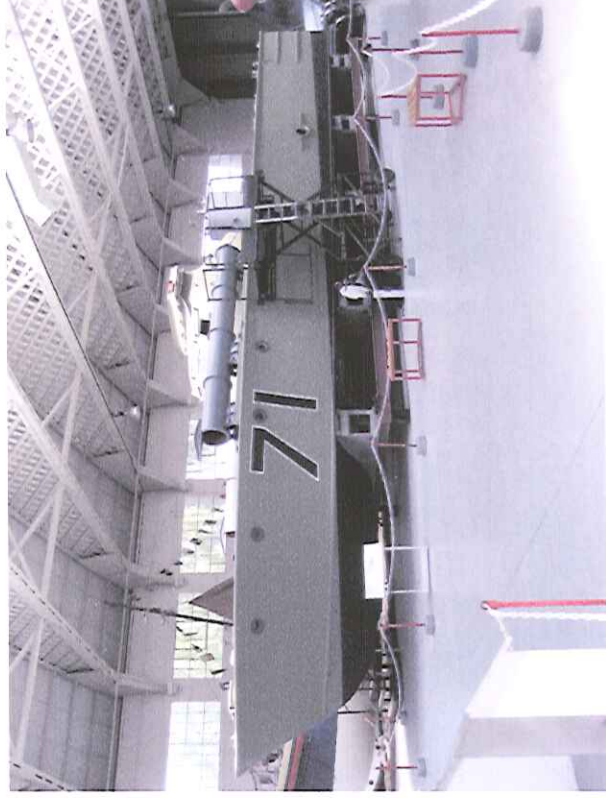


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MTB 71 MOTOR TORPEDO BOAT



CONDITION SURVEY REPORT

and

Discussion regarding potential conservation issues at

THE IMPERIAL WAR MUSEUM, DUXFORD

1. INSTRUCTION

Further to an instruction received from John Delaney, Collections Manager, Imperial War Museum, Duxford on 16th June 2008, I have carried out inspections of the MTB 71 60-foot Motor Torpedo boat at Duxford on 19th May, 30th June, 1st July and 12th September 2008.

The purpose of these inspections was to assess and report on the current condition of the vessel and to make suggestions and outline recommendations regarding her potential conservation and / or restoration.

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2. GENERAL DESCRIPTION

MTB 71 was constructed by Vosper Limited of Portsmouth in around 1940; one of 4 vessels originally ordered from Vosper by the Royal Norwegian Navy. Two of the batch were transferred to the British Royal Navy shortly after construction and designated the numbers MTB 71 and 72. MTB 71 is the vessel we are reporting upon.

LOA: 59.5'
Beam: 15.25'
Draft: 3.5'

Approximate displacement: 25 tonnes fully outfitted

The vessel was powered with two 1,150hp, 24 cylinder Isotta Fraschini petrol engines to shaft driven fixed propellers via reversing gearboxes. None of the original sterngear (shafts, propellers, A' brackets, sternglands) were present. One typical engine is displayed removed from the vessel.

3 HULL CONSTRUCTION

The hull is constructed in a manner known as double and triple diagonal planking. This incorporates two or three layers of relatively thin timber planking laid at opposing angles with an oiled fabric; probably Japanese silk but possibly fine calico or linen, between. The diagonal layers are fastened to each other with copper clenches and rooves and to the internal structural members (skeleton) of the vessel with bronze screws. This vessel is of single-chine hull form with raked stem, flared bows sections and transom stern.

The underside section of the hull; below the chine, is constructed with three layers of Mahogany planking; the external planks are 1/2" thick laid fore and aft and are between 6.5" and 8" wide. Inside this layer there are two diagonal layers laid at right angles to each other of 1/4" thick Mahogany. There is a membrane of oiled fabric between each layer.

The hull topsides above the chine are constructed with two layers of Mahogany planking with the outside diagonal laid at approximately 45 degree angle down from the deckedge running aft. The inside diagonal planking is laid at approximately 90 degrees to that on the outside. The inner planking laminates are 1/4" and 7/16" outside with the oiled fabric membrane between.

4 DECK CONSTRUCTION

The deck is also constructed in a double diagonal manner. The copper nails fastening the two layers together are "turned" rather than incorporating a roove washer on which the nail is riveted. The diagonal lower layer is 1/4" thick Mahogany with oiled fabric membrane and 1/2" top planking laid longitudinally; parallel with the centreline.

The deck is laid on sawn Mahogany deck beams 6 1/4" moulded by 1 1/4" sided at 28" spacing.

On top of the deck beams, there are longitudinal stringers of 2" x 1" Mahogany at 16 1/4" centres. As a whole, the deck is sagging fore and aft over the main structural bulkheads and is fairly flexible underfoot where the timber material has degraded and timber planks shrunk on their copper nail and screw fastenings. The decks are through fastened with bronze screws to the stringers and deck beams.

There are fairly wide Mahogany covering boards, approximately 7" width average. They are split and contain pockets of decay in many sections including but not restricted to; in-line with the main companionway to both port and starboard and aft on the starboard side.

The deck is coated with anti-slip paint, as it would have been following original construction. Rubber covering was also included on the port and starboard sides of the foredeck forward of the wheelhouse when in service. Shrinkage has caused gaps to form between the planks and this has resulted in a deck that is not watertight in addition to the general lack of rigidity.

There are three large soft patches [semi permanent access hatches], that can be removed to gain access to machinery beneath and these are aft from the deckhouse companionway 8' 2" x 5' 6", 8' 2" x 7' 2 1/2" and 5' 9" x 5 1/2" respectively.

All of these soft patches show signs of deterioration and there has been some repair and replacement of planking on all of them.

5 INTERNAL STRUCTURE

The internal structure of the vessel comprises of a wood keel constructed in two parts (one above the other) fastened together with 4 rooved copper nails between each set of frames. The keel structure is substantially of Teak and is finished fair with the external hull planking; that is with no external protruding keel. The top of the keel measure 5 1/2" across.

