling to be in accordance with the Classification Society Requirements.

8. Painting

Steel plates and bars to be prepared by shotblasting and coated with long exposure type primer.

Painting scheme to be as follows:

| | | |
|---|---|---|
| Outer shell below water line | A/C | 2-coat |
| | A/F | 2-coat |
| Outer shell above water line | A/C | 2-coat |
| | Finish paint | 2-coat |
| In board | A/C | 2-coat |
| | Finish paint | 1-coat |
| Deck house | A/C | 2-coat |
| | Finish paint | 2-coat |
| Deck | A/C | 2-coat |
| | Finish paint | 1-coat |

9. Cathodic Protection

Suitable number of aluminum alloy anode to be fitted.

10. Hull Equipment

10.1 Deck Machinery

| | | |
|---|---|---|
| Steering gear | Electro-hydraulic ram type with two (2) pump units, one (1) act as a stand-by | |
| | 2.5 T-M | 1 set |
| Windlass | Electric driven with two (2) gypsy wheels and two (2) warping heads | |
| | 4.5 T x 9 M/Min. | 1 set |
| Mooring capstan | Electro-hydraulic driven vertical shaft, one (1) warping head type | |
| | 2.0 T x 15 M/Min. | 1 set |
| Bow thruster | Electric driven with controllable pitch propeller, abt. 2T thrust | |
| | | 1 set |

| | | |
|---|---|---|
| Deck crane | Hydraulic driven, slewing and luffing type | |
| | 2.0T x 10M max. radius | 1 set |
| Hydraulic power unit | Electric-motor driven for capstan, deck crane and winch, | 1 set |
| | (Note: Each machinery not to be operated simultaneously) | |

10.2 Life Saving Equipment

2 - Life rafts for 20 persons
31 - Life jackets
8 - Life buoys
6 - Rocket signals
12 - Parachute signals
4 - Self-igniting lights
3 - Self activating smoke signals
1 - Life line throwing apparatus

10.3 Fire Fighting Equipment

$CO_2$ fire extinguishing system for engine room.

Fire hydrant system for accommodation space according to the Classification Society requirements.

10.4 Air-Conditioning System and Ventilation

Two (2) sets of air-conditioning machines to be installed to serve as ventilation and/or cooling.

One (1) of them to be served for all cabins, public rooms and duty rooms.

The other to be served for measuring room, draft room and wet laboratories.

The system to be low velocity, single duct system and designed to meet following conditions.

| | Outside air | | Inside air | | Sea water Temp. |
|---|---|---|---|---|---|
| | Temp. | R. Humid | Temp. | R. Humid | |
| Summer | 35°C | 65% | 28°C | abt. 50% | 32°C |

Necessary mechanical ventilation and natural ventilation to be fitted.

10.5 Refrigerated Provision Chamber

Following refrigerated provision chamber to be provided.

| | Volume ($m^3$) | Maintained Temp. (°C) |
|---|---|---|
| Meat and Fish | abt. 8.5 | - 12 |
| Vegetable | abt. 5.5 | + 2 |
| Lobby | abt. 4 | - |
| Total: | abt. 18 | |

10.6 Window, Hatch and Door

All windows to be of Al-alloy frame with reinforced glass.

All hatches to be of steel with hinge up type covers having rubber gaskets and clampings.

Heavy weathertight or weather-tight steel doors to be fitted to the weather exposed entrances of living quarter and other compartments on the upper deck and f'cle deck.

Wooden sliding doors covered by F.R.P. to be provided for wheel house.

10.7 Anchors, Cables and Mooring Ropes

| | | |
|---|---|---|
| 2 - Bower anchor stockless | | 900 Kg each |
| 1 - Spare anchor stockless | | 900 Kg |
| 1 - Anchor chain cable with stud | | 26 MMø x 357.5 M |
| 1 - Towing rope | steel | 24 MMø x 180 M |
| 4 - Mooring rope | nylon | 24 MMø x 140 M |

10.8 Accommodation and Laboratories

As per attached plan.

## 11. Machinery

### 11.1 Main Engine

| | | |
|---|---|---|
| Type | : | Air started, 4 cycle, single-acting trunk piston, turbocharged and inter-cooled non-reversible fresh water cooling diesel engine |
| No. of set | : | Two (2) |
| Maximum continuous output | : | Not less than 600 ps |
| Revolution at MCR | : | Not more than 900 rpm |
| Fuel oil | : | Diesel fuel oil (Japanese A heavy oil) |

### 11.2 Main Reduction Gear

| | | |
|---|---|---|
| Type | : | Non-reversible reduction gear, with hydraulic multiple disc type clutch |
| No. of set | : | One (1) |
| Maximum transmitting output | : | Not less than 1200 ps |
| Gear ratio | : | Approx. 900/320 |

### 11.3 Shafting and Propeller

| | | |
|---|---|---|
| Intermediate shaft | : | One (1) |
| Propeller shaft | : | One (1) |
| Propeller | : | One (1) set<br>Three or four bladed controllable pitch type<br>Material: Aluminum bronze |
| Stern tube | : | Fabricated and welded steel construction type with reinforced rubber bearing |

## 11.4 Electric Generating Plant

1) Main generator

| | | |
|---|---|---|
| Type | : | Drip-proof, self-ventilating, brushless type |
| No. of set | : | Two (2) |
| Capacity | : | Approx. 140 KW, 445 V, A.C., 60 Hz, 3$\phi$ |

2) Main generator diesel engine

| | | |
|---|---|---|
| Type | : | Air started, 4 cycle, single-acting trunk piston turbocharged and inter-cooled fresh water cooling diesel engine |
| No. of set | : | Two (2) |
| Capacity | : | Approx. 220 ps x 1,200 rpm |

3) Emergency/port generator

| | | |
|---|---|---|
| Type | : | Drip-proof, self-ventilating, brushless type |
| No. of set | : | One (1) |
| Capacity | : | Approx. 30 KW, 445 V, A.C., 60 Hz, 3$\phi$ |

4) Emergency/port generator diesel engine

| | | |
|---|---|---|
| Type | : | Electric started, 4 cycle, single-acting trunk piston, radiator cooling diesel engine |
| No. of set | : | One (1) |
| Capacity | : | Approx. 50 ps x 1,800 rpm |

11.5 Pumps

| | | |
|---|---|---|
| * M/E reserve cooling fresh water pump | Motor driven centrifugal 25 $m^3/h$ x 20 m | 1 set |
| Cooling sea water pump for shafting system | Motor driven centrifugal 15 $m^3/h$ x 20 m | 1 set |
| Sea water service pump | Motor driven centrifugal 60 $m^3/h$ x 25 m | 1 set |
| Bilge/ballast pump | Motor driven centrifugal 30/60 $m^3/h$ x 35/25 m | 1 set |
| Fire/general service pump | Motor driven centrifugal 30/60 $m^3/h$ x 35/25 m | 1 set |
| Sanitary pump | Motor driven centrifugal 5 $m^3/h$ x 35 m | 1 set |
| Fresh water pump | Motor driven centrifugal 3 $m^3/h$ x 35 m | 1 set |
| Oily bilge pump | Motor driven piston 0.5 $m^3/h$ x 25 m | 1 set |
| * M/E reserve lub. oil pump | Motor driven gear 7.5 $m^3/h$ x 6 $kg/cm^2$ | 1 set |
| * Main R/G reserve lub. oil pump | Motor driven gear 9 $m^3/h$ x 18 $kg/cm^2$ | 1 set |
| Main fuel oil transfer pump | Motor driven gear 5 $m^3/h$ x 2.5 $kg/cm^2$ | 1 set |
| Aux. fuel oil transfer pump | Motor driven gear 3 $m^3/h$ x 2.5 $kg/cm^2$ | 1 set |

Note: The capacity of * marks pumps are subject to modification in accordance with main engine manufacturer's recommendation.

