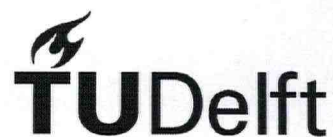


Date August 20, 2004
Written by Jakob Pinkster
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Delft University of Technology

mv Jumbo Javelin

**The first of a series of two of the largest
new heavy (1600 t) lift ships**

By

Jakob Pinkster

Report 1392P

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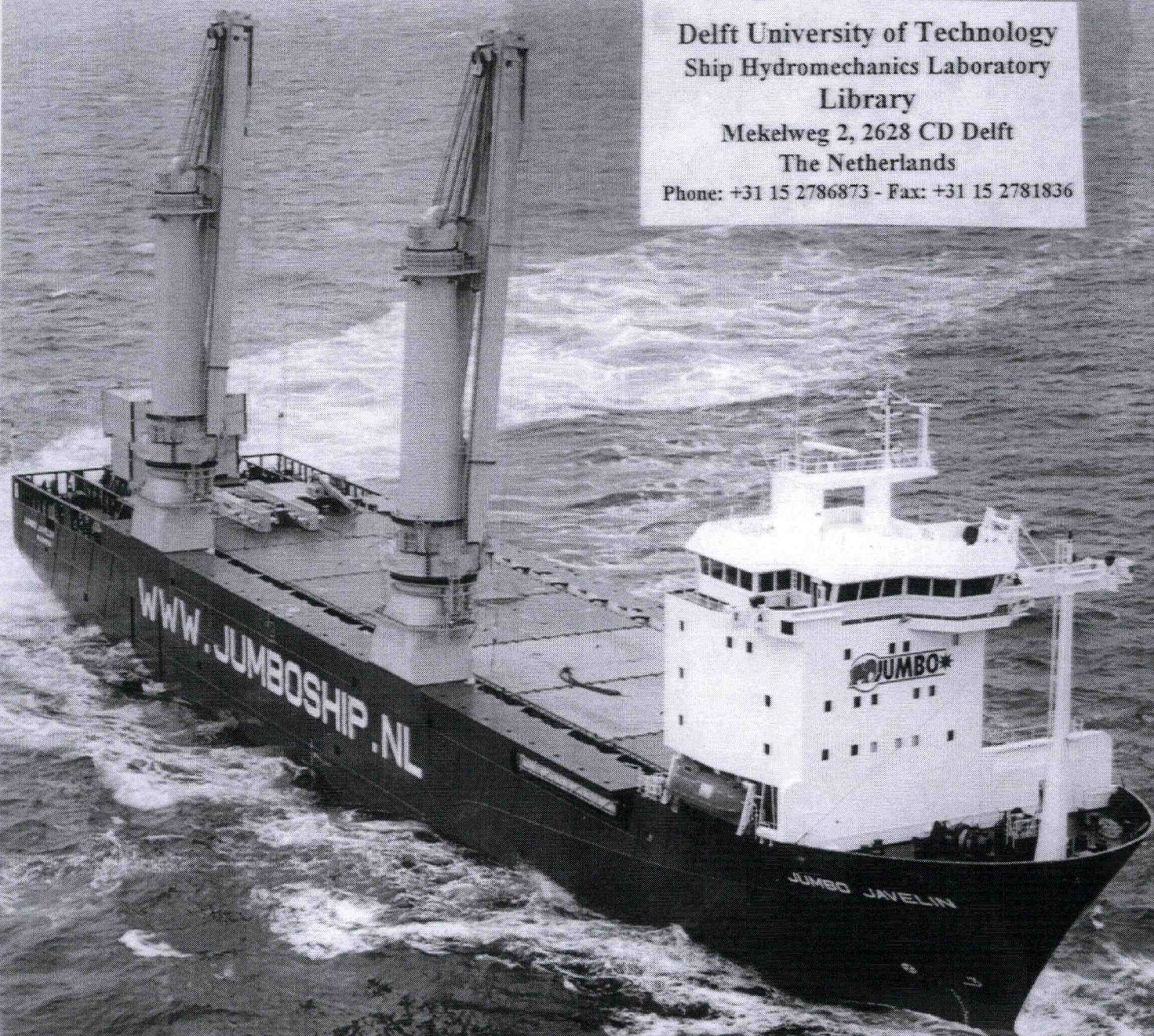
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Deze maand:

Jumbo Javelin

Conditiebewaking bij de
Koninklijke Marine

The Motor Ship Marine
Propulsion Conference 2004

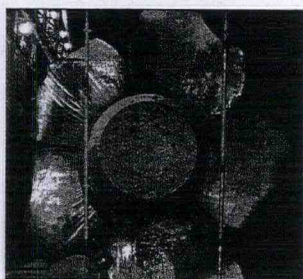
Inhoudsopgave

14 Jumbo Javelin

Zwareladingrederij Jumbo Ship heeft er een nieuwe aanwinst bij: Jumbo Javelin. Het schip is de eerste uit een serie van twee, gebouwd op de werf Damen Galatz in Roemenië. Zusterschip Fairpartner wordt in september in de vaart genomen. De Jumbo Javelin is 143 meter lang en is uitgerust met twee scheepskranen met elk een hijsvermogen van achthonderd ton. Jakob Pinkster doet uitgebreid verslag over dit nieuwe schip van Jumbo.



