BUILDING OF THE NEW, MULTI PURPOSE, GREEK RESEARCH VESSEL

Hellenic Centre for Marine Research

Funded by:

EUROPEAN INVESTMENT BANK (EIB) = **41 Meuros (75%)**

HELLENIC STATE (GR) = **14.18 Meuros (25%)**

Total = 55.18 MEuros

Presentation delivered by:
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Geologist, Inst. of Oceanography,
on behalf of HCMR,
at the
23rd ERVO Annual Meeting, 1-2/6/2021

R/V AEGAEO, 1985

History

JULY 2013: 1st full proposal from HCMR to the Greek Government

JULY 2014: 2nd full proposal from HCMR to the Greek Government

2014 - 2018: Multiple, unofficial discussions with governmental authorities

SEPTEMBER 2018: First positive sign – Deputy Minister of Research calls HCMR for a new proposal for the building of a new research vessel

FEBRUARY 2019: 3rd full proposal submitted to the European Investment Bank (EIB)

JULY 2020: Contract signed by the European Investment Bank and the Greek Minister of Economy

Current situation

Our plan was, before the end of 2020, to visit newly built research vessels, e.g. BELGICA II, to gain experience and discuss with the operators on technical, operational and scientific solutions.
Due to the pandemic and the travel restrictions, this has not been possible so far.

Due to the “Greek beast” (bureaucracy), almost one year after the signature of the contract, it has not been possible to transfer the first payment of EIB from the Greek Ministry of Economy to HCMR.

The Greek state plans to cover its participation (25%, 14 MEuros) through the European Recovery Fund (still pending).

11. What were the criteria used to select or prioritise the type of research the new vessel will be able to perform (e.g. choice of laboratories and equipment, etc.)?

A) Scientific criteria:

Priorities set by the national research strategy of Greece and research priorities defined by the European Commission:

(i) the study of and response to climate change,

(ii) the Blue Growth strategy,

(iii) the ocean / blue energy,

(iv) the sustainable exploitation of the seabed.

The major, thematic, research axes prioritized by HCMR are the following:

(i) ocean observatories and forecasting systems,

(ii) marine ecosystems research, marine ecosystem health and environmental status,

(iii) coastal processes, integrated coastal zone management and

(iv) earth's crust long-term dynamics and kinematics and geohazards.

Priorities and research axes

cover a wide range of research objectives to be implemented through the use of the new vessel include:

- **High-resolution seafloor survey** with the use of advanced acoustic techniques for geomorphological mapping, nature of the seafloor and mapping of seabed habitats as well as for the documentation of submerged cultural heritage.
- **Shallow and deep geophysical, 2D and 3D seismic and seismological surveys** for the study of the seafloor, the geological and tectonic structure below the seafloor and at deeper levels of the Earth's crust and the understanding of active geological and tectonic processes and geohazards (active faults, earthquakes, seismic hazard, landslides, etc.)
- **Water and environmental sampling, sediment sampling/coring** and on board processing of the samples and cores in adequately equipped laboratories for research on climate change, understanding ocean circulation, mapping biodiversity etc.
- **Oceanographic measurements and deployment/handling of oceanographic buoys** for ocean observation and climate monitoring (e.g. POSEIDON, COPERNICUS)

- **Monitoring fish population dynamics** in order to a) provide advice on the sustainability of fish resources, b) predict climate change effects on fish population dynamics and c) explore new resources especially in terms of mesopelagic and deep sea fish populations.
- **Fish population and environmental sampling** to model and map changes in essential fish habitat under climate change scenarios.
- **Fish and invertebrates sampling** to monitor and model the effect of lessepsian fish species and invertebrates under climate change scenarios.
- **Deployment and operation of ROVs, AUVs**
- **Maintenance of deep seafloor observatories**, e.g. EMSO HELLAS observatory
- **Search and recovery operations** in cases of maritime or aircraft accidents
- Research activities and operations related with major **European research policies** e.g. Marine Spatial Planning, Blue Growth, Marine Strategy Framework Directive, Water Framework Directive