## 11.6 Air Compressors, Fans and Air Reservoirs

| | | |
|---|---|---|
| Main air compressor | Motor driven<br>6 $m^3/h$ (F.A.) x 30 $kg/cm^2$ | 2 sets |
| Emergency air compressor | Diesel engine driven<br>4.5 $m^3/h$ (F.A.) x 30 $kg/cm^2$ | 1 set |
| Air compressor for water gun | Motor driven<br>40 $ft^3/min.$ (F.A.) x 1,500 psi. | 2 sets |
| Engine room ventilating fan | Motor driven axial flow<br>200 $m^3/min.$ x 30 mmAq | 2 sets |
| Main air reservoir | 150 liters x 30 $kg/cm^2$ | 2 sets |
| Aux. air reservoir | 100 liters x 30 $kg/cm^2$ | 1 set |
| Air reservoir for water gun | 50 liters x 1,500 psi | 2 sets |

## 11.7 Miscellaneous Machinery

| | | |
|---|---|---|
| Oily bilge separator | Gravity type<br>0.5 t/h | 1 set |
| Lub. oil purifier for main engine | Motor driven disc bowl<br>Approx. 700 ℓ/h | 1 set |
| Lath | Motor driven<br>Center distance : 650 mm | 1 set |
| Drilling machine | Motor driven<br>Drill dia.: abt. 13 mm | 1 set |
| Grinder | Motor driven<br>dia.: 200 mm | 1 set |
| Electric welder | A.C. 300 amp. | 1 set |
| Gas welder set | Oxygen-Acetylene<br>40 ℓ bottle one each | 1 set |
| Air horn | 85 mmϕ | 1 set |

## 11.8 Engine and Propeller Control System

Control of start-stop of main diesel engines to be made at engine side in engine room.

Control of revolution of main diesel engines to be made at engine side in engine room and also to be remote control from the wheelhouse.

Control of reduction gear clutch on-off to be made at gear side in engine room, and also clutch off to be remote control from wheelhouse.

Propeller pitch to be controlled from wheelhouse and at oil distribution box in engine room.

## 12. Electric

### 12.1 System of Supply

Distribution system and their voltage to be as follows:

| Item | Voltage | Frequency | Phase | Conductor |
|---|---|---|---|---|
| Generator | 445 V a.c. | 60 Hz | 3 $\phi$ | 3 wire |
| Power motor | 440 V a.c. | 60 Hz | 3 $\phi$ | 3 wire |
| Do. (Fractional power motor) | 220 V a.c. | 60 Hz | 3 $\phi$ | 3 wire |
| Radio, communication & nautical equipment | 220 V a.c. or | 60 Hz | 1 $\phi$ | 2 wire |
| | 24 V d.c. | - | - | 2 wire |
| Lighting | 220 V a.c. | 60 Hz | 1 $\phi$ | 2 wire |
| Battery light | 24 V d.c. | - | - | 2 wire |

If 100 V a.c. is required as electric sources according to manufacturer's standard, 220/100/110 V transformer to be provided.

### 12.2 Transformer

| | For general service | For emergency service |
|---|---|---|
| Type | Drip-proof, self-cooled dry type | |
| No. of set | Three (3) | Three (3) |
| Output & voltage | 15 kVA x 445/225 V | 5 kVA x 445/225 V |

### 12.3 Battery

Type : Lead acid type

No. of set : One (1) set

Capacity : 24 V x 300 AH (at 10 hours rate)

### 12.4 Shore Connection Box

One (1) set of 440 V A.C., 60 Hz, 3 phase, 100 amperes, drip-proof type shore connection box.

12.5 Electric Lighting

In general, application of lighting fixtures to be as follows:

Fluorescent type : Cabins, public rooms, inside passage ways, main part of engine room

Incandescent type : Other spaces

12.6 Electric Interior Communication Equipment

1 set - Common battery telephone
(3 point, 4 point and 8 point system)

1 set - Engine order telegraph (Lamp type)

1 set - Electric propeller shaft tachometer

1 set - Clock

1 set - Public addressor (Output 50 W)

1 set - Rudder angle indicator

12.7 Electric Nautical Equipment

1 set - Gyro compass and auto pilot

1 - Master compass

5 - Repeater compass

1 - Steering stand

1 set - Navigation echo sounder

1 - Recorder

1 - Transducer

Oscillation frequency : 200 kHz

Max. depth range : 400 m

1 set - Radar (Relative motion)

1 - Display unit (dia. 12", 64 n. mile)

1 - Transceiver

1 - Scanner (abt. 7 ft.)

Wave length : 3 cm

Peak transmitting output : 25 kW

1 set - Radio direction finder

1 - Receiver

1 - Loop antenna

1 set - Electro magnetic log

1 - Log mechanism

1 - Speed distance transmitter

1 - Speed indicator

1 set - Wind speed & direction meter

1 - Transmitter

2 - Wind speed & direction indicator

12.8 Radio Equipment

1 set - SSB radio telephone

1 - Transmitter (Output max. 400 W)
Type of emission: A1, A3A, A3H, A3J

1 - Receiver

1 - Exciter

1 - Power supply

1 set - Antenna equipment

1 set - VHF radio telephone

1 - Transceiver
25 watt, 150 MHz, 61 Ch. F3

1 set - Antenna equipment

1 set - Portable radio apparatus for emergency use

4 sets- Landing/survey boat VHF transceiver

## 13. Survey Equipment

It is to be understood that the following specifications are examples of possible selection of the survey equipments and may be altered in a part or whole, subject to approval of the owner or the owner's representative of the vessel, provided the function of each equipment is equivalent or more to those stipulated herein for the purpose intended.

### 13.1 Integrated Navigation/Data Acquisition System

The outline of the specification of the system is as follows.

(1) NNSS Receiver (1 set)

a. Satellite positioning

b. Dead reckoning

c. Voyage calculation

d. Alert calculation

e. Re-calculation of post satellite data

f. Output of item a, b and e above

(2) Electronic positioning fixing system (1 set)

| | | |
|---|---|---|
| a. | Maximum range | 80 km (line of sight distance) |
| b. | Range display | 99999.9 m (Dual display in six digits) |
| c. | Range resolution | 0.1 m |
| d. | Range accuracy | Normal one meter or less |
| e. | Multi-range performance | Simultaneous measuring of three different ranges |

(3) Doppler sonar (1 set)

| | | |
|---|---|---|
| a. | Ship speed | Forward 20.0 kt, Backward 10.0 kt, Right-left 9.9 kt |
| b. | Depth range | 15～300 meters |
| c. | Frequency | 130 kHz |
| d. | Remote display | Speed indicator x 1, Distance indicator x 1 |

(4) Computer unit (1 set)

Composition

a. CPU

b. Floppy disk

c. 5 MB disk

d. Graphic CRT display

e. Keyboard

f. Adapter, etc.