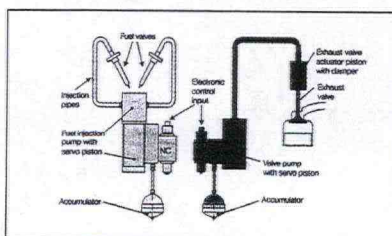
27 Conditiebewaking bij de Koninklijke Marine



De kosten voor onderhoud van technische systemen zijn over de hele linie vaak erg hoog. Tegenwoordig levert conditiebewaking een kostenbesparing op als alternatief voor diverse visuele inspecties. Naast de directe kostenbesparingen op het onderhoudsbudget, heeft conditiebewaking een belangrijk aandeel in de operationele gereedheid van de scheepssystemen en dus gevechtskracht op zee. Een artikel over conditiebewaking bij de Koninklijke Marine door marineofficier Harry Lijzenga.

33 The Motor Ship Marine Propulsion Conference 2004

Tijdens The Motor Ship Marine Propulsion Conference 2004 in Amsterdam hielden meer dan twintig sprekers een voordracht over actuele onderwerpen op het gebied van maritieme technologie. Hoewel de belangstelling voor deze conferentie niet groot was, was het een boeiende bijeenkomst, zo schrijft Kees Verkleij.



42 Terugblik Algemeen Secretaris KNVTS

Eerder al werd het aangekondigd op de algemene ledenvergadering van de KNVTS: Hans Burger stopt per 1 september 2004 als Algemeen Secretaris. "Toen ik in 1996 werd benaderd voor de functie, kon ik niet vermoeden dat er een aantal fijne verenigingsjaren voor de nieuwe functionaris in het verschiet lagen," aldus Hans Burger in zijn terugblik.



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Omslag: Jumbo Javelin (foto Flying Focus)

SCHIP & WERF
Marine Technology de **ZEE**

mv Jumbo Javelin

The first of a series of two of the largest new heavy (1600 t) lift ships

Heavy Lift Company JUMBO is now the proud owner of a fleet of no less than twelve heavy lift ships. Included in this number are two newcomers to the fleet since Jumbo Shipping S.A. Geneva received mv Jumbo Javelin, the first of two sister ships late 2003 from Damen Galatz Shipyard followed by the second of the serie of two, the mv Fairpartner, received later in 2004. The planning has been: Jumbo Javelin operational in April 2004 and the Fairpartner operational as of September 2004. The following is a description of the Jumbo Javelin.

Jumbo Javelin in her element at sea



The main function of the Jumbo Javelin is to load, transport and discharge heavy (and/or voluminous) cargo with own gear (2x800 t SWL) via Lift on/Lift off, Roll on/Roll off or Skid on/Skid off principle.

For this purpose a seaworthy vessel of 143 metres length has been built, equipped with heavy lift gear (total 1600 t in tandem), a large 3100 sq. metre deck area (hold volume 19800 cu metres) for cargo storage, offering a suitable stable and safe platform for the sea leg of the journey.

The vessel

The vessels general design from bow to stern is dominated by:

- a flush deck at upper hatch level almost from stem to stern

- a bow with an asymmetrically placed accommodation and bridge on the foredeck at a short distance from the bow, to accommodate lengthy cargo
- a large box hold with 'tweendeck
- on the starboard wingwall two Heavy Lift Mast Cranes (HLMC) have been positioned
- engine room aft housing a twin engine installation driving a set of controllable pitch propellers
- steering gear room in aft ship / main engine exhaust outlet in transom

The large flush deck area for cargo and the asymmetrically placed accommodation and bridge on the foredeck result in a free corridor on the ship that allows the carriage of deck cargo on starboard side as long as the ship itself or even

longer. To this end even the port side outer wing of the navigation bridge may be vertically pivoted about its axis as is shown in the GAP of the vessel.

The heavy lift gear

It may be argued that the heavy lift gear - consisting of two Huisman Itrec Cranes, each 800 ton SWL - is the most important part of the ship from a functional point of view.

The Jumbo Javelin sailed from Damen Galatz with a 'clean deck' and was fitted out in Rotterdam with her two cranes by Huisman-Itrec.