B) Operational criteria:

- The type of research the new vessel will perform, requires oceanographic cruises in the open sea and research activities at full ocean depth.
- The new vessel is expected to be able to operate at open sea conditions in the Mediterranean, Black and Red Seas and probably beyond those, in the Indian Ocean and parts of the Atlantic Ocean
- The new ship is not intended for Arctic operation.

hcmr
ΕΛΚΕΘΕ

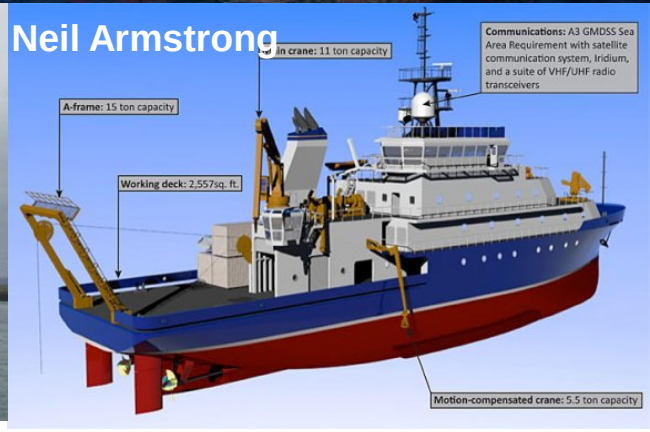
SVEA

BELGICA

FREIRE NB-600 Sarmiento de Gamboa

THALASSA

Neil Armstrong



Technical characteristics of similar vessels 1/4

	AEGAEO	NEW min	NEW max	Neil Armstrong	Henry B. Bigelow	Atlantis	Roger Revelle	Falkor	R/V Sarmiento de Gamboa	RRS James Cook	RRS Discovery	Thalassa	L'Atalante	Celtic Explorer
IMO Number				9688946					9335238		9588029	9070307		
LOA	61.51	68	71	72.54	63.7	83.5?		83	82.9?	70.5	89.2	99.7	73.65	84.6	65.5
LWL				70.14		16	15.85	13							
LBP	55.4			67.44					62			88.8	64.94		
B	9.6	15	15.6	15.24	15				15.5	18.6	18	14.9	15.85	15
D	4.2	6.5		6.706		5.8	5.2	5.8	7.9		7.4	6.45		
T Des				4.572	9.1				4.6	5.5-5.7			5.1	
T Max	2.9		5.7	5.18						6.315	6.6	6.1		5.8
Lightship	753			2091 / 2058 ?										
Displacement	908			3255 / 3204?						approx. 5800		3022	3550	
DWT	155	900		1472?					850	385 (Sciense & Store)	1840	955		
Fuel Oil (m3)	106.6	400		587					573	913	596	460	580	
BW (m3)	157			441.5					293		1375			
Fress Water	75	150							101	204	310	190	261	
Water making capacity		10												
Gross Tonnage		≤3200		2641?					2754	5401	5952	2803	3559	2425
Net Tonnage											1785			727
Speed Cruising		≥10.5		11.5 /12 ?	11	11	11.7	10-12		12 SS4		11	11	10
Speed Max		≥12		12.8	14		15		14	16		14.7	15.3	16
Prop. Power (kW)	1396.5		2x1200	1752							5760	2200	2200	3000
Total Power (kW)				4176 / 3952 ?					2400	7080		4512	3000	4320

