

**WORK PACKAGE (SCOPE OF WORK) FOR INSITU  
ASSEMBLY, INSTALLATION, COMMISSIONING AND  
TEST & TRIALS OF "MIDSHIP PLANE" ON  
INS SINDHUKIRTI**

**A) TECHNICAL SPECIFICATIONS**

1. Activity: Carry out assembly, installation, Trials and Commissioning of Midship Plane as per drawing/repair manual. Manufacturing of all shims and fit bolts as required including machining, bedding, reaming holes, alignment, clearances of mating components, assembly and Pressure testing. The assembly and installation drawings and repair manuals are to be guide lines for assembly and installation of Midship Plane and enclosed in Appendix-1.

2. Spares and materials: All raw materials required for manufacturing the shims and fit bolts, special studs, dowel pins, electrodes, consumables like gaskets, gas, compressed air, oil, Paint etc. will be supplied by HSL at HSL Stores. All fasteners and spares required for assembly the components in situ will be supplied by HSL and other fasteners, gaskets etc. required for testing will be under contractor scope. Contractor should make arrangements to cut the materials from Rounds/Plates as required for manufacturing the jigs and fixture. All cleaning and working materials like rag, Kerosene, wire brush, Persian blue, hand pump (Hand pump will be arranged by HSL) for pressure testing of the components etc. will have to be arranged by the contractor. The contractor should submit detailed list of spares/raw materials required for manufacturing the shims, fit bolts, special studs and dowel pins within 10 days of placement of order. The list of material required for installation and testing should be submitted within 20 days of placement of order.

3. Checks, Testing and Inspections:- All the checks and tests are mentioned in the drawing/repair manual/approved QAP by WOT, are to be offered for inspection by the team of HSL and WOT(V) as required and the data to be recorded. The Inspection Report recorded data are to be bound and submit in triplicate to HSL-QC.

4. Components:- The following main components of Mid Ship Plane are as follows :

The Main assembly units and parts of Mid Planes:

<u>SL.No..</u>	<u>Description.</u>	<u>Qty.</u>
i)	Mid Plane Stock with Bearings.	02
ii)	Mid Plane Blade.	02

iii)	Radial Guide Assembly.	02
iv)	Hydraulic Cylinder -БO-2-200/80x560.	02
v)	Tiller Shaft Assembly.	01
vi)	Stopper Shaft Assembly.	02
vii)	Tie Rod Assembly.	08
viii)	Hydraulic Cylinder 110/60 Dia.	02
xi)	Interlocking Device.	01
x)	Lever Assembly.	05
xi)	Intermediate Lever.	01
xii)	Gear Rack	02
xiii)	Shaft.	05
xiv)	Gland Cover.	04
xv)	Gland Bushing (to be fitted).	05
xvi)	Gland Casing.	01
xvii)	Hydraulic Cylinder of 280/125 Dia.	01
xviii)	Pins Ø 50-11, Ø 75-2, Ø 90-3 Nos.	16
xix)	Connecting coupling.	01
xx)	Drive of П7 & д PY-400K instruments.	01
xxi)	Central lubricator Distributor.	04
xxii)	Guide.	01
xxiii)	Bearing.	04
xxiv)	Inter Locking Device.	03
xxv)	Fork.	04
xxvi)	Central lubricator devices.	01
xxvii)	Shutter gear	02
xxviii)	Shutter	02

5. Description of components :- The submarine uses a retractable Midship planes system, the planes being geared to each other and retracted into the superstructure.

The Midship planes system incorporates:

Two Blades;

Tilting mechanism;

Two shutters to close the holes in the superstructure.

The Midship planes are arranged in the superstructure forward of the conning tower fairwater. The Midship Plane tilting mechanism incorporates the following hydraulic gears:

- i) Shutter gear;
- ii) Stop drive;
- iii) Two plane rigging gears.
- iv) Tilting gear

All actuating hydraulic cylinders of the Mid Planes gear are fitted and arranged inside the submarine pressure hull in Compartment – 1. The force arising in the operation of the actuating cylinders are transmitted to outer hull with help of inter connected vertical shafts passed through pressure hull/emergency glands respectively. Normally, in static condition of the planes (Blades) shall be in fold condition inside forward casing and covered with both (Port& Stbd.) shutters. These two shutters are operated by a single hydraulic cylinder (110/60 dia) which is one of the actuating gear out of five gears. This shutter Mechanism has got separate operating control in-addition to total rigging in/out in sequence. The sequence operation of entire Mid Planes is internally controlled by slide safety valves and direction control valves. The operation sequence is as follows:-

a) Shutters get opened-gives impels to un-lock closed blades-gives -impels to 'Zero' rising device fitted to tiller hydraulic gear and rigging out-again lock after completion of rig out & shutter closed. It takes to 40 seconds for total operating. Then it allows the planes for tilting operation and takes 17 seconds from hard 'surface' to 'dive' position (25° either side).

b) The reverse (closing) operation is similar, likely starts from 'zero' rising Mechanism-shutter opens –unlocked –followed by rigging in-locked & shutter closed.