Inner and outer stem are Oak,

Sawn frames are arranged at 14" centres throughout the vessel, mostly in Mahogany except where stated in the text below where they have been replaced with laminated plywood. There are 51 frames from the stem to the transom. The frames are 4 1/4" moulded and 1" sided inside the hull topsides and 5 1/4" moulded and 1 1/4" sided on the hull bottom, with the exception of the steering flat, where the lower frames are larger.

Structural (and probably originally) watertight bulkheads are installed at frames 18, 31 and 41 from the bow. There is an additional non structural bulkhead forming the aft end of the heads compartment at frame 7. The watertight bulkheads are constructed from double diagonal teak, copper clenched and finishing at 1/2" thick. With vertical stiffeners 3" x 1 5/8" at varying centres between 22" and 16", depending upon the position and width of the bulkhead.

The chine stringer is, most likely, Pitch Pine and the beam shelf Mahogany.

There are steel structural plate floors (tying the frames together across the centreline structure of lower stem and forefoot) and the remains or fastening holes in the frame bottoms where fabricated steel structural floors had originally been installed to every frame, except where a bulkhead is positioned.

There were, originally, fabricated steel frame knees across the hull chine on every frame through the vessel with adapted knees at the bulkheads. The majority of these have been removed. These are clearly shown on section drawings included in Construction Drawing Number 9216 (one of the few original drawings identified).

Steel fabricated hanging knees were installed at every deckbeam end and many of these remain.

In addition to the fairly thin bent steel plate chine knees, structural floors and hanging knees at each framed that were bolted through the frames, deckbeams and to brackets on the keel there were also a pair of longitudinal girders that ran from the fourth frame aft, right through to the aft end of the machinery space,

These girders are shown in part on Construction Drawing Number 9216 and small sections remaining indicate that these were formed out of a pair of 1 1/4" angle bars, with 1/4" plate – up stand all riveted together. These girders, in conjunction with packing pieces between the frames, at 13" and 52" out from the centreline on both sides, would have originally formed an enormously strong longitudinal girder system inside this vast vessel.

Much of the internal stiffening on this structure is missing.

6 SURVEY FINDINGS

Method

Visual inspection, light hammer sounding, moisture content readings of timber, Removal of sample fastenings.

Hull

GENERAL

The fabric membrane between planking layers had degraded wherever sections were revealed. The material is completely lacking in strength / substance.

Gaps have formed between the layers of planking leaving voids and these are partly filled with a mixture of marine sediment and dried bedding compound (most likely lead powder rich putty)

The below section of the hull was faired with hard filler at some stage and sheathed with a fairly heavy layup of glass fibre chopped strand matt bonded with polyester resin. There is little of this remaining and those sections still in place indicate that the level of bond between the filler and GRP with the original hull timber was poor.

The structure of the vessel is significantly weakened due to the absence of many of the original hull stiffening components.

The bow of the vessel has been sagging forward of the forward cradle support and this is now supported with a prop.

PORT SIDE - below the chine. Approximate measurements taken from the stem at the waterline:

Hammer and spike testing on the underside; revealed the following overt defects.

4' aft – there is considerable deterioration (decay) in the outer planking immediately outside the centreline and filler is present on the lower fore foot on the centreline.

There has been renewal of external planking – four and five planks up from the centreline.

The garboard / first plank from the centreline, is heavily deteriorated and there are short plank ends close to three through-hull fittings. (most likely for the forward heads and sink)

10' aft – there is heavy wear on the outer planking, in places completely through this layer. I consider it probable, that there has been gribble worm attack on the planking and subsequent wear caused by the boat regularly grounding between tides.

There are longitudinal splits in the planking along fastening rows – 2nd plank up and fairly heavy degradation where the GRP has been removed.

14' aft – planks have shrunk across their width and there is an extreme amount of dry powder exiting the cracks, probably a mixture of salt and old dried powdered lead rich putty.

There are varying degrees of plank deterioration through the under body, but there are very few planks that have not been seriously degraded, with material missing between an 1/8" depth, to the full thickness of the planking (1/2"). The timber is in most placed de-lignified; lacking in strength and pliability.

31' aft – there is a fairly large yellow metal plate, believed to be the transponder surface for the Asdec equipment. Degradation of planking outboard and immediately inboard of the chine-rail is present, through to this area from the bow.

There is some minor improvement of the external planking surface from the propeller shaft log exit position to the aft set of hull supports.

STARBOARD SIDE below chine - Measurements taken from the stem at the waterline

There is a fairly heavy section of decay in the inner and outer planking, 3' aft.

8' to 12' – there are plywood replacement planks included, with very heavy worm degradation of the first and second planks from the centreline and two planks beneath the chine to 16' aft.

16' to 25' – very heavy degradation in pockets, with thick polyester filler still in place.

25' to 35' – very heavy degradation outboard, with the timber de-natured.

The aft fore foot of the hull has a particularly bad degree of degraded timber, with sections where the entire external 1/2" veneer has been lost.

PORT TOPSIDE

Decayed planking is evident around the aft lifting eye over 4 or 5 planks, approximately 45' aft from the stem, with further decay in planks and in the edge of planks, through opened seams, approximately 40' aft.

Planks through the topsides have shrunk considerably and seams have previously been filled with what appears to be decorator's caulk. This when raked out reveals that there is a gap between the inner and outer layers of timber planking where the fabric barrier material is exposed. The oiled fabric material has degraded to such an extent, as to be useless as a watertight barrier/ membrane.

STARBOARD TOPSIDES

From 3' aft and approximately 1' down from the sheer the outer planks forward on the starboard side are heavily decayed over a large area, the full extent of which is difficult to assess without removal of paint and a degree of destructive testing. Spike testing indicates this may well extend through into the internal planking.

5' to 11' aft – there is a large area of decay with a fairly large plywood patch. Beneath the plywood there is degraded inner planking evident both inside and out between 15' and 22' aft and at 30' aft. There are further patches in this part of the vessel where sections of plywood have been inserted in place of original Mahogany planking, particularly around the exhaust outlet and further forward.