Performance

a. Multi accuracy calculation

b. Graphic display control

c. Control of inputs/outputs

(5) Magnetic tape unit (1 set)

a. Tape speed 27 IPS

b. No. of track 9

c. Recording density 1,600 BPI

d. Recording system PE

e. Length of tape 1,200 ft (half reel)

(6) Interface (1 set)

Control of various input/output signal by microprocessor

(7) Software (1 set)

a. Conversion from R/R of positioning data to B.L.

b. Examination of the position of land station by NNSS

c. Processing of NNSS position data for higher accuracy of ship's position

(8) Printer (1 set)

| | | |
|---|---|---|
| a. | Printing method | Dot matrix |
| b. | Printing speed | 200 letters/sec. |
| c. | No. of letter per line | 136 letter/line |
| d. | Width of paper | 15 inches |

(9) X-Y Plotter (1 set)

| | | |
|---|---|---|
| a. | Paper size | Ao size |
| b. | Flat bed type | |

(10) Remote CRT display (1 set)

a. Sixteen letters, eight column 9 inch display

b. Desk top type or rack-mount type

Fig. 1 Integrated Navigation/Data Acquisition System
(Example of System Composition)

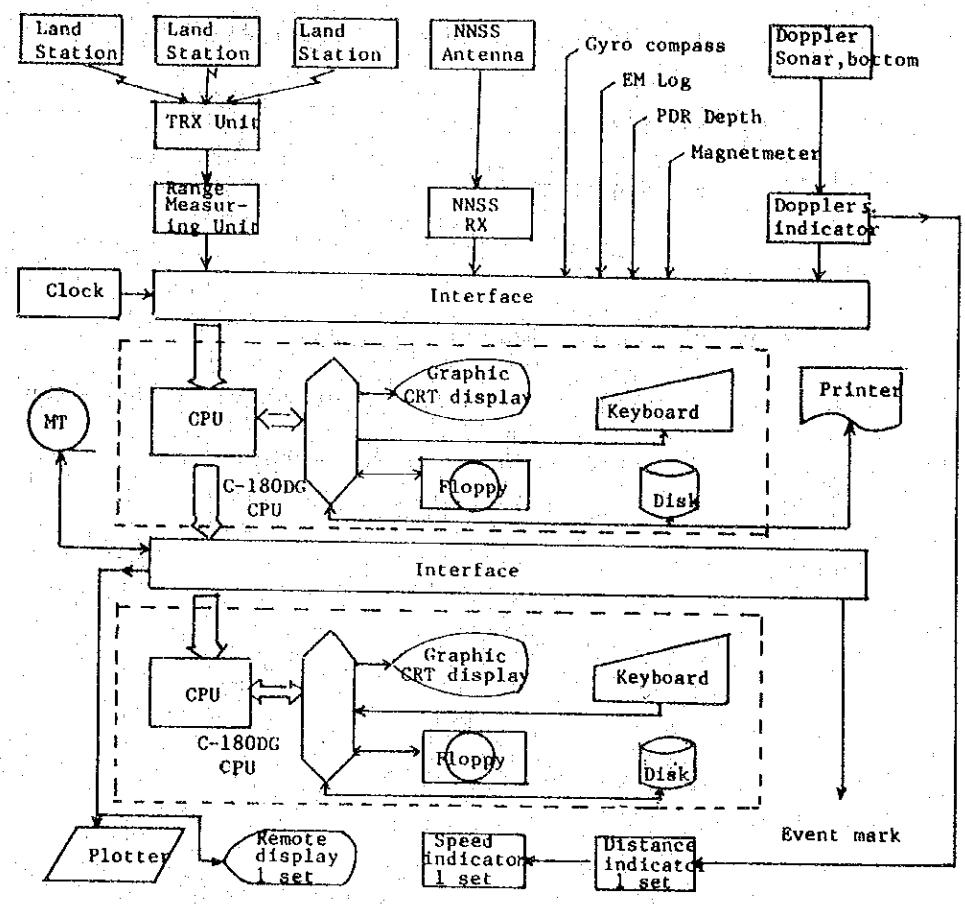
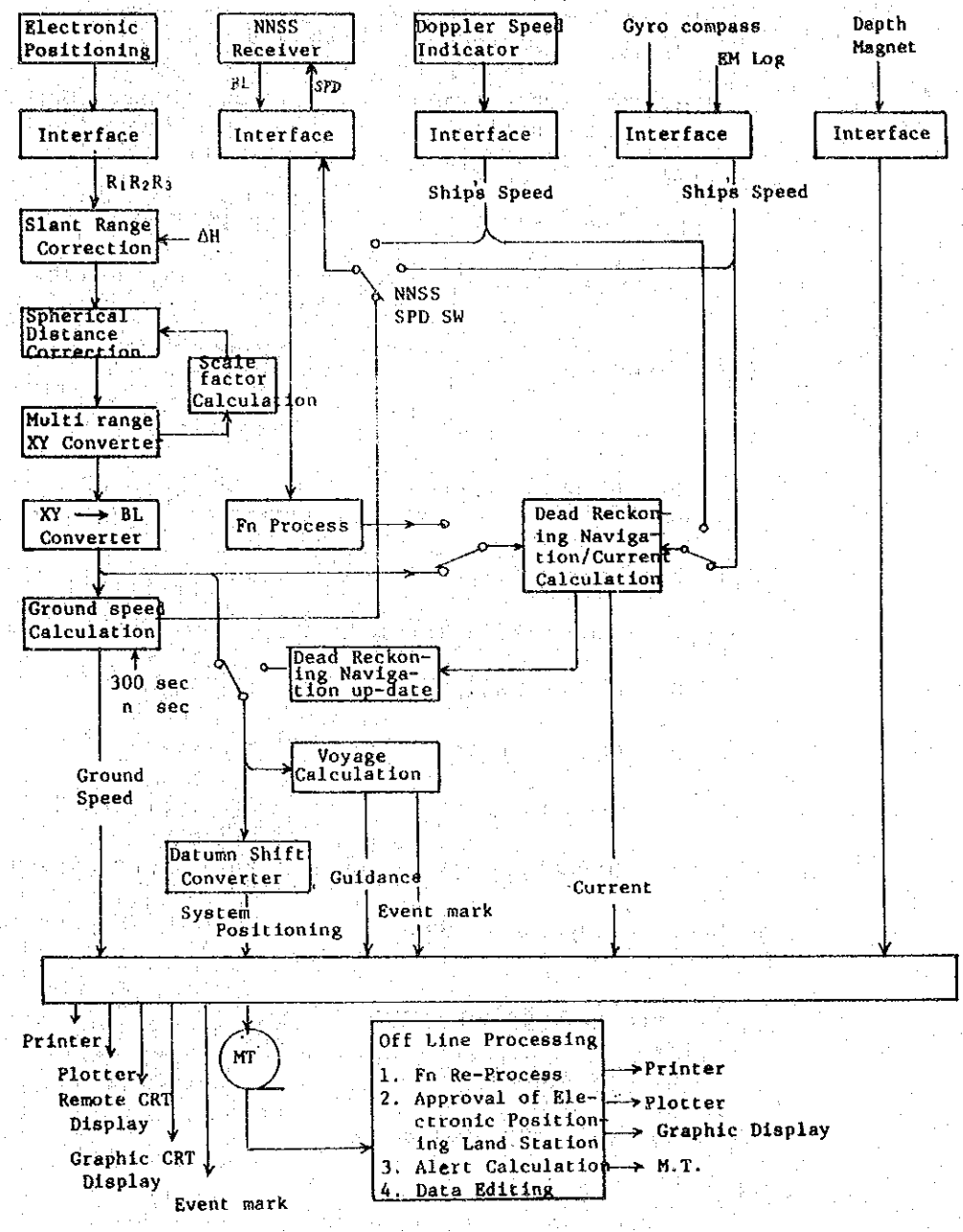