Technical characteristics of similar vessels 2/4

	AEGAEO	NEW min	NEW max	Neil Armstrong	Henry B. Bigelow	Atlantis	Roger Revelle	Falkor	R/V Sarmiento de Gamboa	RRS James Cook	RRS Discovery	Thalassa	L'Atalante	Celtic Explorer
Main Generators (kW)	6003	3 or 4 gensets total>4000kw		4176					4320		7080	4512		4320
Em. Generator (kW)				210										
Propulsion system		Diesel Electric / Poded Azimuth		Diesel Electric / 2 Propellers					Diesel Electric / 1 Propeller ?	Diesel Electric / 2 Propellers	Diesel Electric / Poded	Diesel Electric / 1 Propeller		
Bow Thruster (kW)		300		686					590	1200	1350	440		700
Bow Thruster2 (kW)		300								1350	1700			
Stern Thruster 1 (kW)				620					350	600		264		400
Stern Thruster 2 (kW)										800				
Azimuth Thruster (Kw)										1350				
Dynamic Positioning		DP1		± 5 m in 35 kno wind and 2 kn beam current,										
Seakeeping				ship headed into collinear wind and SS5 waves 100% operability in SS4 and 86%/88% operability in SS5 for arrival load/full load, with roll stabilization tank										
Range (nm)	5520	8500nm at cruising speed		11500	12000	17280	15000	9206						
Endouranve (days)	20	provisions for 50 days		40	40	60	60	36	40	50	50	60		35
Towing at 6kn (t)				4.536										
Towing at 4kn (t)				11.34										
Stabilization		Anti-rolling tanks										Flume tank	passive fuel tank	

Technical characteristics of similar vessels 3/4

	AEGAEO	NEW min	NEW max	Neil Armstrong	Henry B. Bigelow	Atlantis	Roger Revelle	Falkor	R/V Sarmiento de Gamboa	RRS James Cook	RRS Discovery	Thalassa	L'Atalante	Celtic Explorer
Main crane (t)	22tm	5t at 12m		11										
Crane		2.5t at 12m												
Aft A-Frame (t)	10	15t		15		Articulated side A-frame for bathysounder hydrology						22 /10 t	22	25t 10.5m clearance from dk
Side Frame		15t										5 t	10	10t
Articulated side A-frame for bathysounder hydrology or equivalent		5t												
Motion Compensated crane (CTD)				5.5										
Deck area at main deck (m2)		300		237.55										165
Chemical & Biological Lab		45												
CTD Control Room		10												
Geophysical Lab (m2)		50		95.04										75
Wet Lab (m2)		15		36.98										70
Computer Lab (m2)		20		28.89										
Meeting room (m2)		30												
Staging Bay (m2)				28.15										
Total Lab (m2)		170		189.06		>325			250		~400	320	306	145
20 ft Container Labs or storage		4		5?								5	8	7
Scientists				24	41 (total)	80 (total)	37	44 (total)	26	32	28	25	30	20-22
Crew				20			21		16	22	24	16 to 25	17 to 30	13-15
Accomodation total		≥50												

Technical characteristics of similar vessels 4/4

	AEGAEO	NEW min	NEW max	Neil Armstrong	Henry B. Bigelow	Atlantis	Roger Revelle	Falkor	R/V Sarmiento de Gamboa	RRS James Cook	RRS Discovery	Thalassa	L'Atalante	Celtic Explorer
Preservation/cooling room		10 m2												
Electrical workshop		15												
Mechanical workshop		15												
Transducers room at tank top		40												
Class		IACS							BV		LR	BV	BV	LR
Country		GREECE		USA	USA	USA		USA	Spain		UK			
Owner		HCMR		ONR		US Navy			CSIC		NERC			
Operator				Woods Hole	NOAA	Woods Hole				NERC				
Delivery				2015	2007	1997	1996	1981	2006	2007	2013	1996	1989	
Daily cost				$40k?										
Building Cost									€22m ?		£75m			