TRANSOM

The transom is constructed with 7.5" wide boards, ½" thick, horizontally laid externally and with 5/16ths thick diagonal planks inside. There has been a large repair at the top port-hand corner of the transom carried out to a poor standard.

FASTENINGS

Apart from local renewal of the bronze screw fastening in areas where previous repairs have been carried out the screw fastenings have degraded through dezincification. Samples tested in most parts sheared at the screw head.

Copper fastenings have fared better although shrinkage of the timber through which they fasten has left many of these nails loose in the timber material.

INSIDE THE HULL STRUCTURE FROM THE BOW

Much of the fabricated steel internal stiffening in the manner of knees, structural floors, webs and longitudinal girders is missing, as stated in the earlier description of the Internal Structure.

The sawn Mahogany frames are arranged at 14" centres throughout the vessel and these are 4 ¼" moulded and 1" sided in the hull topsides and 5 ¼" moulded and 1 ¼" sided in the hull bottom, with the exception of the steering flat, where the lower frames are larger.

Inside from the stem, there are 51 frames to the transom, with watertight bulkheads at 18, 31 and 41. There is an additional non structural bulkhead forming the aft end of the heads compartment at frame 7. There is some delamination on this plywood bulkhead.

Repairs at the upper stem inboard are in epoxy resin and plywood.

The inner stem is split from the top down, approximately 3' 6", with minor local decay. There are thin original design steel-plate floors on 1, 2 and 3 frames.

The watertight bulkhead is constructed with double diagonal teak and is 1/2" thick. The watertight door remains. Deterioration is evident on the bulkhead bottoms where original stiffening components were bolted.

The original heads compartment is sited between frames 4 -7 and a sink is in position. Decay is present in the inner planking to starboard and there is a plywood patch to port, presumably covering similar deterioration.

The first full deck beam is installed at frame 6.

There is a large plywood patch on the inside of the hull to port, immediately aft of frame 7 and close under the deck edge.

Electro-chemical decay is evident in the chine timbers around through bolts.

The inner stem is split between frame 7 and 10 with some local deterioration of the timber around fastenings.

Internal diagonal planking is loose and there are many splits along the lines of fastenings.

Note, the metal plate floors through this section extended approximately 2' up the hull sides, either side of the centreline and that there is considerable deterioration and decay, on the frames through the centreline areas and at the majority of positions where the floor and chine knee fastenings were positioned. The majority of the hanging knees at the deck beam to frame connection remain in position and material around these has not deteriorated badly.

At frame 18, we have an additional large doorway cut in the watertight bulkhead to starboard. The actual watertight doors throughout the vessel are not present with the exception of the forward collision bulkhead door. Deterioration is evident on the bulkhead bottoms where original stiffening components were bolted.

Fore and aft packing pieces to port of the centreline, between frames 12 and 18 are probably remnants of chocking beneath the original longitudinal girder system.

Between frames 18 and approximately 22 on the starboard side there is heavy area of degradation of the inner hull planking. All internal chine knees are missing through this area.

The port beam shelf has been repaired between frames 18 to 22.

The starboard beam shelf has a decayed section and short joint between frames 24 to 31.

At the aft end of this compartment between frames 26 to 31 to starboard and 27 to 31 to port, the original Mahogany frames have been replaced with laminated ply. These were in varying degrees of deterioration. It is probable that the ply knees were added at the chine position in this area following a major repair during active service.

Aft of frame 31, within the engine compartment, all of the original girder and structural floor internal stiffening has been removed. There are large plywood patches to port under the deck in this compartment, where deck timber has decayed. There is also another ply deck patch between 26 and 31 to starboard of the centreline beneath the footprint of the aluminium wheelhouse.

Chine stringer scarf opened port at frame 31 with some decay around.

Inner planking and framing has deteriorated at the chine and close to the centreline as in compartments further forward.

Aft of the double diagonal bulkhead at frame 46, two of the four structural frames have been renewed and inner planking is in relatively good condition, indicating that this may have received some rebuilding in the past. compartment. Original frames were 5 1/2" moulded x 2" sided and the two renewed frames are 5" moulded x 1 3/4" sided

Bulkhead at frame 31 is fairly heavily damaged where fore and aft girders would have been connected.

Approximately 40% of frames will require repair at chines and / or centreline.

7 FIXTURES AND FITTINGS

Interior

Structure – Important and interesting features of the interior stiffening in the manner of complex fabricated steel fore and aft girders, chine knees, structural floors and engine bearers are missing.

Machinery – All machinery is removed and apart from the single engine exhibited outside the vessel, is not available.

Two auxiliary Vosper V 8 engines are shown on Vosper drawing 9216. I am not aware that these were installed in MTB 71

Tanks – No fuel or water tanks are available

Watertight doors - All missing except for the collision bulkhead forward.

Steering gear – A steering wheel was observed loose on board, however none of the original hydraulic steering equipment was seen.

Interior joinery – None remaining other than heads sink to port forward

Hull

Topside ports x 6 – Installed and in need of renovation or loose inboard

Steering gear external - Rudders and stocks were originally transom mounted and none were observed.

Stern Gear – none observed. Shafts, propellers, stern glands and A' brackets

Deck

Aluminium wheelhouse - is sited at the correct position but not fastened.

Gun mounting - a plywood mock up of the original mounting is installed aft of the wheelhouse

Deck hatches – round watertight deck hatches are installed as shown on the original plans.

Cowl vents – A variety of original type deck cowl vents are loose inside the vessel with upstands mounted on deck forward of the wheelhouse. Vents originally installed on Dorade type boxes aft are missing.

Mushroom vents - The majority of these are installed with 2 missing / not found.

Stanchions and guardrails – not found

Torpedo tubes – Fabricated copies sited on deck

Lifelines – These were originally in a diamond formation on the aft deck and on the centreline forward to the jackstaff forward and ensign staff aft. None found.