Fig. 2. Integrated Navigation/Data Acquisition System
(Example of Data Process Flow)



## 13.2 Multichannel Seismic Reflection System

(1) Streamer cable

| | | |
|---|---|---|
| a. | Active section | 50m/12 channel or 25m/24 channel |
| b. | Depth/Distance section | 3 channel |
| c. | Stretch section | 25m x 3 section |
| | Dead section | 25m x 2 section |
| d. | Lead-in section | 150m |
| e. | Tail section | Light Buoy |
| f. | Winch | Electric or Electro-hydraulic |

(2) Water gun

| | | |
|---|---|---|
| a. | 80 Cubic inch | 1 unit |
| b. | 15 Cubic inch | 2 units |

(3) Data acquisition

| | | |
|---|---|---|
| a. | Sampling interval | 0.5 ms, 1 ms, 2 ms, 4 ms |
| b. | No. of channel | 12 channel |
| c. | Record length | 5 sec. |
| d. | Tape format | SEG-B or SEG-X |
| e. | Off line processing | Format change, stacking |
| f. | Support program | Editor, Fortran compiler, Commands |

(4) Data processing system

a. CDP gather

b. Velocity analysis

c. NMO correction

d. CDP stacking

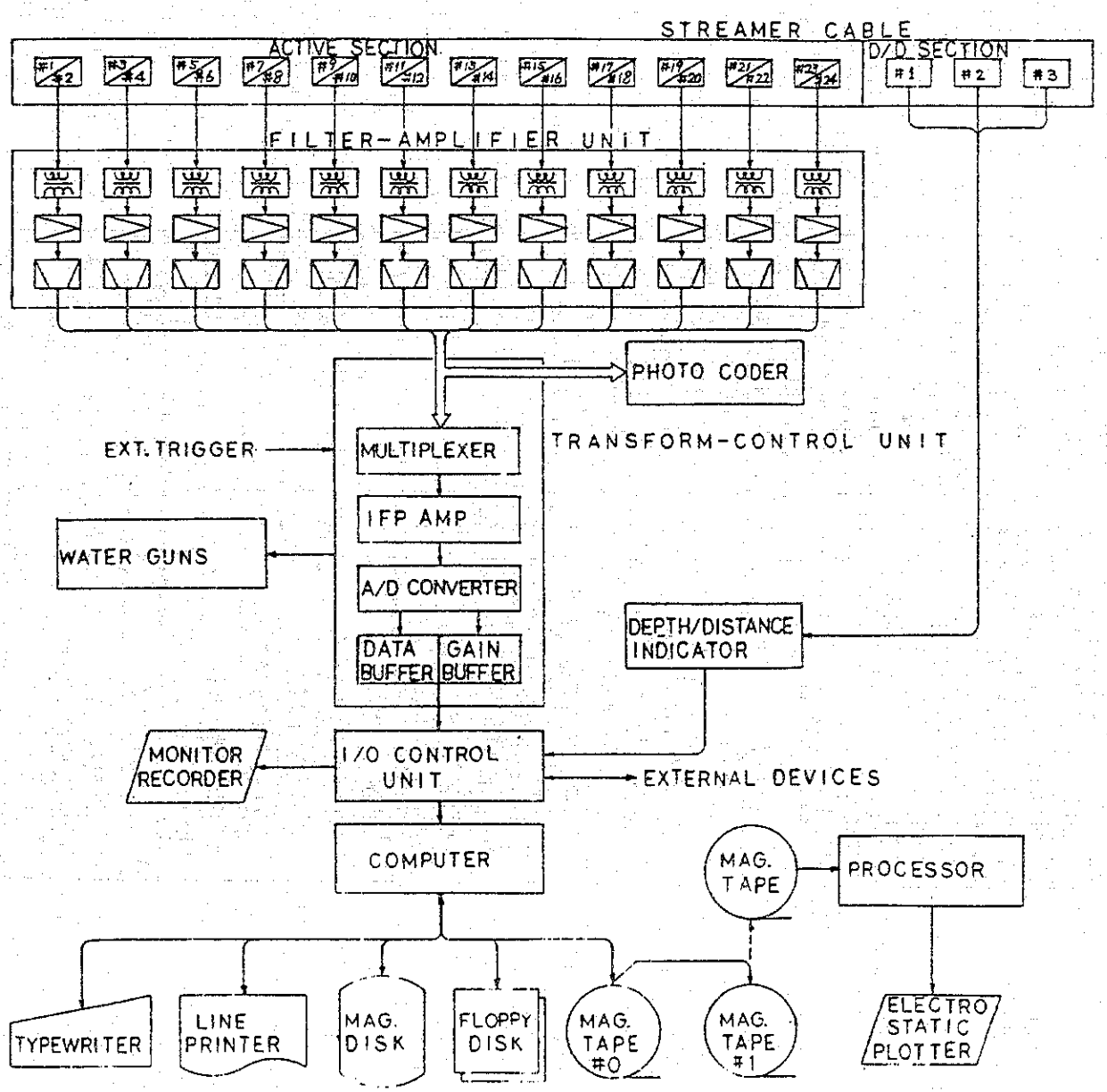
e. Deconvolution

f. Filtering

g. Electrostatic plotter display

| NO | ITEM | Q'TY | NOTES |
|---|---|---|---|
| 1 | STREAMER CABLE | | |
| -1 | ACTIVE SECTION | 24 | 25m/ch |
| -2 | D/D SECTION | 3 | |
| -3 | STRETCH SECTION | 3 | 25m/ch |
| -4 | DEAD SECTION | 2 | 25m/ch |
| -5 | TAIL SECTION | 1 | w. light buoy |
| -6 | LEAD-IN SECTION | 1 | 150m |
| -7 | WINCH | 1 | electric |
| 2 | WATER GUN | | |
| -1 | S.80 | 1 | |
| -2 | S.15 | 2 | |
| -3 | CONTROLLER | 1 | |
| 3 | DATA AQUISITION | | |
| -1 | FILTER-AMPLIFIER | 1 | |
| -2 | TRANSFORM-CNTL. | 1 | |
| -3 | I/O CNTL. | 1 | |
| -4 | COMPUTER | 1 | |
| -5 | TYPEWRITER | 1 | |
| -6 | LINE PRINTER | 1 | |
| -7 | MAG. DISK | 1 | |
| -8 | FLOPPY DISK | 1 | 2 drives |
| -9 | MAG. TAPE | 2 | |
| -10 | D/D INDICATOR | 1 | |
| -11 | RECORDER | 1 | |
| -12 | PHOTO CODER | 1 | |
| 4 | DISPLAY | | |
| -1 | MAG. TAPE | 1 | |
| -2 | PROCESSOR | 1 | |
| -3 | E S P | 1 | |
| 5 | ACCESSORIES | | |
| -1 | DC POWER SPLY. | 1 | |
| -2 | TOOLS | 1 | MAKER'S STD. |
| -3 | EXPENDABLES | 1 | MAKER'S STD. |
| 6 | SPARE PARTS | 1 | MAKER'S STD. |

FIG. 3. EXAMPLE OF MULTI-CHANNEL SEISMIC PROFILING SYSTEM



13.3 Survey Echo Sounder ( 1 set )

a. Power supply — 115 V.a.c. or 100 V.a.c. 50 ∿ 60 Hz

b. Directional width — (-3 db) 15°

c. Range — 200, 400, 800, 1 000, 2 000, 4 000, 6 000, 8 000 m

d. Line density — 30, 45, 60, 90 line/cm

e. Recording data — 486 mm x 60 m

f. Frequency — 12 kHz (± 10%)

g. Digitizer

Digitizer converts analog echo signal into digital depth data format for numeric display and data/output to shipboard system.