Table 12. Main characteristics of the new vessel

Main Particulars		Min	Max	AEGAEO
Length Over All	[m]	68.0	72.0	61.51
Beam	[m]	15.0	15.6	9.6
Scantling Draught	[m]		5.7	2.9
Depth to Bulkheads Deck	[m]	6.5		4.2
GRT	-		3500	
DWT	[t]	900.0		155
Fuel Oil	[m^3]	400.0		106.6
Fresh Water	[m^3]	150.0		75
Fresh Water making capacity	[m^3/day]	10.0		
Speed Cruising	[kn]	10.5		
Speed Max.	[kn]	12.0		
Propulsion Type	-	Diesel Electric, Azimuth Pod Propulsion		
Propulsion Power	[kW]		2400.0	1396.5
Main Generators (3 or 4 GenSets)	[kW]	4000.0		600
Range at Cruising Speed	[nm]	8500.0		
Endurance	days	50		

Table 12. Main characteristics of the new vessel

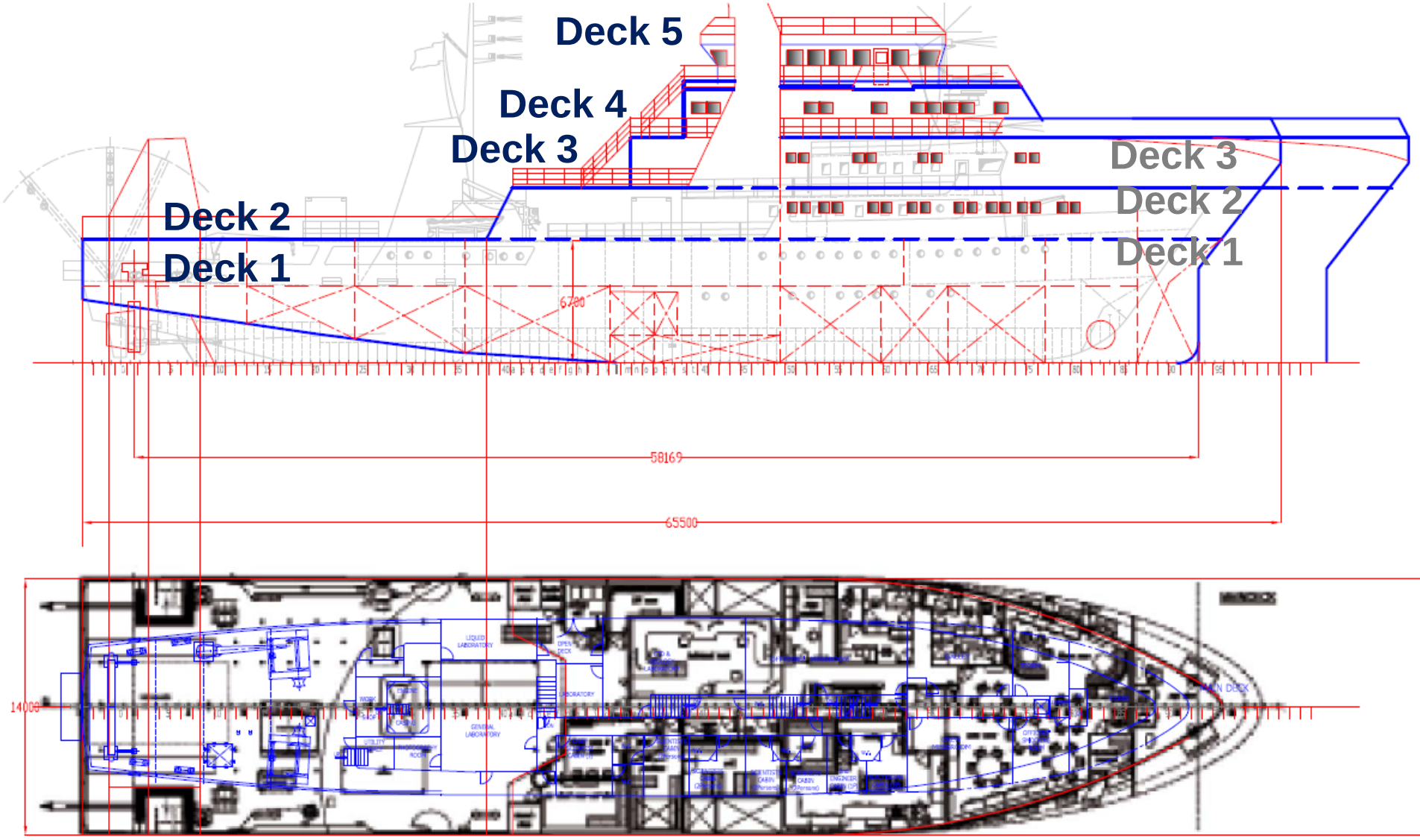
Main Particulars		Min	Max	AEGAEO
Stabilization	-	Anti-rolling tanks		
Dynamic Positioning	-	DP2		-
Bow Thrusters	[kW}	2x300.0		
Main Crane	[tm]	60.0		30
Second Crane	[tm]	30.0		-
Aft A-Frame	[t]	15.0		10
Side A-Frame	[t]	15.0		
Articulated Side A-frame for Bathysounder Hydrology or Equivalent	[t]	5.0		
Free Deck Area at Main Deck (aft)	[m^2]	300.0		75