8 CONSERVATION / RESTORATION issues

The structure of MTB 71 has deteriorated to such a degree as to render her uneconomic to restore to active use without complete dismantling and re-building. The nature of her double and triple diagonal hull and double diagonal deck construction is such that although sections of centreline structure and framing could, most likely, be retained, her original hull and deck planking laminates could not.

As inspected at Duxford, the vessel is well supported in a purpose made cradle. Apart from the requirement to keep the bow of the vessel chocked to prevent further sagging the vessel is reasonable dimensionally stable. Additional (non original) pillars have been added inboard to inhibit further sagging of the deck structure between main bulkheads.

As listed above, all of the interior joinery, most of the machinery, fixtures and fittings are not with the vessel and are most likely unavailable unless they can be retrieved from another similar vessel in poorer structural condition.

The timber employed to construct the vessel has naturally degraded. The material, particularly the Mahogany, has de-lignified and is now lacking in strength and pliability in most sections of the vessel.

The vessel is, in my opinion, one of importance. She was built with a complex fabricated metal internal stiffening regime, much of which is now missing. A drawing is available showing sufficient construction detail and layout to allow reconstruction of these elements. The manufacturing techniques and design detail associated with diagonal planking over sawn frames, in conjunction with the fabricated metal stiffening originally utilised, provided a light, strong vessel that could be quickly constructed and it is, in my opinion, these attributes that makes this vessel of specific interest.

Previous diagonal planking deterioration had been dealt with by external FRP sheathing below the chine and insertion of plywood in place of the original Mahogany timber above. It is probable that the replacement plywood frames and knees at about frame 26-30 were installed when the vessel was on active duty.

Regarding ongoing display, I considered that it would be desirable to display the vessel sited lower to the ground and with the soft patches aft removed and allowing good sight of the (reinstated) internal stiffening web structure. This would require a higher access staging than that presently alongside.

9 Possible levels of conservation / restoration for consideration

9.1 Complete rebuild of the structure. It is probable that approximately 40% of the centreline structure, sawn framing, deck beams and stringers could be retained and re-used during this program.

9.2 Stabilisation of the structure. Decay is present at a variety of positions throughout the vessel's structure. The current location of the vessel out of the water and under cover at Duxford will slow down the rate of deterioration through decay but will not completely eliminate it. The vessel is likely to continue to deteriorate through decay as and where she now lies. The rate of deterioration could be slowed considerably or stopped if paint coatings were removed from the timber surfaces inside and out to allow treatment with suitable timberpreservative/ fungal decay inhibitors. A degree of injection of this preservative into the opened gaps between diagonals would also be possible and beneficial.

9.3 Improvement of the structure. In conjunction with the abovementioned "stabilisation of the structure" it would be desirable to :-

- a Remove sections of plywood external planking where these have replaced original material and renew in Mahogany.

- b Remove and replace degraded sections of the covering board
- c Repair sawn frames internally by scarphing and graving in new Mahogany material where this has degraded.
- d Reinstate to the original design fabricated steel fore and aft girders, chine knees, structural floors and engine bearers.
- e Remove and renew the very heavily degraded external fore and aft planking below the chine line along with associated fastenings.
- f Re fill / fair and paint.

9.4 Improve the external appearance of the exhibit by completion of the outfit of deck equipment, as shown in Vosper drawing number 9216. Some components are no longer available and it would be necessary and desirable to prefabricate some replacement parts. It was considered not necessary to manufacture and replace stern gear (shafts and propellers) for display purposes.

10 LIST of DRAWINGS relevant to MTB 71 and available at Greenwich Maritime Museum

Collection VOS/2018-21/3

Name & Class: 60 ft Norwegian MTBs c.1940

Type:Motor torpedo boat

Line	Plan Type	Scale
1	Drg 9216.Gen Arrangt Profile, Decks & Sections	
2	Drg 8351.Arrangt & Details Propeller Shafting	1:2
3	Drg 8570.Details of Steering Gear.1939	3:4
4	Drg 8576.Steering Wheel.1939	1:2
5	Drg 8579.Indicator & Steering Spindle Details	1:8
6	Drg 8585.Arrangt of Steering Gear.1939	1:1
7	Drg 8847.Eng Telegraph Plates (in Norwegian)	1:2
8	Drg 8886.Driving Shaft for Aux Cruising Engine	1:1
9	Drg 8941.Steerg Spindle & Transmitter Bracket	1:1
10	Drg 8965.Seating for Lockheed Pump.1940	1:1
11	Drg 8975.Arrangt Lockheed Pump Drive.1940	1:12
12	Drg 8986.Arrangt Air Starting System.1940	1:12
13	Drg 9058.Proposed Reserve Fuel Tanks.1940	
14	Drg 9115A.Temporary Shaft for I.F. Engine.1940	1:2
19	Drg 9926.Splined Driving Shaft for Aux Engines	1:1

11 MTB 71 - GLOSSARY of TERMS as used in this report

ASDIC - anti-submarine detection investigation committee

beam - maximum width of the vessel

beam shelf - timber stringer at the inside deck edge to which the deck beams are fastened

bows – forward end of the vessel

bulkheads – transverse partition inside the vessel

chine – the joint between two flat sections of the hull

chine knees – supporting structure across the joint inboard

chine stringer – longitudinal timber strengthening the chine

Chine stringer scarf – a long tapered joint in the chine stringer timber

companionway – main access to below decks from the wheelhouse

copper clenches – square section copper nails that hold planking laminates together

covering boards – heavy deck timbers that are attached at the deck edge and transom top

cowl vents – deck mounted vents that stand above the deck with a tube body

deck beams – timbers spanning across the vessel from side to side

deck hatches - round watertight deck hatches

decorator's caulk – a cosmetic decorating filler, normally for home indoor use

delamination – when layers or veneers of a material normally bonded together come apart

de-lignified - degradation of the cell wall structure of timber

dezincification – deterioration of an alloy where the zinc component is lost, normally through cathodic or electrolytic action.

displacement – the actual weight of the vessel / weight of the water displaced when afloat

double diagonal - two layers of planking laid at opposing angles fastened together with a waterproof membrane between.

draft – maximum depth of the vessel when afloat.

electro-chemical decay – deterioration of timber around metal fastenings and fittings in a damp environment

epoxy resin – a relatively modern resin adhesive

fabricated steel frame knees – metal plate and angle components bolted across joints in the timber hull framing to strengthen them at the chines and deck edge.

fastenings - Screws, bolts, nails and roves that attach components of the vessel together

frames – transverse ribs that for part of the skeleton of the vessel

garboard - first plank up from the centreline / next to the keel

gribble - a marine isopod that bores into wood for ingestion as food.