1. Number of figure 5/digit

2. Max. range 0 ∿ 19,999 m

3. Time gate control

   Automatic bottom tracking

4. Depth data (output)

   BCD code

13.4 Proton Magnetometer (1 set)

a. Measuring range — 20,000 ∿ 100,000 gammas

b. Sensitivity — 1 gamma

c. Accuracy — ± 0.5 gamma

d. Measurement interval — 3.6 sec.

e. Output — Digital signal BCD Cord TTL Level

   Analog signal 0∿99, 0∿990 gamma

f. Operating voltage — 24V DC

g. Sensor — Troidal coil

| | | |
|---|---|---|
| h. | Tow cable | 220 m abt. ϕ20 mm |
| i. | Winch | Electro -hydraulic |

13.5 Bottom Sampler

| | | |
|---|---|---|
| a. | Piston core sampler | (2 pcs.) |
| | Sampler tube | SUS abt. 76.3ϕ x abt. 67.9ϕ mm |
| | Inner tube | Plastic abt. 65ϕ x abt. 60ϕ mm,4m |
| | Weight | 40 kg x 10 pcs. (Max.) |
| b. | Gravity core sampler | (2 pcs.) |
| | Sampler tube | SUS abt. 101.6ϕ x abt. 93.6ϕ mm |
| | Inner tube | Plastic abt. 90ϕ x abt. 84ϕmm,3m |
| | Weight | 40 kg x 10 pcs. (Max.) |

13.6 Scuba Diving Gear

(1) Six (6) sets to be provided, each set consisting of:

1 - Tank block 12 liters, 150 $kg/cm^2$

1 - Regulator

1 - Aqua sea gauge

1 - Mask

1 pair - Fins

1 - Dive knife

1 - Wet suit

1 pair - Aqua boots

1 - Weight belt

1 - Bag

1 - Snorkel

1 - Flash light

(2) 1 Set of Electric motor driven portable air compressor

13.7 Survey Winch

1 - Sampling winch for handling core samplers at the sea top to 200 m depth (3,000 m x 9 mmø)

13.8 Boat

1 - Landing/Survey boat, abt. 5 M length, steel construction with engine

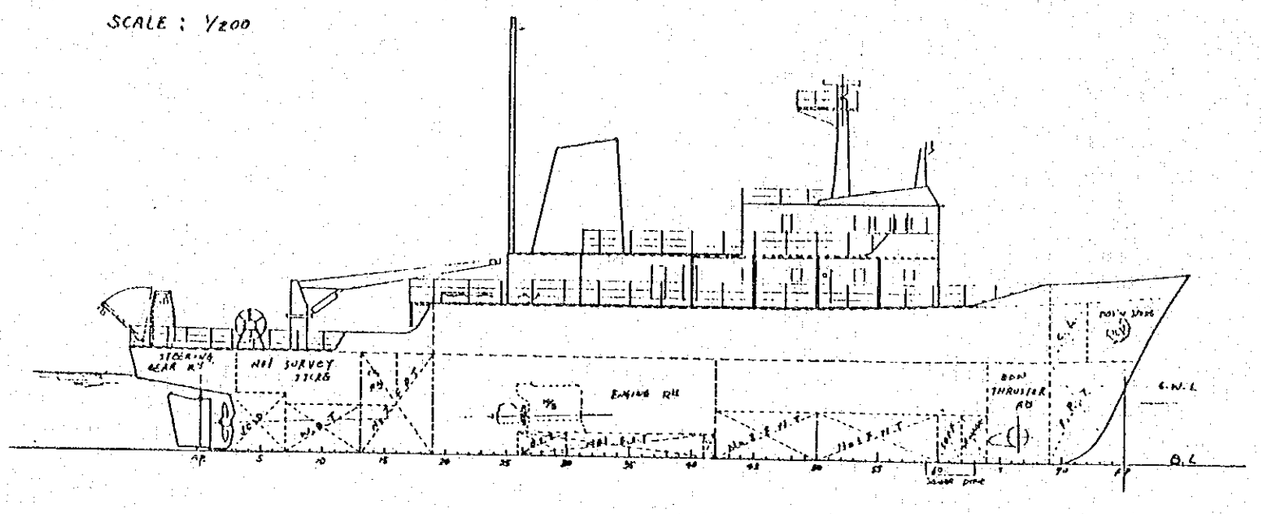
1 - Boat davit for Landing/Survey boat

1 - Service boat, for six (6) persons with out-board engine

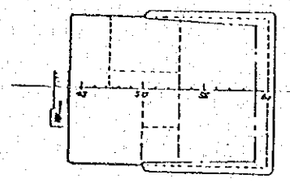
1 - Inflatable rubber boat, abt. 4 M length with out-board engine