Specially designed and built by Huisman-Itrec (Rotterdam, The Netherlands) for Jumbo Javelin, are the two Heavy Lift Mast Cranes (HLMC). These cranes are placed at 48 m distance apart on the starboard side of the box hold and supported integrally throughout the ship's structure. These HLMC's can be defined as a compact powerful rotating crane with very high lifting capacities. This solution may be considered as being 'best practice' since this type of crane has, in the past, been specially designed for use on Heavy Lift Vessels, for over sea transport of large and heavy equipment; most of the HLMC's are installed in a tandem configuration, sometimes one on each side, sometimes both on the same side of the vessel. The capacity, range and structure are excellent for this specialized

Main particulars

General particulars	: ms Jumbo Javelin (J-1600 type)
Call sign	: PJFR
IMO no.	: 9243837
Port of registry	: Willemstad, Curaçao, N.A.
Flag	: Netherlands Antilles
Classification	: Lloyd's Register 100 A1, LI, CG, LMC, UMS, with descriptive note SCM regarding loading and unloading aground during crane operations, class contemplated.
Built	: 2004
Owners	: Jumbo Scheepvaartmaatschappij (Curaçao) N.V.
Manager	: Jumbo Shipping S.A. Geneva
Agents	: Kahn Scheepvaart B.V. Rotterdam
Owners P&I club	: Gard Arndal, Norway
G.T.	: 15.022
N.T.	: 4.506
D.W.T.	: 12.870 All Told
Draft above bottom of keel	: 7,518 m
Length o.a.	: 143,10 m
Breath moulded	: 26,50 m
Air draft (above keel)	: 47,32 m (derricks down)
Suez Canal G.T.	: 41.565 cbm / 14.672 RT
N.T.	: 30.952 cbm / 10.926 RT
Panama G.T.	: 51.068 cbm
N.T.	: 12.592
Number of holds	: 1
Number of hatches	: 1
Hold cap. bale	: 19800 cbm.
Free deckspace	: 3100 sq m
Hold dimensions	: 82,65 x 17,00 m
lowerhold	
Tweendeck	: 101,95 x 17,00 m
Total height in hold	: 12,50 mtr. / 6,856 m
Strength of tanktop	: 12 t / m ²
Strength of tweendeck	: 7 t / m ²
Strength of hatchcovers	: 3 and 5 pcs of 12 and 8,7 t / m ² resp.
Number of tweendecks	: 1 (flush) adjustable in height
Cargo gear	: 1 crane 800 tons / 1 crane 800 tons. In combi 1600 ts
Auxiliary hoist	: 37,5 t (travelling trolley)
	: 10 t whip hoist
Main engine	: 2x MAN 9L 32/40 (4320 kW each engine at 750 rpm)
Bow thruster	: Lips C.P.P. 1450 kW
Speed	: about 17 kn
Bunker capacity	: 1200 tons HFO / 110 tons MGO
Fresh water capacity	: 140 tons
Container intake	: 426 TEU / 192 FEU in hold w/o tweendeck hatch covers
Lakes fitted	: No

Note: Compensation for cranes and deckhouse - 11640 ton.mtr.
Standard stores / equipment / lub oil - 200 tons.

use. The hoisting capacity amounts to 2 x 800 = 1600 SWL in tandem.

Both cranes also have the possibility to fit a revolutionary modular crane extension system, the so-called Fly Jib System, which is aimed at adding in-

stallation capabilities to the already vastly versatile 1600 tons lifting capacity of the ship. The Fly Jib System is an innovative adaptation of a land-based design and results in a dramatic increase in the crane's lifting height and outreach. This will enable Jumbo