Table 12. Main characteristics of the new vessel

Main Particulars		Min	Max	AEGAEO
Chemical & Biological Lab	[m^2]	45.0		30
CTD Control Room	[m^2]	10.0		6
Geophysical Lab	[m^2]	50.0		35
Wet Lab	[m^2]	20.0		12
Computer Lab	[m^2]	20.0		-
Meeting room	[m^2]	30.0		16
Total Lab Area	[m^2]	175.0		99
20ft Container Capacity (Labs, Equipment or Storage)	-	4		1
Preservation/Cooling Room	[m2]	2x10.0		-
Electrical workshop	[m2]	15.0		-
Mechanical workshop	[m2]	15.0		-
Transducers room at tank top	[m2]	50.0		-
Accommodation (total)	-	50		41
Class	-	IACS		
Flag	-	Greek		Greek
Owner	-	HCMR		HCMR

Table 12. Main characteristics of the new vessel

Comparison between R/V AEGAEO and preliminary drawings of the new vessel



Technical description of the proposed ship 1/3

- The ship will be constructed from Mild Steel with limited use of High Tensile Steel as necessary. Plate treatment and welding procedures will be according to Class requirements. Material, equipment and machinery installed on the ship will comply with Class requirements and will bear all necessary quality certificates.
- The ship will be fitted with a Power Plant featuring three or four Diesel Generators of an aggregate power of at least 4000 kW and a Diesel Electric Propulsion consisting of two Azimuth Pod Propulsors.
- The total Propulsion Power required to achieve the maximum speed of 12.0 kn will be not greater than 2400 kW.
- The ship will be fitted with two electrically driven bow thrusters.
- Safety and Navigation equipment will be in full compliance with relevant Rules and Regulations in force at the time of the construction of the ship.

Technical description of the proposed ship 2/3

- The ship will be fitted with five decks above the tank top.
- The Bulkheads Deck (i.e. Deck 2, which in this case coincides with the Main Deck) will be fitted at an ample height above the tank top enabling the installation of a lower deck between the tank top and the Main Deck.
- The spaces bellow Main Deck will be used for the installation of the power plant, the propulsion and steering machinery, a control room, auxiliary ship machinery, oceanographic winches, transducers and transceivers rooms, workshops, stores, refrigerated compartments, fuel tanks, fresh water tanks, ballast tanks etc.
- The aft part of the internal spaces on the Main Deck will be used for the installation of a Chemical & Biological Lab, a CTD Control Room, a Geophysical Lab, a Wet Lab a Computer Lab and a Meeting room.
- The remaining internal spaces on the Main Deck (forward part) will be used as public spaces (lounges, mess rooms, galley, stores etc.).
- Ample open spaces will be provided in the aft part of the Main Deck, as required by the ship’s operational profile.
- Oceanographic research winches will be installed as far as possible bellow Main Deck.