## GENERAL ARRANGEMENT PLAN

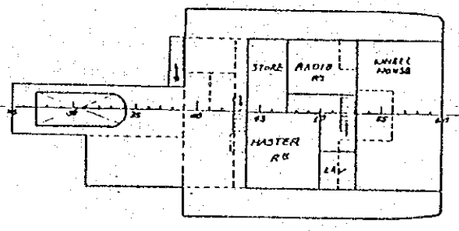
SCALE : 1/200



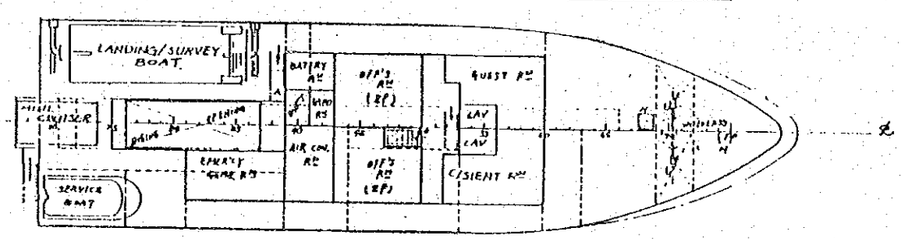

COMPASS BRIDGE DECK



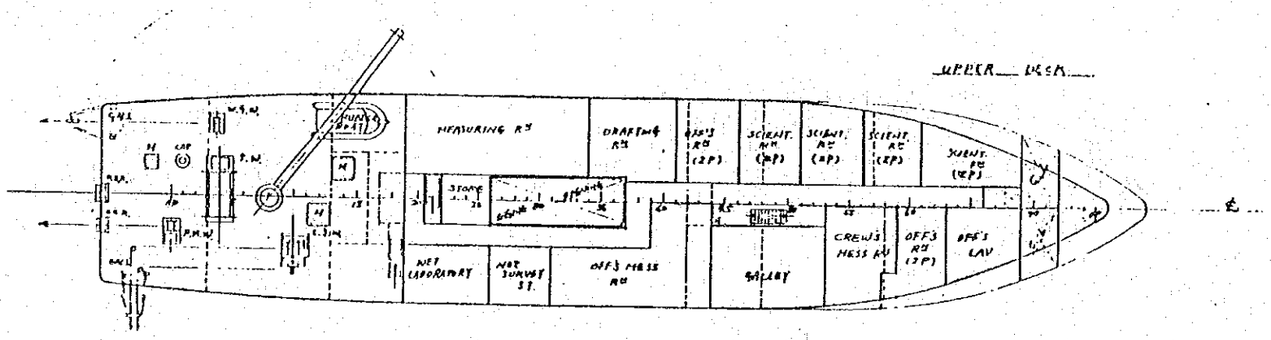
NAV. BRIDGE DECK




FORECASTLE DECK




UPPER DECK

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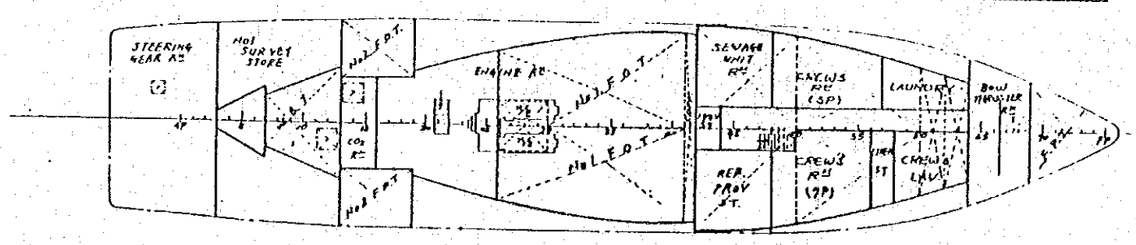

# CHAPTER 4

# CONSTRUCTION PLAN

# OF EXPLORATION VESSEL

# CHAPTER 4 CONSTRUCTION PLAN OF EXPLORATION VESSEL

## 4-1 Construction Process

The construction process of the planned exploration vessel is as shown below:

| Month | Schedule |
|---|---|
| | × Exchange of Notes |
| 1 | Consultanting service contract |
| 2 | } Tender preparation |
| 3 | Tender documents approval |
| 4 | Tender announcement |
| | Tender |
| 5 | Tender evaluation |
| 6 | Shipbuilding contract |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | Start of shipbuilding |
| 14 | |
| 15 | |
| 16 | Launching |
| 17 | |
| 18 | |
| 19 | Delivery made in Japan |
| 20 | ○ |

## 4-2 Construction system

As is clear in the basic design, the planned exploration vessel requires highly advanced techniques in the design and construction. Accordingly, it is preferable that the construction contract is made with a distinguished shipbuilder.

Procurement of exploration equipment to be installed on the vessel should also be decided by the shipbuilder since such an arrangement makes sure that the construction process goes as scheduled. This setup will make the one shipbuilder responsible for the vessel and equipment, bringing a favorable effect for the maintenance and management after delivery.

# CHAPTER 5

# PLAN FOR OPERATION, MAINTENANCE AND MANAGEMENT

# CHAPTER 5 PLAN FOR OPERATION, MAINTENANCE AND MANAGEMENT

## 5-1 System of Operation, Maintenance and Management

Mr. Carlos F. Teodoro, Chief of the Marine Mineral Resources Division (MMRD), is to assume the responsibility on all activities related to this project. Mr. Teodoro is placed under direct supervision and is responsible to the Director of Bureau of Mines and Geo-Sciences (BMG). The complement and scientists on board the exploration vessel will be put under the control of Mr. Teodoro. Also, Mr. Teodoro assumes the responsibilities of operation, maintenance and management of the vessel and the pertinent division of BMG is to manage practical affairs under the control of Mr. Teodoro.

## 5-2 Expenses of Operation, Maintenance and Management of Exploration Vessel

The estimate of operation expenses calculated by MMRD is shown below. The estimated amount is about ¥198 million (about P 6.6 million) per year, but we consider that the following must be added to it:

(1) While the expenses for the complement are counted as an item to be born by BCGS, when calculating the total project expenses, they must be added in this estimate. Based on the information obtained concerning salaries of seamen, we estimate these expenses to be about ¥11.4 million (about P 380,000). Furthermore, about ¥1.95 million (about P 65,000) should be added, as BMGS navigation allowance to the seamen, making the total expenses about ¥13.5 million (about P 450,000).

(2) We assume that the dry dock charge, daily repair expenses and vessel's insurance premiums are included in the figure of about 1.26 million Pesos of the Supplies and other Expenses.

(3) A trial calculation of the survey team is shown on Page 75 which sums up 150 million Yen (5 million Pesos) on an annual basis. The largest difference appears in the fuel cost, and the amount in our estimate came to about 60% of that of MMRD's trial calculation.

## Budget Estimate for the Vessel Operation 1984

| | | |
|---|---|---|
| Personnels and Staff | | |
| Salaries and allowances | | |
| 1 Supervising Geologist II | | ₱35,928.00 |
| 1 Supervising Geologist I | | 33,780.00 |
| 2 Sr. Geologist | | 57,672.00 |
| 1 Sr. Geophysicist | | 28,836.00 |
| 1 Sr. Mining Engineer | | 31,836.00 |
| 2 Geologist | | 52,488.00 |
| 1 Mining Engineer | | 25,044.00 |
| 1 Electronic Engineer | | 25,044.00 |
| 4 Survey Aides | | 48,960.00 |
| | Total | ₱339,588.00 |
| Salary Adjustments | | 33,958.80 |
| Traveling and Transportation Expenses | | 68,349.00 |
| | Total | ₱441,895.80 |
| POL Products | | |
| 1.5 m Diesel Gasoline | | ₱4,009,500.00 |
| 150 Drums Oils | | 335,625.00 |
| 16 Drums Hydraulics | | 4,199.60 |
| 50 Drums Regular Gasoline | | 53,455.50 |
| | Total | ₱4,402,780.10 |
| 102 Inflationary Adjustment | | 565,992.10 |
| Supplies and Other Expenses | | 1,257,141.00 |
| GRAND TOTAL | | ₱6,667,809.10 |

CARLOS F. TEODORO
Chief, Marine Mineral Resources Division

NOTE: Salaries and allowances of the officers and crew are included in the budget of the Bureau of Coast and Geodetic Survey.

Operation Expenses estimated by Survey Team

| | | | |
|---|---|---|---|
| Seamen wage | about | ¥13,290,000 | (₱ 443,292) |
| Scientists wage | " | 10,170,000 | ( 339,588) |
| Travelling and transportation | " | 4,800,000 | ( 160,000) |
| Navigation articles | " | 2,400,000 | ( 80,000) |
| Fresh water (7 tons/day) | " | 450,000 | ( 15,330) |
| Dock charges (12 days) | " | 3,000,000 | ( 100,000) |
| Repair | " | 900,000 | ( 30,000) |
| Fuel oil (about 700 t) | " | 77,100,000 | ( 2,565,750) |
| Labricating oil | " | 1,560,000 | ( 51,470) |
| "Navotas" port charges | " | 30,000 | ( 900) |
| "Navotas" port electricity charges | " | 450,000 | ( 15,000) |
| Insurance premium | " | 30,000,000 | ( 1,000,000) |
| Total | " | ¥144,150,000 | (₱ 4,801,330) |

Allowing some leeway, we consider that ¥150 million (₱ 5,000,000), would be sufficient as normal annual expenses.

## 5-3 Exploration Data Analysis Expenses

The following shows the expenses required for analysis on the land of data obtained from the exploration.

### 5-3-1

BMG estimates about 770,000 Pesos as the expenses necessary to prepare maps of 1 : 100,000 or 1 : 250,000 scale from the data of 100 magnetic tapes of submarine magnetic and seismic reflection exploration.

### 5-3-2

Analysis expenses of collected samples are estimated to be about 150,000 Pesos per 100 samples.

Details of these calculations are shown on the following pages.