GRP – glass reinforced plastic / usually a glass cloth bonded with polyester or epoxy resin

guardrails – Wires or ropes arranged to inhibit people from falling overboard.

hanging knees – vertical stiffening plates across the joint at the deck edge forming the strong attachment between deck beams and hull frames

interior joinery – Seats, beds, cupboards doors and other components providing the living accommodation within the vessel

keel – centreline structure of the hull

LOA - length overall of the hull

longitudinal girders - metal plate and angle components riveted together and attached inside the hull over most of the length to provide considerable strengthening

Machinery – Engines, pumps, generators
Mahogany - relatively light weight strong tropical hardwood favoured as a boatbuilding material
MTB – Motor Torpedo Boat
mushroom vent - a vent tube attached on deck with a domed top cowl that can be closed to prevent ingress of water
Oak – European durable hardwood often use in boatbuilding
Pitch Pine - resinous softwood used in boatbuilding
plywood – thin veneers of timber bonded together with an adhesive to form sheet material
port –to the left when looking forward in the vessel or round windows in the hull
rooves – cone shaped copper washers through which the point of copper fastening nails are inserted before riveting (clenching)
sagging – When the bow and stern of a vessel droop through lack of structural rigidity
soft patches - semi permanent access hatches, sealed and watertight but removable
stanchions - well secured upright onto which guardrails are attached.
starboard – to the right when looking forward in the vessel
Stem - the forward centreline component of the vessel
Stern – the back of the vessel
sterngear - shafts, propellers, A' brackets, sternglands
Stringers – long pieces of timber running fore and aft inside the hull to provide strength

structural plate floors - metal plate and angle components riveted together tying the frames together across the centreline structure inboard

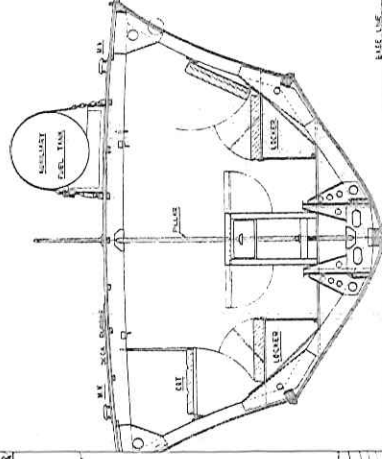
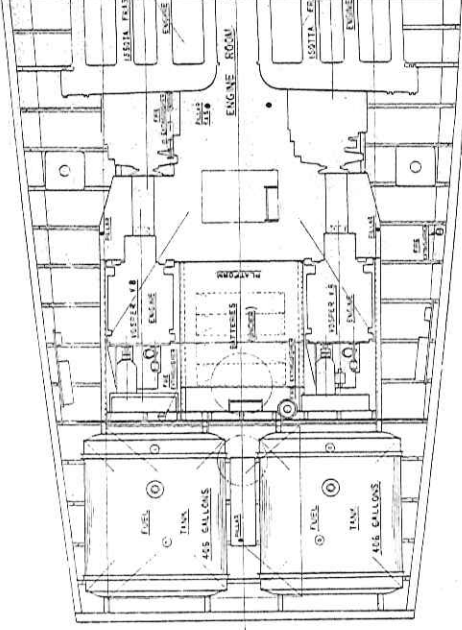
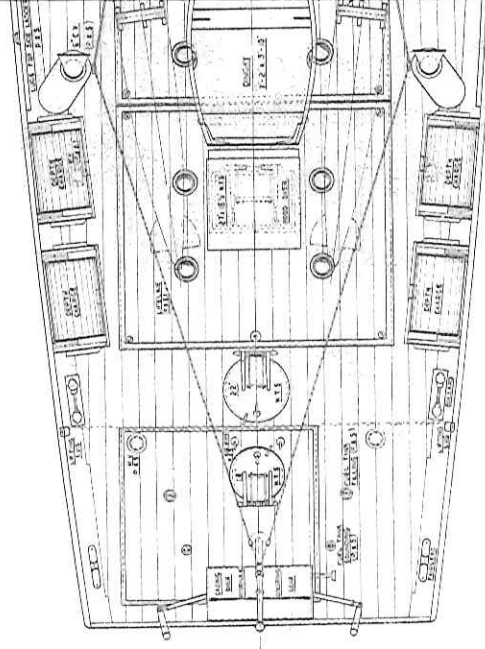
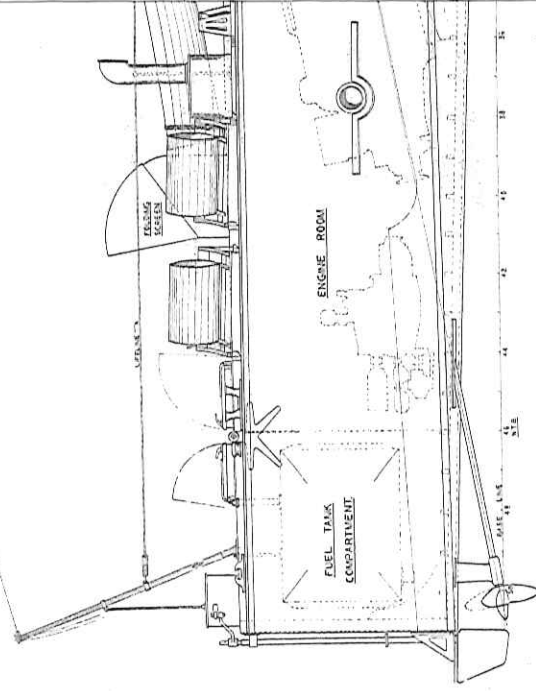
Teak – durable tropical hardwood
Topsides - hull side above the waterline
transom – vertical stern of the vessel
triple diagonal - three layers of planking laid at opposing angles fastened together with a waterproof membrane between.
turned copper nails – copper nails fastening double diagonal deck planking together bent over rather than riveted / clenched with rooves. (a specialised technique to do effectively)
Vosper Limited - British shipbuilding company established in 1871 as Vosper & Company. Became Vosper Limited in 1936.