#### 6. Technical Data:

- (i) Working pressure of Hydraulic Drives : 100Kg/cm<sup>2</sup>
- (ii) Hard over angle of Midship Plane from a midships: ± 25°
- (iii) Angle of Midship Plane limited by bracket. : ± 26.5°
- (iv) Time taken to put Midship Plane from hard surface to hard Dive. : 17±2Sec.
- (v) Time taken to make Blade ready for putting over (rigging out of Midship Plane) : 40 Sec.
- (vi) Tiller Pressure hull & Emergency Gland test pressure. : 38 Kg/cm<sup>2</sup>
- (vii) Rigging, Shutter & Stopper Pressure Hull & Emergency Gland test Pressure. :80 Kg/cm<sup>2</sup>
- (viii) CLS Distributor Pressure Hull Gland test pressure : 45 Kg/cm<sup>2</sup>

7. Description of Work :- On completion of medium repair of all equipments/components will be handed over to the contractor for installation. All equipments/components are to be inspected for its completeness and condition by contractor before installation. All bolts, nuts and washers are to be cadmium coating/ Phosphotize before installation the equipment/components. During installation all clearances/fits limits are to be maintained as per related documents/drawings. De-preservation and preservation of equipment are to be carried out by contractor till its installation/handing over onboard. Total work can be sub divided into following activities:-

a) Installation :- Preparation of ship foundation beds and shims of hydraulic cylinders, Radial Guide Assembly, Interlocking Device, Tiller Shaft Assembly and other components beds of the system are to be done before installation by eliminate nicks, notches, scores by means of spot buildup, grinding, bedding & scrapping, then check with a testing plate by Persian blue.

b) Installation shall be carried out in three phases :-

Phase-I Confirmation/Preparation of onboard parts components-

- i) Press fitted bronze bushes of (P&S) radial bearings, shutter & stopper hull glands (replace if necessary).
- ii) Calibrate/repair threads of radial bearing foundation, shutter, stopper & tiller protective flanges.
- iii) Calibrate, repair threads of Blades hubs.
- iv) Carry out bedding, Matching, blue impression check & key fitment of blades & stocks upto acceptance limit & satisfaction of WOT.

Phase – II

- i) Install all Hydraulic pressure in-board. Align, Manufacture new Ships, ream foundation holes & secure with proper fit bolts.
- ii) Install all hull shafts, pressure hull & emergency glands.
- iii) Pressure test all hull glands & confirm. – 80 Kg/cm<sup>2</sup> for 10 min.
- iv) Connect-up with connecting leavers /couplings.
- v) Operate by the help of hand pump for confirmation using same hydraulic fluid.

Phase-III

- i) Install as per sequence all out board systems followed by alignment, manufacturing of new required shims.
- ii) Ream holes and secure with newly manufactured fit bolts.
- iii) Confirm individual drives operation using earlier fitted hand pumps.
- iv) Ty. Install both the shutters & check operation.
- v) Give clearance for casing installation.

- vi) Align shutter operation and trim buffer pads. All bottom & top buffers must be almost equal.
- vii) Ream shutter foundation & secure with proper bolts & fit bolts.
- viii) Confirm all operations using hand pumps.
- ix) Adjust locks pads, stopper limiters & tiller tilt angles using weld shims.