Jumbo Javelin using her heavy lift mast cranes

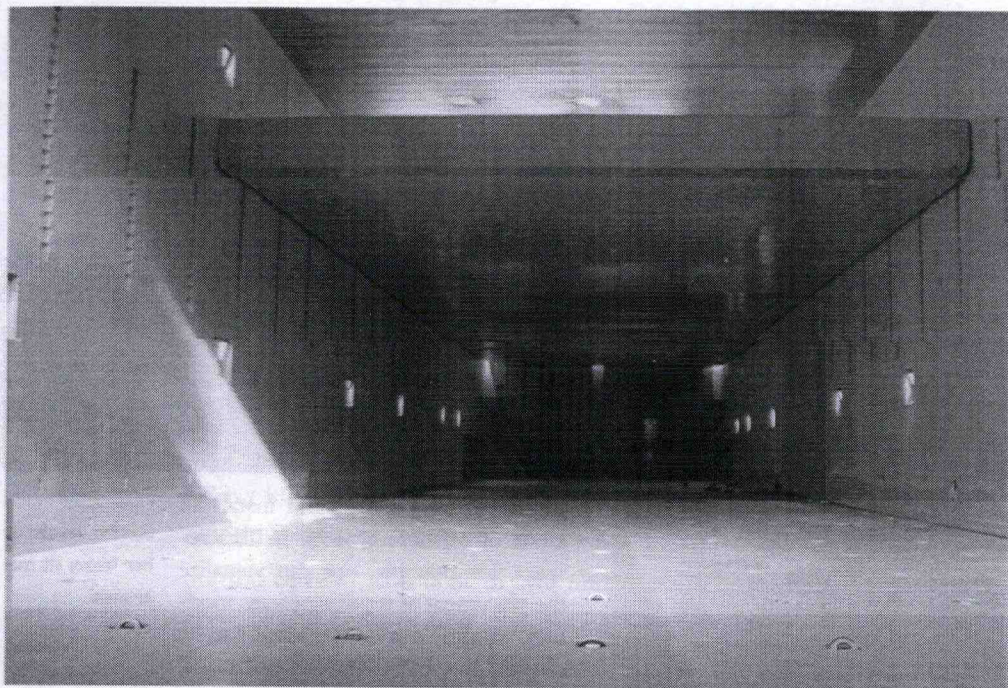
Javelin to also unload and install all kinds of offshore objects. In this respect, for example, one can visualize the placement of topside process modules, windmills or even internal turrets directly onto FPSO hulls as well as offshore windmills. Such versatility of Jumbo Javelin wipes out the necessity of the use of sheer legs and crane barges and gives the vessel a number of strategic advantages compared to the competition. The Fly Jib being of a modular design may be transported with the use of conventional tonnage (i.e. other ordinary ships) and may therefore be assembled prior to the arrival of the Jumbo Javelin at the required destination. A simple case of logistics (very important in the heavy lift business). The Fly Jib has a number of 6 metre and 12 metre segments that can be installed in different configurations and thereby produce a system that is custom-rigged for specific combinations of lift and outreach. The standard configuration has as a base a 34 metre jib and as such offers a 76 metre lifting height at an outreach of 22 m.

Auxiliary hoist

An auxiliary hoist (travelling trolley) runs along the length of each HLHC jib. These travelling trolleys are capable of supplying both a hoisting and a transport function for the lighter ob-



Fly Jib System (Jumbo goes offshore)



Box hold Jumbo Javelin looking forehead, up from the tank top

jects on board. Each travelling trolley has a max. outreach of 35 m and can carry up to 37,5 tons SWL for a jib angle from 0 to 30° with the horizontal axis and 24 tons SWL for a jib angle of 45°. Also to be found on each HLMC jib is a sling handling hoist of 10 tons SWL. When the vessel is sailing each travelling trolley is stored at the lower end of the jib.

Heavy lift platform

The Heavy lift cargoes are free to be placed on different vertical levels in the vessel. The highest level is directly on top of the 8 box hold hatch covers. The lowest level is on the tank top, which is the floor of the box hold. An intermediate level may be found on the vertically adjustable tweendecks in the box hold. Heavy lift cargoes are free to be placed on the weather deck hatches at 12 t/m², on the tweendeck at 7 t/m² or on the tanktop at 12 t/m².

The top of the box hold is closed with the aid of 8 watertight steel pontoon hatch covers of the flush deck type, offering an unobstructed area of 3100 m² for deck cargo positioning. The tweendeck may be placed at different levels in the box hold or even omitted altogether. All hatches are of the pontoon type and are floatable as separate units. The vessel can sail if required without 'tweendeck and/or without weatherdeck hatch covers. She is classed to do so (open hatch type of vessel) and therefore fitted out with extra large suc-

tion pipes lines to the holds and extra large capacity bilge water pumps. The lower hold floor area available is 82,65 x 17,00 m and, when utilised, the 'tweendeck offers a floor area of 101,95 x 17,00 m. The available height for cargo between the main hatches and the tanktop is 12,50 m. The vertical position of the 'tweendeck can be adjusted to fit a given cargo via pen-hole construction. If hatches are not utilised they may be stowed in the hold and/or on deck or left ashore or afloat at some location. During loading or discharging operations hatches may also be stored in the same way.

The longitudinal subdivision under the main deck is:

- Forepeak for water ballast
- Bow thruster room
- HFO fuel deep tanks
- Pump room (for ballasting and deballasting during loading/unloading)
- Cargo area (with ballastable wing walls)
- On starboard side, there is a passageway with two watertight doors above

the wing tanks and below the main deck, that connects the forecastle to the engine room

- The necessary crane winches and steel wire reels are situated on the tank top - against the box hold side - within each crane pedestal compartment in the wing wall
- Engine room (for main engines/generators, auxiliary generators etcetera)
- Aft peak for water ballast, on top of which the steering gear room is situated

The protected passageway on starboard side also contains some piping (water, fuel and hydraulic fluid, CO₂ lines for fire fighting in the hold) and electrical wiring. Both the wing and the double bottom tanks are designated as water ballast tanks. Also GRE (glass-fiber reinforced epoxy) piping is present for ballasting/deballasting the ballast tanks and dewatering the box hold should this be necessary.