12 GENERAL ARRANGEMENT DRAWING 9216

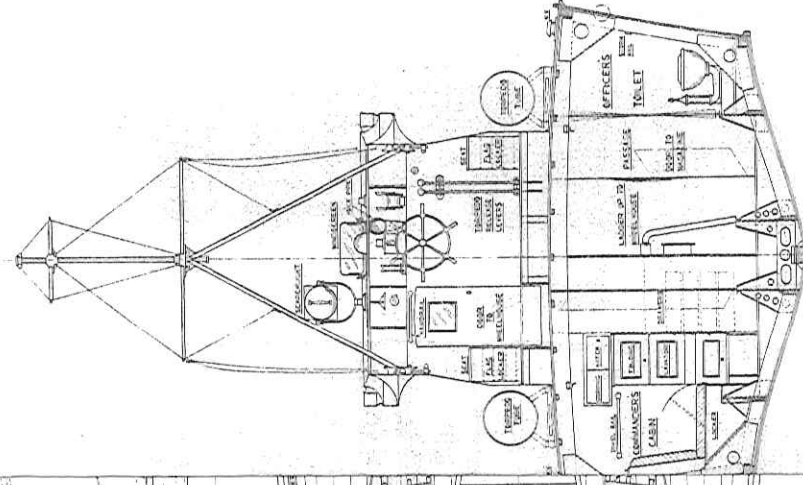
VOSPER LTD. PORTSMOUTH.

30' M.T.B.'s NOS 2018-21. NORWEGIAN NOS 5 & 6. AD. NOS 71 &
GENERAL ARRANGEMENT. (AS FITTED.)

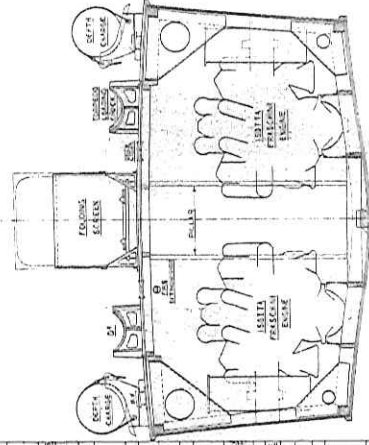
SCALE:-



SECTION ABOUT FR 12
LOOKING FORWARD



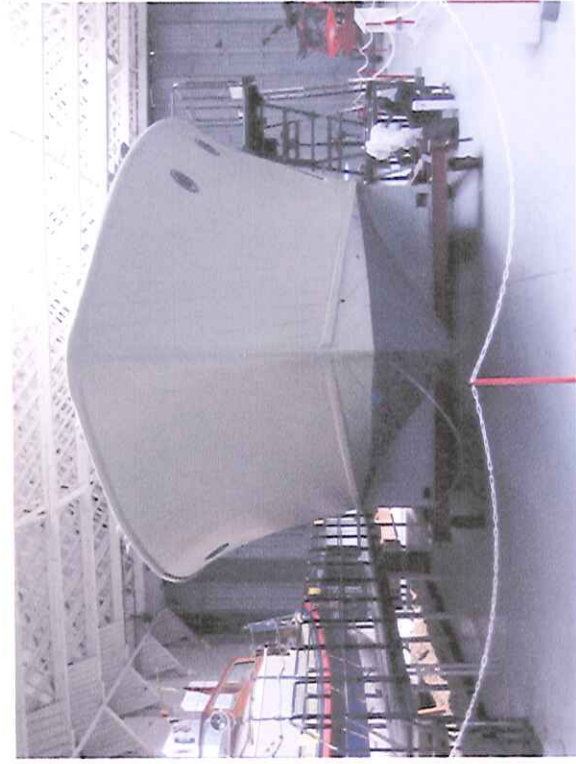
SECTION ABOUT FR 26
LOOKING FORWARD



SECTION THIRD ENGINE ROOM
LOOKING FORWARD

DRG. NO 9216.