MARINE MAGNETIC DATA PROCESSING AND INTERPRETATION

DETAILS OF COST ESTIMATE

1. Cost of 100 Magnetic Tapes, for Original Data

Specification: 9 - Track, 1600 BPI, 2400 ft.
Canister - ₱265.00
Tape seal belt - ₱245.00
₱510.00

₱510 × 100 = ₱51,000

TOTAL COST OF MAGNETIC TAPES = ₱102,000

2. Computer Usage Fee

A) Processing for 90 working days (4 months)

4 hrs./day × 90 days = 360 hrs.
₱350.00/hr. × 360 hrs. = ₱126,000.00

B) Analysis and interpretation for 40 working days (2 months)

4 hrs./day × 40 days = 160 hrs.
₱350.00/hr. × 160 hrs. = ₱56,000.00

TOTAL COMPUTER USAGE FEE = ₱182,000.00

3. Manpower

| Position | Salary/Mo. | No. of Working Mos | TOTAL |
|---|---|---|---|
| 1 Sr. Geophysicist | ₱2,403.00 | 6 | ₱14,418.00 |
| 2 Geophysicists | 4,174.00 | 6 | 26,244.00 |
| 1 Programmer | 2,000.00 | 6 | 12,000.00 |
| 1 Computer II | 946.00 | 6 | 6,276.00 |
| 1 Cartographer | 946.00 | 2 | 2,092.00 |
| | | GRAND TOTAL..... | ₱61,030.00 |
| | | | ₱62,000.00 |

4. Whiteprinting of Bathymetric Maps & Track-chart

4 copies each of maps printed in scales: 1,500,000
1,100,000
1,250,000

Approximately ₱1,000.00

5. Others:

A) Transportation expenses: From BMG to Computer Installation of Bureau of Lands and Back.

₱2.00/person for 130 working days = ₱260.00

4 persons × ₱260.00 = ₱1,040.00

B) Supplies and Materials:

| | | |
|---|---|---|
| a) | 10 rolls tracing paper | ₱3,000.00 |
| b) | 10 rolls Cross-section Paper | 2,000.00 |
| c) | 5 rolls acetate film | 4,000.00 |
| d) | 20 boxes punch cards (10,000 cards) | 2,000.00 |
| e) | Additional Tapes (4) | 2,000.00 |
| f) | Miscellaneous | 2,000.00 |
| | | ₱15,000.00 |
| | | 1,000.00 |
| | | ₱16,000.00 |

## MARINE SEISMIC DATA PROCESSING AND INTERPRETATION

DETAILS OF COST ESTIMATE

1. Cost of 100 magnetic tapes, for original data

Specification: 9 - Track, 1600 BPI, 2400 ÷ 1

Canister - ₱265.00

Tape seal belt - ₱245.00

₱510.00

₱510 × 100 = ₱51,000

Cost of 100 additional tapes for storage of Corrected Data = ₱51,000

TOTAL COST OF MAGNETIC TAPES = ₱102,000.00

2. Computer Usage Fee

A) Processing for 60 working days (3 months)

4 hrs./day × 60 days = 240 hrs.

₱350.00/hr. × 240 hrs. = ₱84,000.00

B) Analysis and Interpretation for 90 working days (4 months)

4 hrs./day × 90 days = 360 hrs.

360 hrs. × ₱350.00 = ₱126,000.00

TOTAL COMPUTER USAGE FEE = ₱210,000.00

3. Manpower

| Position | Salary/Mo. | No. of Working Mos. | TOTAL |
|---|---|---|---|
| 1 Sr. Mining Engr./ Geophysicist | ₱2,553.00 | 7 | ₱18,571.00 |
| 2 Geophysicists | 4,174.00 | 7 | 30,618.00 |
| 1 Geologist | 2,087.00 | 4 | 8,748.00 |
| 1 Programmer | 2,000.00 | 7 | 14,000.00 |
| 1 Computer II | 946.00 | 7 | 7,322.00 |
| 1 Cartographer | 946.00 | 4 | 4,184.00 |
| | | GRAND TOTAL | ₱85,443.00 |
| | | | ₱84,000.00 |

4. Printing of Bathymetric Maps & Track-chart

Rate : ₱0.50/sq. ft. of Map

Assume: ₱1,000.00 (4 copies each map)

5. Others:

A) Transportation Expenses: From BMG to Computer Installaiton at Bureau of Lands and Back

₱2.00/person for 150 working days = ₱300.00/personnel

4 personnels × ₱300.00 = ₱1,200.00

B) Supplies and Materials:

| | | |
|---|---|---|
| a) | 10 rolls Tracing Paper | ₱3,000.00 |
| b) | 10 rolls Cross-section Paper | 2,000.00 |
| c) | 4 rolls Acetate Film | 3,200.00 |
| d) | Miscellaneous | 3,000.00 |
| | TOTAL | ₱11,200.00 |

OVERALL TOTAL:

| | | |
|---|---|---|
| 1. | Tapes | ₱204,000.00 |
| 2. | Computer Usage: | |
| | A. Magnetics | ₱182,000.00 |
| | B. Seismic | ₱210,000.00 |
| 3. | Manpower: | |
| | A. Magnetics | ₱62,000.00 |
| | B. Seismic | ₱84,000.00 |
| 4. | Printing | ₱2,000.00 |
| 5. | Others | |
| | A. Transportation | ₱2,200.00 |
| | B. Supplies | ₱27,200.00 |
| | OVERALL TOTAL | ₱772,400.00 |

COST ESTIMATE OF SAMPLE ANALYSIS
(ROCK & SEDIMENT SAMPLES)

| | SEDIMENT SAMPLES | PRICE PER 100 RAW SMAPLES |
|---|---|---|
| 1. | Sieve Analysis | ₱1,000.00 |
| 2. | Heavy Media Separation | ₱15,000.00 |
| 3. | Magnetic Separation (Isodynamic Method) | ₱10,000.00 |
| 4. | Mineralogical Identification (Grain Mounted) | ₱75,000.00 |
| | TOTAL | ₱101,000.00 |

ROCK SAMPLES

| | | |
|---|---|---|
| 1. | Petrographic, mineragraphic identification of rock samples | ₱5,000.00 |
| 2. | Paleontological dating | ₱5,000.00 |
| | Assaying service (Assuming price elements to be assayed per sample at ₱70.00/ element) | ₱35,000.00 |
| | TOTAL | ₱45,000.00 |
| | OVER ALL TOTAL | ₱146,000.00 |

The survey team has judged that these expenses are appropriate.

About 400 magnet tapes are needed annually by this exploration vessel and the number of samples collected by this vessel is estimated to be about 400 per year. Accordingly, the annual expenses for data analysis will be about ¥111 million (about ₱ 3.7 million).

# CHAPTER 6

# PROJECT EVALUATION

# CHAPTER 6 PROJECT EVALUATION

## 6-1 Financial Evaluation

An annual expense can be roughly estimated around 8.7 million Pesos which covers data collection, analysis, and reporting including the exploration vessel expenses illustrated in the Chapter 5 herein.

The following chart is the comparison of the budget projected today and the annual expenses in 1984, the expected time of delivery of the vessel.

Table 8

| | Beach & Offshore | Marine Geophysical | Marine Geological | Total |
|---|---|---|---|---|
| 1982 | ₱ 653,478 | ₱ 2,393,356 | ₱ 1,472,046 | ₱ 4,518,880 |
| 1983 | ₱ 721,350 | ₱ 2,965,000 | ₱ 1,614,300 | ₱ 5,300,650 |
| 1984 | ₱ 547,780 | ₱ 3,643,660 | ₱ 2,465,660 | ₱ 6,657,100 |

(Source: Budget made by MMRD)

| Budget | Annual expense | Deficit |
|---|---|---|
| 6.66 million Pesos | 8.7 million Pesos | 2.04 million Pesos |

The deficit of 2.04 million Pesos shares less than only about 3% in BMG's whole annual budget of 63.07 million Pesos for 1982.