In the engine room, situated aft, two fuel oil settling tanks and day tanks are positioned on port side as well as E.R. stores, while space on the starboard side is allocated for the switchboard room and E.R. workshop spaces. The space below the 'tweendeck aft of the engine room is utilized by the two sets consisting of main engine-gearbox-pto generator-propeller systems and auxiliary generator system.

In the forecastle, space has been dedicated to accommodation, deck office, winches etcetera. Below the forecastle one finds provisions spaces, AC units, HFO tanks, fresh water tanks, ballast tanks and working spaces such as boatswain stores, paint stores and lashing stores.

Accommodation

The accommodation is not only for crew and officers but also for extra personnel required on board during loading/discharging operations. The accommodation is arranged under the forecastle on the upper tween and on

The tank capacities of the vessel (100%) are as follows:

Total storage capacity of heavy fuel oil	approx. 1200 m ³
Total storage capacity of marine diesel oil	approx. 110 m ³
Total storage capacity of lubricating oil	approx. 50 m ³
Total storage capacity of fresh water	approx. 140 m ³

the main deck and in a deckhouse placed on the fore ship, as per general arrangement plan (see GAP).

Accommodation is arranged for a total sailing complement of fifteen persons and houses in total twenty persons, as follows:

surrounded by a number of screens (LCD) which show an overview of the ballast system and allows control of actual ballasting and deballasting by means of remote operation of pumps and valves.

The ballast console has an operation

- a tank ullage and loading regulating and monitoring system
- a load recorder
- a system to monitor and show the position of the cranes
- automatic regulation of the ballast pump flow
- systems to measure vacuum and pressure

Bridge deck:

- Wheel house
- Bridge deck technical space

Officer's deck (D-Deck):

- 1 Captain's cabin with separate office, living room and sleeping room and private shower room annex
- 1 Chief Engineer's cabin with separate living room and sleeping room and private shower room annex
- 1 chief officer's cabins with separate living room and sleeping room and private shower room annex
- 1 pilot/supercargo cabin with private shower room annex

Officer's deck (C-Deck):

- One 2nd Engineer's cabin with separate living room and sleeping room and private shower room annex
- 5 cabins with private shower room annex

Crew deck (B-Deck):

- 7 cabins with private shower room annex

Forecastle deck (A-Deck):

- 3 single-berth crew's cabins with private shower room annex
- 1 deck office
- Covered life boat (starboard)

Main deck (F-Deck):

- 2 mess rooms
- 1 galley
- 1 recreation room with cosy corner
- Sanitary units
- Covered life boat (portside)

Upper 'tween deck fore:

- Several stores, dry provisions, cold and freeze
- Change room
- Laundry
- Fitness room
- Lashing store, boatswain store, rode reels

Lower 'tween deck fore:

- AC room
- Suez room
- Provision store room with refrigerated store incorporated

Load on/load off operation

The loading and discharging processes are monitored and operated from the bridge where the operations manager has his crane console positioned on PS where he has an excellent view on the cranes, the deck and the box hold. He is

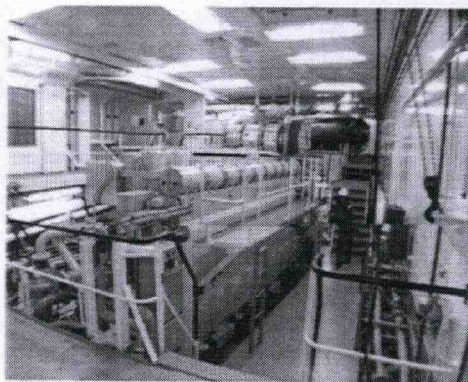
mimic of the suction and pressure pipe lines. Along with this, there are the necessary LCD-screens, metres, pointers and signal lamps.

The ballast instrumentation include, amongst others:

- a combined flow speed indicator

The large cranes can also be controlled on site by means of wireless controllers. This process is monitored by the captain. Last but not least, a navigation console has been situated in the fore middle of the wheelhouse.

Engine Installation



One of the main engines Jumbo Javelin

Jumbo Javelin has in the engine room two MAN main diesel engines, type 9L 32/40, rated at 4320 kW m.c.r. at 750 rpm. Each main engine drives via an integrated coupling in the reduction gearbox Anslug/Advance, reduction is 1:5,5, a controllable pitch propeller (make: four bladed John Crane Lips), diameter 4350 mm. Both propeller shaft lines are slanted inwards in order to gain the optimal flow around the propeller and also utilise engine room space. At the propeller end, the main engines each drive a PTO consisting of an alternating AC generator with an output of 3750 kVA/3000 kW with a frequency/speed of 60 Hz/1800 rpm and a voltage of 440 VAC/3 Phase (Cos phi = 0,8). (Leroy Somer.) The generators also supply the power for the electrically driven cranes on board.