PHOTOGRAPHS



Bow view

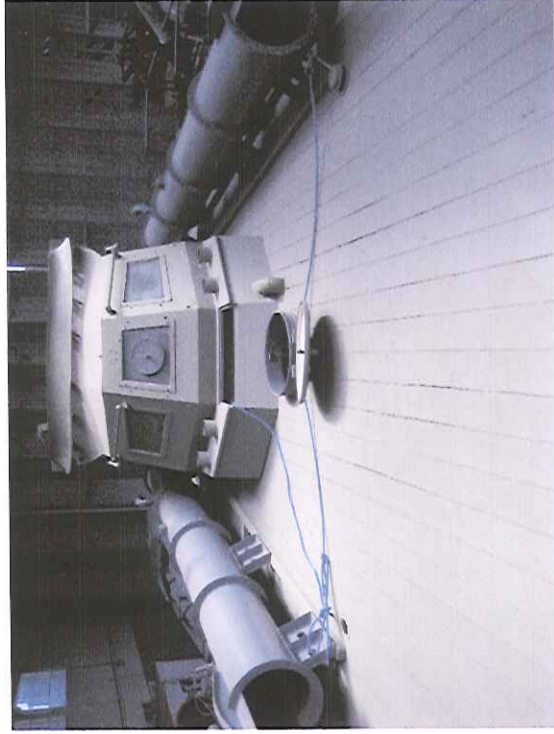
Transom View



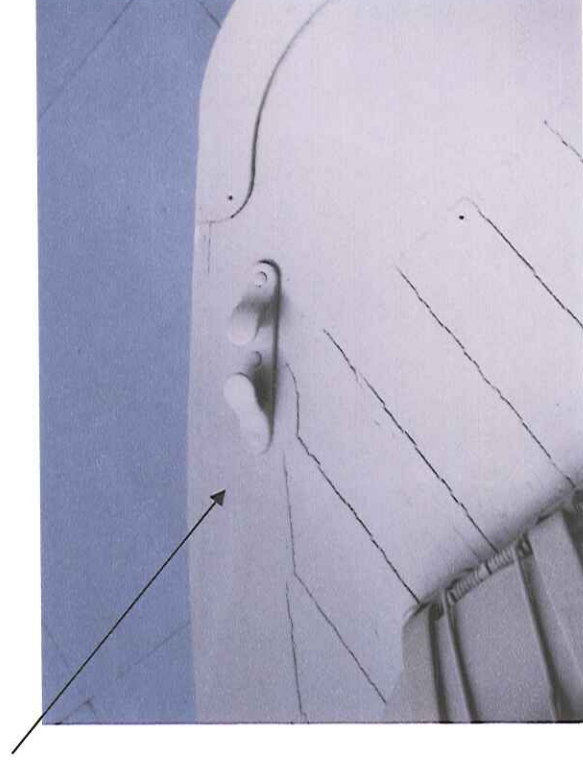
Gaps in topside planking where shrinkage has occurred and decorator caulk filler removed



View down deck from forward



Covering board at the stem





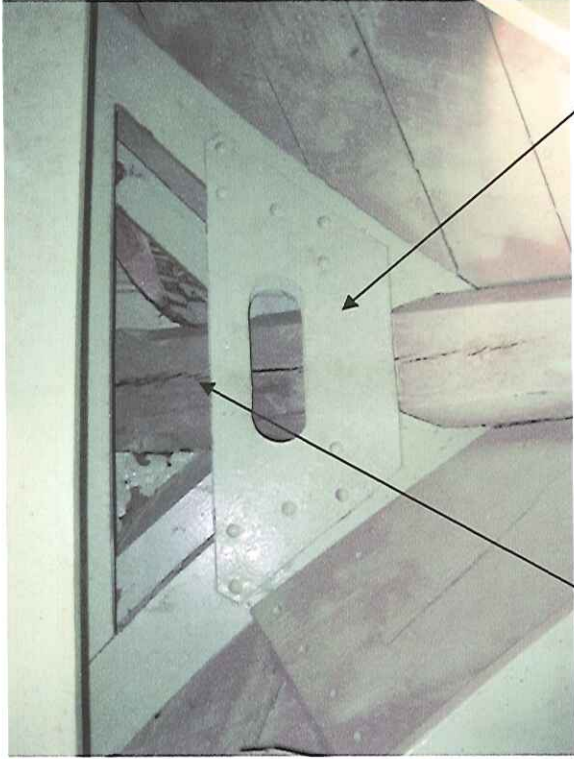
Typical deterioration on underside planking