Technical description of the proposed ship 3/3

- The Upper Decks (Decks 3 and 4) will be mainly used as Accommodation space, fitted with single and double cabins with a capacity for 50 persons onboard plus a hospital.
- The exact synthesis of researchers, officers and crew will depend on the occasional mission requirements, but on average it is expected that the ship will carry approximately 30 researchers and a complement of 20 officers, crew and technicians.
- The Accommodation spaces and the overall design of the internal layout will comply with relevant Greek and International Regulatory Requirements.
- An enclosed control room will be fitted on the aft end of Deck 3 with undisturbed view to the aft part of the Main Deck and the ship's sides, from where a user may have full control of the ship's oceanographic winches, A-Frames and Cranes.
- Deck 5 will be used as the Bridge deck. Preferably, no other spaces will be fitted on Deck 5, enabling the construction of a wheel house with an undisturbed peripheral view.
- The wheel house will be fitted with a second control station looking aft with direct view towards the aft end of the Main Deck, from which the master will be able to control the ship during stationary research operations or during deployment or retrieval of research equipment.

Scientific / Research Equipment – 10-15 M€

1	ROV, 4500m rated
2	AUV, 2000-3000 m rated (?), including LARS
3	Deep water Multi beam 5000m, hull mounted
4	Shallow water Multi beam system (<500 m), hull-mounted
5	Multi-Channel Seismic Reflection System
6	Sub-bottom profiler, hull-mounted
7	Corer 15m long, Winch / wire rope 6000 m long
8	CPT in-situ geotechnical measurements
9	ADCP hull mounted
10	CTD, rosette, 24 bottles, winch / tow cable 6000 m
11	Chemical, biological and & wet Laboratories equipment: fume hoods, clean bench, Milli-Q, centrifuge, spectrometer, chromatograph, nutrients analyzer etc.
12	Deep tow DSS positioning system
13	Multi-net
14	Two winches, 12 tones capacity each

Table 15. Investment Costs

		PROJECT NAME: New Research Ship	CONSTRUCTION PERIOD		COST	
			START	END	M€	%
1		**Initial Design**	**M1**	**M26**	**2.08**	**3**
	1.1	Basic Research - Concept Design				
	1.2	Preliminary Design				
	1.3	Contract design				
	1.4	Technical Specification				
	1.5	Call for tenders (Including Preparation, Elaboration, Evaluation)				
2		**Contract signature**	**M26**	**M30**		
3		**Ship's construction**	**M30**	**M60**	**41**	**75**
	3.1	Structures				
	3.3	Propulsion				
	3.3	Electrical				
	3.4	Electronics & Navigation				
	3.5	Auxiliary Systems				
	3.6	Outfit & Furnishings				
	3.7	Research Equipment				
	3.8	Test & Trials				
	3.9	Ship's Delivery				
	3.10	Training of the crew / ship's Technicians				
4		**Portable Research Equipment**	**M58**	**M60**	**9.9**	**18**
	4.1	ROV + umbilical winch				
	4.2	Portable container workshops				
5		**Owners costs**	**M30**	**M60**	**2.2**	**4**
		TOTAL			**55.18**	**100**

Table 14. Indicative Timeline

1. Preliminary Design / Finalization of operational requirements	M1 to M6
2. Basic Design	M7 to M15
3. Technical Specification	M14 to M16
4. Call for tenders (Including Preparation, Elaboration, Evaluation)	M16 to M26
5. Contract Signature	M26 to M30
6. Detailed design / Ship Drawings	M30 to M36
7. Ship Construction and Outfitting	M36 to M56
8. Commissioning - Sea Trials	M56 to M58
9. Training	M58 to M60