Auxiliary installation

Jumbo Javelin has one auxiliary generator and an emergency generator. The former is placed on the tanktop in the engine room and the other on the main deck and not in the engine room. The auxiliary generator engine (air started)

is a MAN 8L 16/24 diesel motor with an output of 800 kW at 1200 rpm. This auxiliary diesel engine drives a generator with an output of 950 kVA/760 kW and a frequency/speed of 60 Hz/1200 rpm with a voltage of 440 VAC/3 Phase. The cosine phi factor of this generator is equal to 0,8.

The emergency (marine type) generating set is a driven by a MAN D2848 LE201 diesel motor producing a generator output of 460 kVA/368 kW with a frequency/speed of 60 Hz/1800 rpm and a voltage of 440 VAC/3 Phase (Cos phi = 0,8)

Propellor installation

Jumbo Javelin has two high skew controllable pitch propellers (four bladed). This system is designed for maximum free sailing speed at around 17 knots. Each propeller has a maximum revolution rate equal to 136 rpm. Given the propeller diameter of 4350 mm and an absorbed propeller power of 3920 kW by each propeller, this results in a propeller tip speed of 31 m/s and a propeller loading (Power/Diameter²) of 207 kW/m².

These values of tip speed and propeller loading along with the vessels' underwater volume and speed all adds up to produce a formidable design task for the propeller designer.

Co-operation of JUMBO and MARIN has produced an answer to this challenging design problem.

The hull's aft body has been optimized using a special CFD (Computational Fluid Dynamics) program for viscous flow which calculated the complicated flow pattern around the hull and resulted in a prognosis for full scale wake field. With this knowledge a propeller configuration was designed most suited to the requirements of the vessel, i.e. maximum sailing power as well as propulsion power ahead and astern.

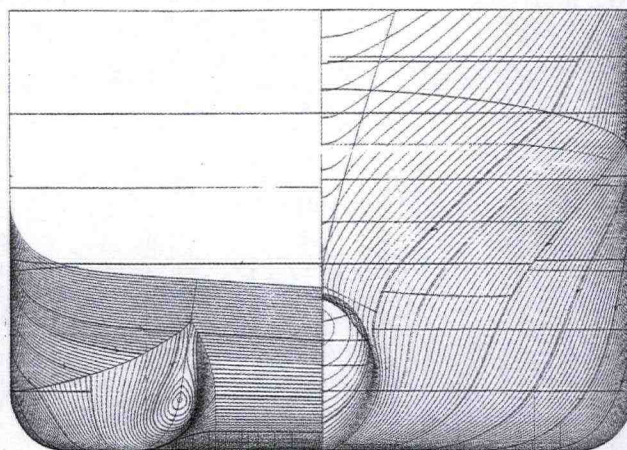
Other equipment

Rudder steering machines

The twin rudders are rectangular with a streamlined cross section, type spade and make Bot. They are of the free hanging type and each have a lateral projected area of 17 m².

An automatic continuous grease lubricating system is provided for the rudderstock bearings.

The rudder arrangement permits a maximum rudder angle of 55° from centre each side. The steering gear is of



Body plan Jumbo Javelin

the electric-hydraulic type make Bruselle.

The two rudder stocks are not mechanically linked. The hydraulic system of the steering gear is fed by two electrically driven hydraulic pumps. In normal operation mode, one pump per steering gear is in operation.

Anchor and mooring equipment

On the forecastle deck two combined mooring/anchor winches are installed for a 62 mm diameter stud link chain cable of high tensile strength steel, grade U3. Each windlass is driven by a slow 3-speed electric motor via a totally enclosed gearbox. For mooring purposes, each winch is equipped with a cast iron warping head. 2 stockless bow anchors each 6450 kg (type Speck), are fitted with 302,5 m stud link chain cable for each bow anchor, grade U3.

On the aft main deck, one electrically driven winch has been fitted on starboard and one on port side. For mooring purposes, one cast iron warping head with a diameter of 630 mm and a width of 530 mm is provided. The winch is driven by a slow speed electric motor via a totally enclosed gearbox.

Cranes for moving equipment stores

Also cleverly installed for maintenance service on deck and aiding loading, sea fastening an discharging work is, of course, the afore mentioned auxiliary hoist mounted on the HLMCs' jib (travelling trolley crane). Besides these auxiliary hoists a 15 ton SWL JCB telescopic crane on crawler tracks has been placed on board for similar purposes and can indeed serve many locations on deck and in the box hold.