Remnants of GRP sheathing





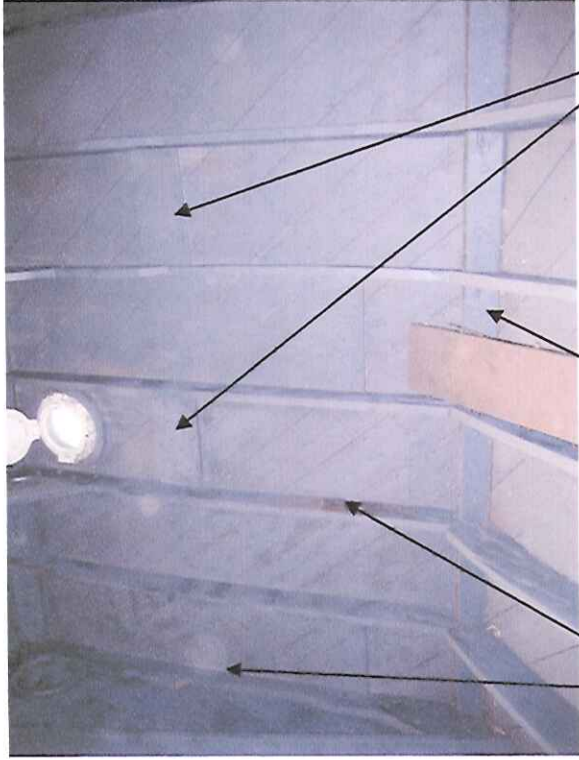
Crack inside stem

Plate structural floor

Inner diagonal planking at port bow area



Deck stringer



Frames

chine stringer

internal patches

Temporary deck pillar

Non structural forward bulkhead

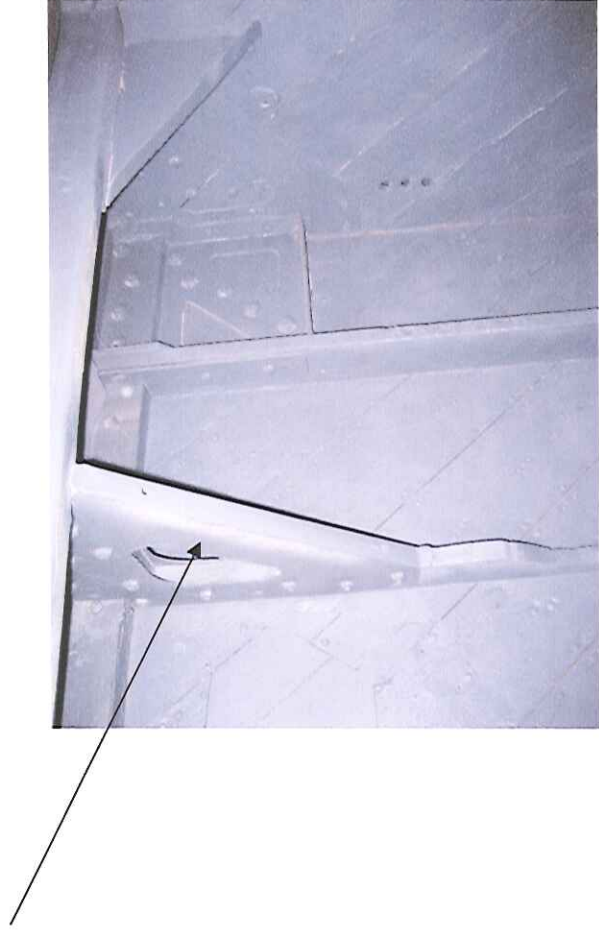




Remainder of fore and aft girder system

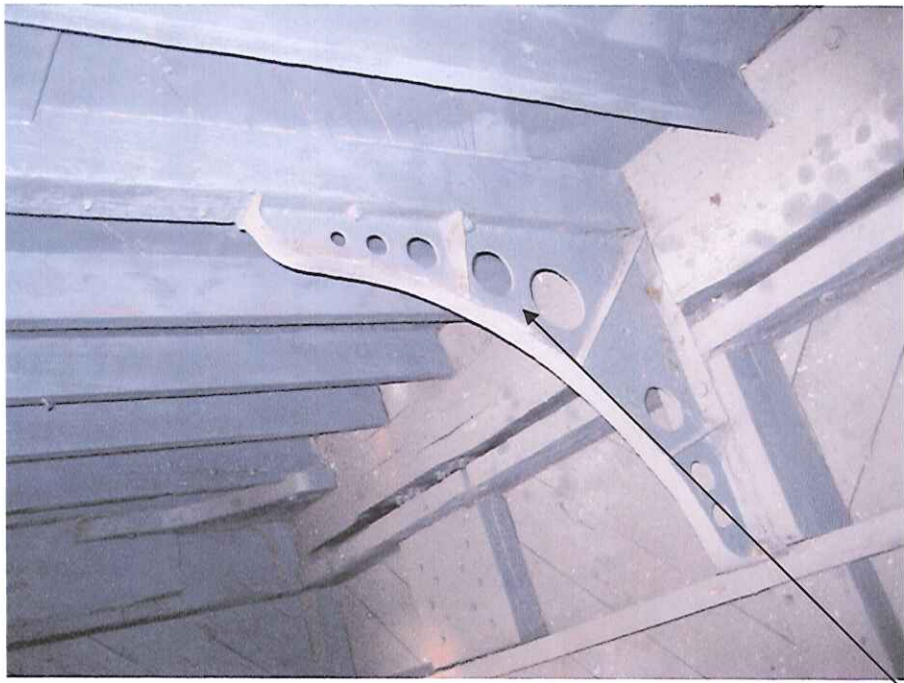


Fabricated hanging knee



Strong hanging knee

Teak double diagonal bulkhead

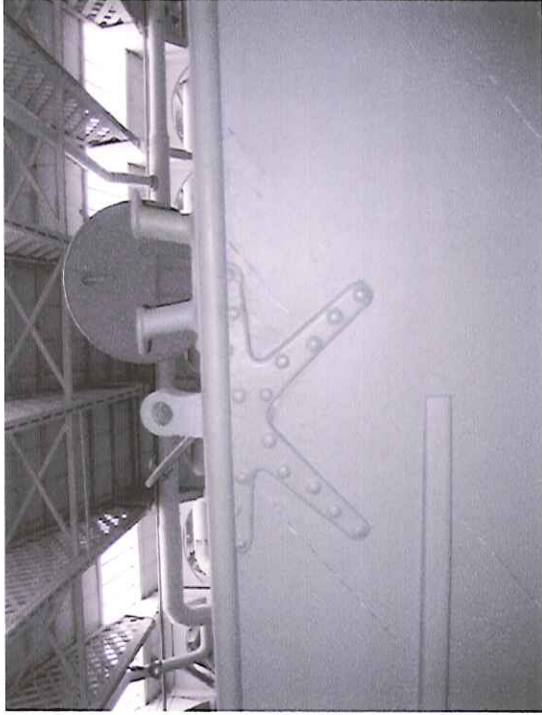


Large transom knee



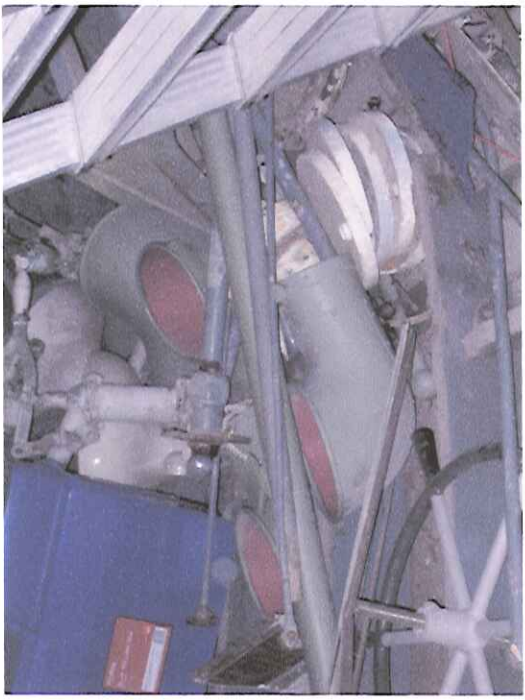
Typical deterioration of frame bottoms with structural floor missing

Exhaust outlet detail



Heavy Lifting eyes aft P & S

Assorted loose equipment on board



Multiple repairs in aft deck removable hatches