After final fitment of fit bolts 0.05mm Feeler gauge no go are to be check between the shims and foundation beds/components beds. Foundations holes, shims and components bed holes are to be ream in situ after alignment the components. Fit bolts 92 nos., shims 69 nos., special stud 92 nos. and dowel pins 30 nos. are to be manufactured during installation for fitment as per required size. Operating the hydraulic cylinders first hydraulic pipes are to be connected by the contractor. Hull gland bush fitment is in contractor scope. All components are to assembly/ installed and clearances/ fit should be maintained as per drawing/ repair manuals.

c) Manufacturing of grease pipelines:- Midship Plane components lubrication grease pipelines are to be manufactured by contractor. Total length of the pipes is 250 Mts. Approx., no of spools 147, pipe diameter 14x2.5, few pipes of  $\varnothing$  10x2 in board, material of pipe M3P Copper, and material of end fittings Bronze. All pipe lines are to be test, installed, clamped & grease proving to be done as per repair manual. The system flexible Hose 19 Nos. will be supplied by HSL, but installation pressure testing in the scope of contractor. Four in numbers grease distributors and one in number central lubricator devices will be provided by HSL are to be installed by the contractor. All raw materials for manufacturing the pipes and end fittings clamping (clamps-M.S., Rubber Strips-neoprene & Fasteners of H.T., and Class of strength 8.8) are in contractor scope. Lubricator device is to be tested for tightness together with Centralized lubrication system pipelines, with air at a pressure 0.5-10 Kg/cm<sup>2</sup> leakage is not permissible with hydraulic at a pressure 200 Kg/cm<sup>2</sup> (Lubricant Amc-1).

- d) Installation & Integration checks.
- e) Final installation of the system.
- f) HATs and SATs as per Methodica.

8. (i) HATs: Hats are to be carried out as per Hats Methodica which is enclosed at an Appendix-2 to this Work Package. During HATs all parameters should be satisfied as per HATs Methodica. No additional payment will be made for during trials fault finding and defect rectification. During HATs all consumable are at HSL scope.

(ii) SATs: SATs will be carried out by Ship Staff. Any defects observed during SATs and remarks given by Ship Staff are to be rectified by the contractor. No additional payment will be made.

## 9. MISCELLANEOUS.

- a) Repeated Works: No additional amount will be paid for repeated jobs till completion of guarantee period.
- b) Tool and appliances: All tools, instruments and appliances required for manufacture, assembly/ installation, trials and inspection are to be arranged by the contractor. Instruments must be of high precision quality procured from branded company and acceptable to inspection agency, calibration when ever required must be carried out.
- c) Work Standards: General Engineering practices and special instructions laid down the reference documents are to be strictly adhered by the contractor during the execution of the contract. All the technical requirements indicated in the relevant drawings technical operating and repair instructions are to be strictly adhered.  
Clearance/ fit standards as laid down in the reference documents are to be achieved during manufacturing, assembly/installation and trials.
- d) Drawing/ Documents: All reference Documents/ Drawing will be available for reference in document section or with the engineer-in-charge which is enclosed at an Appendix-1 to this Work Package. However, the contractor may take Xerox copies at his cost for reference, on completion of work the Xerox copies are to be returned to HSL.
- e) Contractor should have past experience in similar type of work and employ professionally qualified site Engineer for supervising the work.
- f) Contractor should employ highly skilled technicians who have previous experience, should be able to read the drawings and well acquainted with measuring instruments.
- g) Inside and out side the submarine there will be so many contractors working parallel for different systems. You should co-operate with each other and maintain healthy atmosphere.
- h) It is a challenging project linked with so many agencies including foreign countries. Contractor has no right to ask any explanation or claim against time delay.
- i) Installation or Hydraulic manipulators, valves, Hydraulic pipes concerning to Midship Plane at HSL scope. But it sequence of operation, adjustment of throttles, timing, interlocks etc. at contractor scope during installation and trials.
- j) Installation/ pressure testing the components & equipments manufacturing the jigs and fixture are in contractor scope. Manufacturing the jigs and fixture raw materials will be provided by HSL.
- k) Shifting of components/ spares for small items are in contractor scope but shifting of heavy components crane facility will be provided by HSL.
- l) During installation crane facility/ scaffolding is in HSL Scope.