Further hydrodynamic design considerations

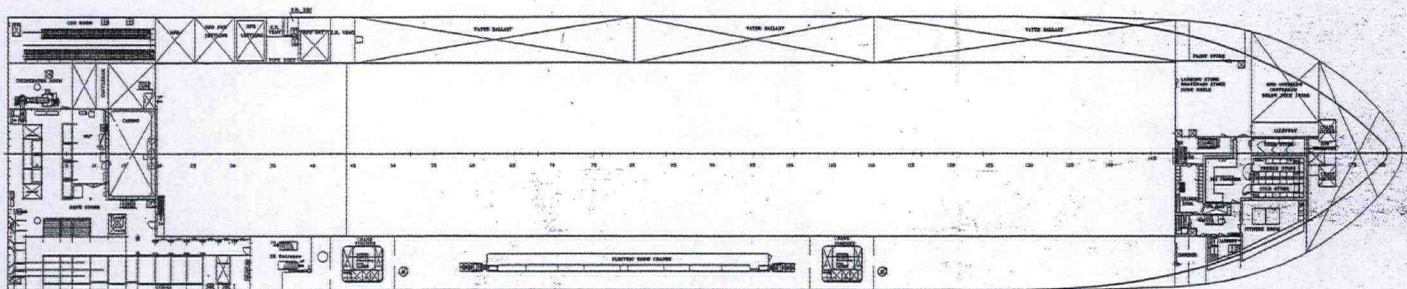
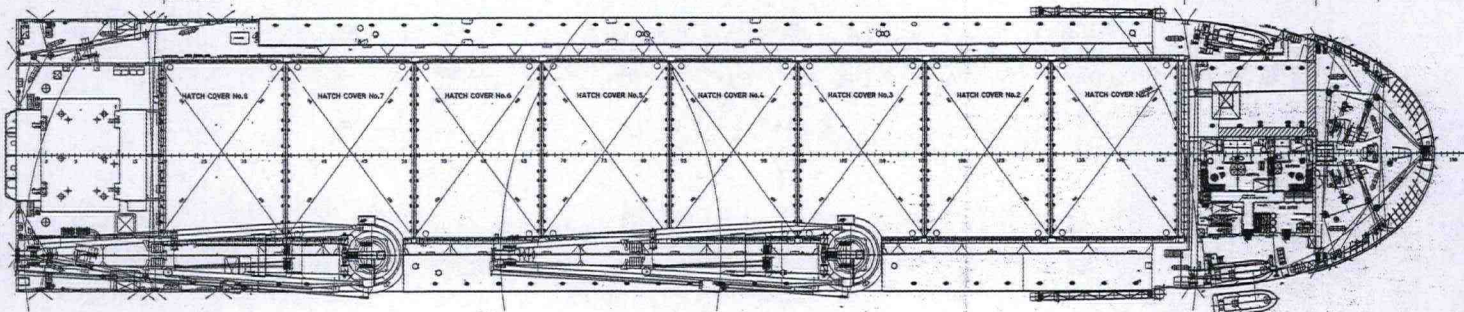
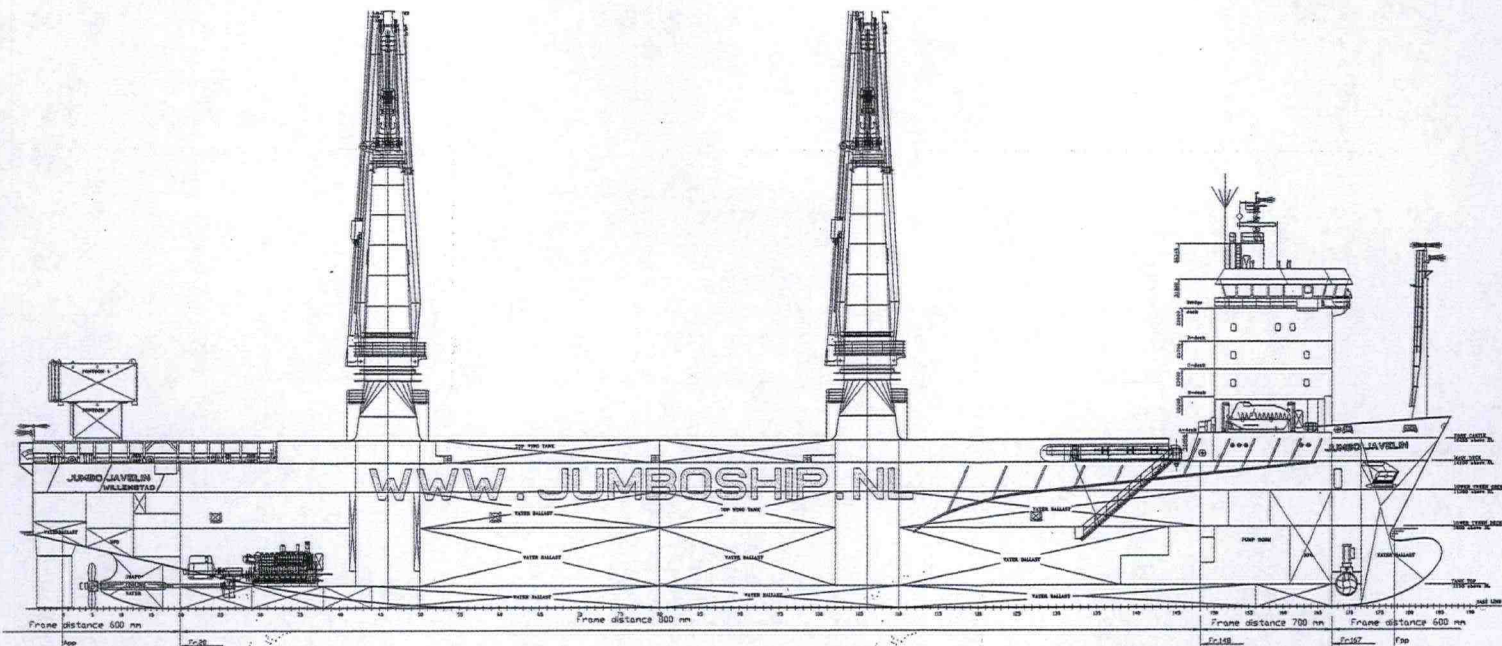
The Jumbo Javelin has a service speed that is about 2 knot faster than that of her fastest competitors. This speed requirement (i.e. 16 knots average service speed) along with the obvious high demands on vessel stability, motions in a seaway etcetera, in conjunction with her relatively full displacement, proposed a formidable design challenge for the JUMBO newbuilding team. In close co-operation with MARIN the vessel was fitted out with a bulbous bow. MARIN came upon this design solution based again on advanced CFD calculations and model tests. Also the vessel is fitted out with two asymmetrical streamlined skegs which house the tail shaft of each propeller. These skegs provide optimal flow of water to the two propellers and thereby produce high propulsion efficiency and also result in low propeller vibration levels.