The increase to suffice the deficit in the budget allocation seems definately not to create any burden whatever if taken account from the national policy of economy.

## 6-2 Evaluation on Operation

There is no problem anticipated in the operation of the vessel since Navotas fishing port has been determined as the base port. Skilled members on vessel maneuvering will be dispatched from BCGS and repair facilities of the vessel are in the Philippines.

However, many latest equipment is installed on the vessel for exploration, such as the seismic reflection exploration equipment, and sufficient consideration must be given to render technical aid from foreign countries including Japan concerning the operation, maintenance, management and analysis methods.

As to the ability of the computer system to process the exploration data, the existing system is not good enough since it is not equipped with a graphic display which is essential for analysis of seismic relfection exploration data.

The system must be strengthened to the extent of being able to process all required data items in the future.

## 6-3 Evaluation of Operation Organization

MMRD of BMG is the main force behind the operating of the exploration project, but there are a number of other agencies participating in the exploration. Therefore, communication and adjustment of plans with all these agencies is very important. Furthermore, since this is the first experience for BMG to own a vessel, it imposes a new task for MMRD, a group of scientists. An ex-captain is assigned to the management work of the vessel at present, but in the future, a division forming exclusive staff group must be established to help the Chief of MMRD for management missions including communications with the related agencies. A recommended configuration of such a staff group is one scientist, one ex-captain class person and one or two clerks. The anticipated management work related to the vessel are as follows:

1) Liaison and adjustment between scientists and the vessel captain on planning of exploration work
2) Determination of work contents and expenses in dock and dock selection
3) General repair of the vessel and equipment and arrangement of repairing firms
4) Arrangement of procurement of consumables (including fuel, fresh water, food, parts, etc.)
5) Technical guidance of complement
6) Employment/discharging of seamen and distribution of their duties. Labor and welfare arrangement and wage payment
7) In/out management of inventory items
8) Check and payment on all preceding items

# CHAPTER 7

# CONCLUSIONS AND RECOMMENDATIONS

# CHAPTER 7 CONCLUSIONS AND RECOMMENDATIONS

The Philippines is the third largest supplier of metallic raw material, in monetary terms, to Japan ranking after Australia and USA. Also, the Philippines herself needs a steady supply of mineral resources as the base materials for industrialization of the country. Accordingly, new development of offshore mineral resources is a very important subject not just for the two countries but for the whole world, and realization of this project for this purpose is extremely significant.

There is a need of technical help from foreign countries including Japan on operation of the vessel even after delivery.

The following are the conditions essential for smooth progress of this project:

(1) The Philippines Government should extend enough financial help on the following items:

Items that should have been completed before the vessel is delivered to the Philippines side:

i) Pier warehouse
ii) Computer facilities for data processing
iii) Laboratories for data compilation, analysis and interpretation
iv) Laboratories for petrographic, paleontological, metallurgical and chemical analysis
v) Rooms for storage of collected samples and tapes
vi) Printing facility of geological maps and reports
vii) Exploration vessel management office
viii) Financial arrangement for project implementation

The annual maintenance and management fee of the exploration work (about P8,700,000) explained in the chapter 5 and chapter 6 should be considered and in addition, the transportation fee of the exploration vessel (about P234,000) from Japan to the Philippines should be added in case of the first year.

(2) Improvement of the computer facility in the Philippines, that is, increase of the computer's data processing ability and additional installation of peripheral devices to cope with the latest exploration techniques.

(3) Dispatch of members from the Philippines side for training in Japan and then ferrying the exploration vessel is to the Philippines scheduled as shown below.

Scheduled of Dispatch of Ship's complement and scientists to Japan for training and to ferry the survey vessel from Japan to the Philippines

Captain and Chief Engineer -- 2 months before ships delivery

Chief Scientist -- 1 month before ships delivery

4 Scientists and 7 Crew members -- 3 weeks before ships delevery

Since the vessel is installed with the latest exploration equipment (especially the seismic exploration equipment), training of the scientists is essential for smooth progress of the exploration. The Philippines requests on technical assistance from Japan on this subject is outlined below. The Japanese side must take the necessary steps to fulfill the requirement.

Proposed

Technical Assistance and Training Grants for
Offshore Mineral Explorasion Project of
the Bureau of Mines and Geo-Sciences

In conjunction with the implementation of the proposed Offshore Mineral Exploration Project of the Bureau of Mines and Geo-Sciences, it is proposed that training in shipborne geological/geophysical survey operation be granted to the following technical personnel and expert assistance be provided in some fields of specialization related to marine geological/geophysical survey.

I. Training Grants

| | Discipline | No. of Trainees | Time and Duration |
|---|---|---|---|
| | **1982** | | |
| A. | Instrumentation and Technique in Offshore Survey Operation | 2 | 6 months each<br>July - December |
| B. | Marine Geology and Oceanography | 1 | 6 months<br>July - December |
| | **1983** | | |
| A. | Marine Geology and Oceanography | 1 | 6 months<br>January - June |
| B. | Electronic Maintenance & Repair of Measuring Equipment used in Geophysical Survey Operation | 2 | 4 months each<br>January - April<br>and<br>May - August |
| C. | Geophysical Data Processing and Interpretation using Computer | 2 | 6 months each<br>January - June<br>and<br>July - December |
| | **1984** | | |
| A. | Geophysical Data Processing and Interpretation using computer | 1 | 6 months<br>January - June |

II. Expert Assistance

| Expert/Nature of Assistance | 1983 Requested No. of Expert | Duration/Time |
|---|---|---|
| A. Marine Geophysicists | | |
| 1. To advise in planning and execution of geophysical survey and train Filipino counterpart in all phases of survey operation. | 1 | 6 months July - December |
| 2. To assist in compilation computer processing and interpretation of geophysical data, and formulation of computer program. | 1 | 2 months November - December |
| B. Marine Geologists | | |
| 1. To advise in planning and execution of sea-bottom sampling and sediment analysis | 1 | 6 months July - December |
| 2. To assist in compilation and processing of offshore geological data in relation to geotectonics and economic mineral deposition. | 1 | 2 months November - December |
| C. Electronic Engineer | | |
| 1. To advise and orient Filipino counterparts repair & maintenance of surveyed natigational equipment. | 1 | 3 months August - October |

| Expert/Nature of Assistance | Requested No. of Expert | Duration/Time |
|---|---|---|
| A. Marine Geophysicist | | |
| 1. To continue assistance in compilation computes processing and interpretation of geophysical data and computer programming. | 1 | 4 months<br>February - May |
| B. Marine Geologist | | |
| 1. To continue assistance in compilation and processing of geological data and relate these to tectonics and economic mineral deposition in surveyed area. | 1 | 4 months<br>February - May |
| C. Electronic Engineer | | |
| 1. To continue assistance and orientation of Filipino counterparts in proper maintenance and repair of survey and navigation equipment. | 1 | 3 months<br>February - April |

Also, it is preferable that Japan send experts for technical assistance for 3 years or so after the delivery of the vessel. The arrangement that we see fit is to send 3 persons (researchers and engineers of the equipment manufacturer) a few times each year for a period of 2 to 3 months each time, according to the exploration schedule set by the Philippines side.