Appendix-1

<b><u>List of Drawing for Mid Ship Plane</u></b>	
<b><u>Sl.No</u></b>	<b><u>Description</u></b>
1	Middle Hydroplane Steering Engine. - 877፳KM-213-90043, 17/1148)
2	Middle Hydroplane Steering Engine Specification - 877፳KM-213-9004C3 (17/1148/a)
3	Middle Hydroplane shutting shields - 877፳KM-213-90053 (17/1149)
4	Middle Hydroplane shutting shields specification - 877፳KM-213-9005C፳ (17/1149a)
5	Gland of FWD Bow Plane shutter / Lock - 554-03.955 cb) (RTDL-17/5273)
6	C LS for Mid Plane installation drawing in Comp.1.- 877፳P2-507-014MYStage-1-872
7	CLS for middle plane installation drawing in Comp.1 Specification. - 877፳P2-507-014 (Stage-1, SL.871)
8	Device for central lubrication in Comp.1. Installation Drawing. - 877፳P2-507-004MY
9	Device for CLS in Comp.1. Installation Specification. -877፳P2-507-004 (Stage-1-858)
10	Device for CLS Area Installation. - 877 ፳KM-507-90043 (17/1920)
11	Device for CLS Area Installation Specification - 877፳KM-507-90043. (17/1921)
12	CLS pipeline for Hydroplane in Comp.1. - 877፳KM-507-9014C3, (17/1937)
13	C.L.S pipeline for Hydroplane in Comp.1 Specification -877፳KM-507-901C3,17/1937
14	Steering System & Planes Description & Operation Instruction-877፳KM-902-3016TO
15	Steering Gears Specification for Medium Report - 877፳KM-200-004YP3,(17/1061).
16	Hydraulic Steering Engine Medium Repair Specifications- 238-32-1222Y3,(Vol.-1&2) RTDL-17/960.
17	BOW Plane Rig in / out Stock. - - RTDL-17/5002

RESTRICTEDHARBOUR ACCEPTANCE TRILSFORE PLANES (MID SHIP PLANE)1201. Instruments Required.

- (a) Stop Watch.
- (b) Megger

1202. Systems Required.

- (a) Hydraulic Systems
- (b) Palladi and Pirit
- (c) Centralised lubricating system.

Checks

1203. Installation. Check the quality of assembly and installation of the gear as per technical description and operating manual 238-32. 1151 TO.

1204 Carry out lubrication of fore planes and prove grease at all the points.

1205 Pressure Test .: Carry out pressure testing of the system by working fluid in accordance with technical description and operating instruction at a pressure of 125 kg/cm<sup>2</sup>.

1206 Insulation:. Check insulation resistance of circuits and repeaters and record in table A.

Trials

1207. Check the proper adjustment of the safety valves of the hydraulic cylinders at a pressure of 120 kg/cm<sup>2</sup>.

1208 Check the operation of the slide valve for automatic opening of Shutters. Control from Pirit system, ICH and by the slide valve handle fitted in the F/E. Open and shut shutters 5 times.

1209. Rig in and out the fore planes three times. Compare the mechanical indicator and electrical indicator. Check for simultaneous rigging in and out of port and Stbd. plane.

1210. Operate the fore planes and check the matching of electrical and mechanical indicators for planes shifting angles and record in table B. During this:

- (a) Carry out matching for electrical and mechanical indicators of planes for each 5° tilt of the angles during operation from the control posts as well as from F/E.
- (b) Difference in the values of angles should be not more than  $\pm 2^\circ$  on tilting from 20° to 25° .

(c) Testing duration should be 2 cycles of checking from each control post for each value of tilting angle.

(d) When planes are in rigged-in position tilt the plane and check for satisfactory operation. Planes should not get tilted at this position by operation or by gravity.

1211. Operate planes five times at maximum angles slowly without any jerk (if required purge out the system) by manual control from P 12 G in F/E. Check tilting time and hydraulic cylinder pressure, and record in table C.

Note : While checking give maximum planes angle  $\pm 25^\circ$  . Pressure drop during operation should not be more than 14-16 Kg / cm.<sup>2</sup>

1212. Rig out/in Fwd planes from Pirit and Check the following :

(a) Measure the time taken for rigging out/in the planes including opening of shutters and removal/fitting of locks.

(b) Measure the time taken for removal/fitting of lock and opening/shutting of shutters.

(c) Check automatic opening and shutting of shutters.

1213. Check the operation of light signaling on the Pirit and Palladi during change in the operating mode. .

1214 Operate Fwd planes five-time fully to dive and surface.

1215. Measure the changing over time from the main control to the manual control. It should be about 3 sec.

1216. Rectify the following if observed during trials.

(a) Working fluid leakage through the rod seals in the hydraulic cylinders due to damage of cups.

(b) Working fluid Leakage from the slide valves due to damage of sealing rings

(c) Decrease of the planes speed due to failure or damage of the piston-cups.

1217 Check the operation of the shutter opening interlock while blowing centre group MBT's and while opening of centre group main vents.