Jumbo Javelin and TU Delft

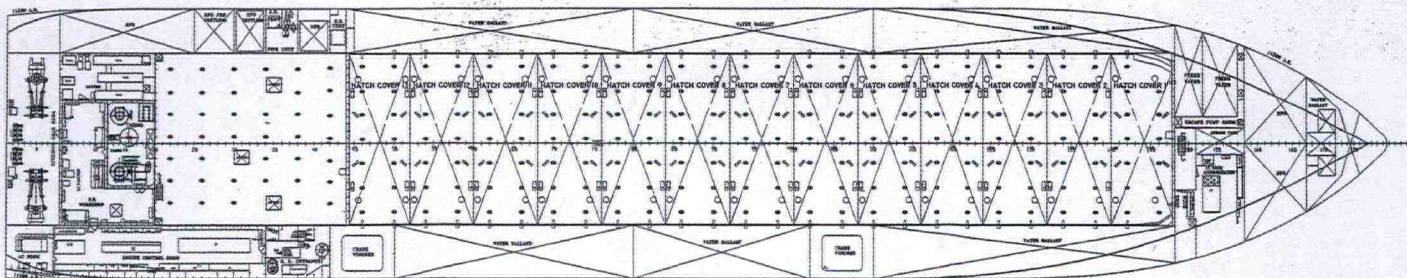
During the construction phase of the vessel the Ship Hydromechanics laboratory of the TU Delft has been commissioned by JUMBO to carry out a number of desk top studies in order to assess the feasibility of the use of the vessel for the positioning of offshore units on the sea bottom. The results were promising and may indeed lead the way to seeing Jumbo Javelin placing offshore structures with the aid of her own cranes and from her own decks in the future.

Where is Jumbo Javelin now?

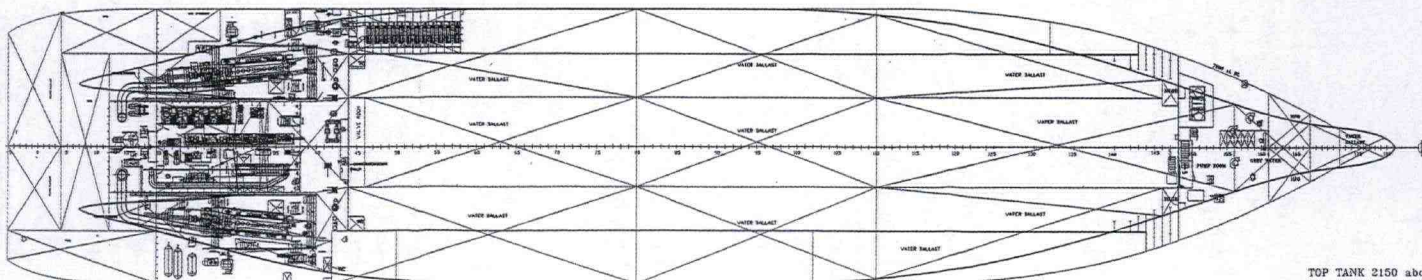
Jumbo Javelin is now on her way to the Far East to load a 1400 ton module.



UPPER TWEEN DECK 11300 above BL



LOWER TWEENDECK 7800 above BL



VIEW ON ER FLOOR

TOP TANK 2150 above BL