**TABLE - A****INSULATION RESISTANCE OF ELECTRICAL CIRCUITS**

<u>Sl. No.</u>	<u>Electrical circuit</u>	<u>Insulation in Meg. Ohms</u>		
		<u>Normal</u>	<u>Before Trials</u>	<u>After Trials</u>
1.	<u>Pirit drive</u>	1.0		
2.	<u>Repeaters</u>	1.0		

**TABLE - B****TEST RESULT OF FWD PLANE  
MATCHING OF INDICATORS**

<u>Type of indicator</u>		<u>Indicator Reading (Deg)</u>												
		<u>Dive</u>							<u>0</u>	<u>Surface</u>				
		<u>30</u>	<u>25</u>	<u>20</u>	<u>15</u>	<u>10</u>	<u>05</u>	<u>05</u>		<u>10</u>	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>
<u>Mechanical in F/E</u>	1													
	2													
<u>Electrical in C/R</u>	1													
	2													

<u>Sl.No.</u>	<u>Initial Range</u>	<u>Zeroing of plane at Control Room.</u>	
		<u>Control Room</u>	<u>Fore End</u>
		<u>SAT / UNSAT</u>	<u>SAT / UNSAT</u>
<u>1</u>	17° Surface		
<u>2</u>	26.5° Dive		
<u>3</u>	26.5° Surface		
<u>4</u>	17° Dive		
<u>5</u>	17° Surface		

Independent opening/ closing of shutters is to be carried out. The checks is to be carried out 5 times from local station in First Compartment.

**TABLE - C****TEST RESULT OF FWD PLANES –MAX. ANGLE 25°**

<u>Operating Mode</u>		<u>Pr. In The System Kg/Cm</u>	<u>Shifting Time During Control Sec.</u>			<u>Shifting Speed Deg./Sec. 3± 0.3°/sec</u>		<u>Pressure in Hydraulic Cylinder Kgf/Cm</u>	
			<u>Nor</u>	<u>C/R</u>	<u>F/E</u>	<u>Ist Comp</u>	<u>C/R</u>	<u>Head</u>	<u>Dis.</u>
Rigging out/in	1		40						
	2		40						
	3		40						
	4		40						
Tilting full dive to surface	1		17						
	2		17						
	3		17						
	4		17						
Automatic opening of shutter	1		9						
	2		9						
	3		9						
	4		9						
Lock	1		9						
	2		9						
	3		9						
	4		9						

Representative of HSL production Department

Representative of Quality Control Department

Representative of WOT

Representative of Ship's Staff

## **B - COMMERCIAL TERMS & CONDITIONS**

1. **TIME SCHEDULE:** The completion time schedule is for **100 days** from 01.10.2010.
  2. **PAYMENT TERMS:**
    - 2.1 **Stage –I :-** 30% Payment shall be made after completion of **assembling insitu** against the submission of the satisfactory work done certificate duly certified by the concerned production department.
    - 2.2 **Stage –II :-** 30% Payment shall be made after completion of **installation onboard** against the submission of the satisfactory work done certificate duly certified by the concerned production department.
    - 2.3 **Stage –III :-** 20% Payment shall be made after completion of **Commissioning** against the submission of the satisfactory work done certificate duly certified by the concerned production department.
    - 2.4 **Stage –IV :-** 10% Payment shall be made after completion of **HATs & SATs (Test & Trials)** against the submission of the satisfactory work done certificate duly certified by the concerned production department.
    - 2.5 **Stage- V :-** Balance 10% payment shall be made after completion of guarantee Period.
  3. **GUARANTEE PERIOD** : The guarantee period is 12 Months from the date of HATs & SATs of the Midship plane onboard. Any defects arising are to be attended to promptly and rectified at free of cost.
  4. **PERFORMANCE BANK GUARANTEE** : 10% Performance Bank Guarantee to be submitted upto the period of satisfactory completion of the work within 15 days of issuing LOI / Confirmatory Work Order.
  5. **DELAY IN COMPLETION OF WORK** : 0.5% per week subject to a maximum of 10% of the Work Order Value.
  6. **GENERAL TERMS & CONDITIONS** : As per Enclosure – 2
  7. **EMD** : Rs.20,000/- Demand Draft / Bankers Cheque on the Name of M/s Hindustan Shipyard Ltd., Visakhapatnam-530 005 towards Earnest Money Deposit to be submitted along with Technical Bid. (Returnable)
- Note:-** Vendors registered with HSL are also to submit the EMD.
8. **TENDER FEE** : Rs.500/- Vide State Bank of India Challan /Bankers Cheque on the Name of Hindustan Shipyard Ltd., Visakhapatnam - 530 005 (Branch No.9082), Cr. HSL Current A/c No. 10299596073 towards tender fee to be submitted along with Technical Bid. (Non returnable)

**Chief Manager (SBO)**