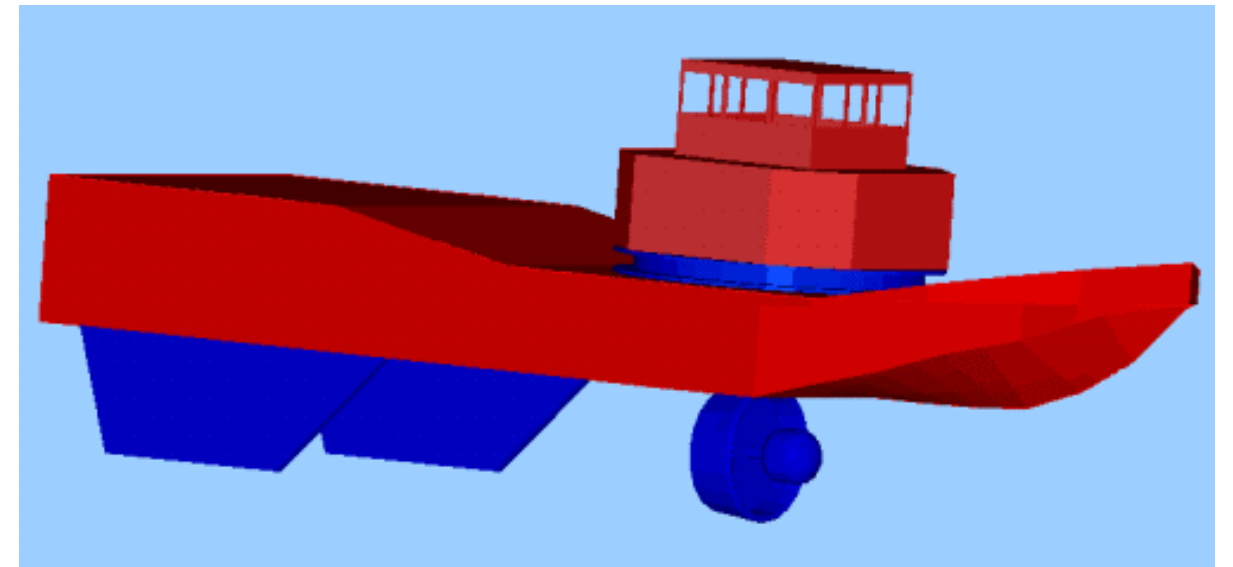


IMC ThrustLiner harbour tug design

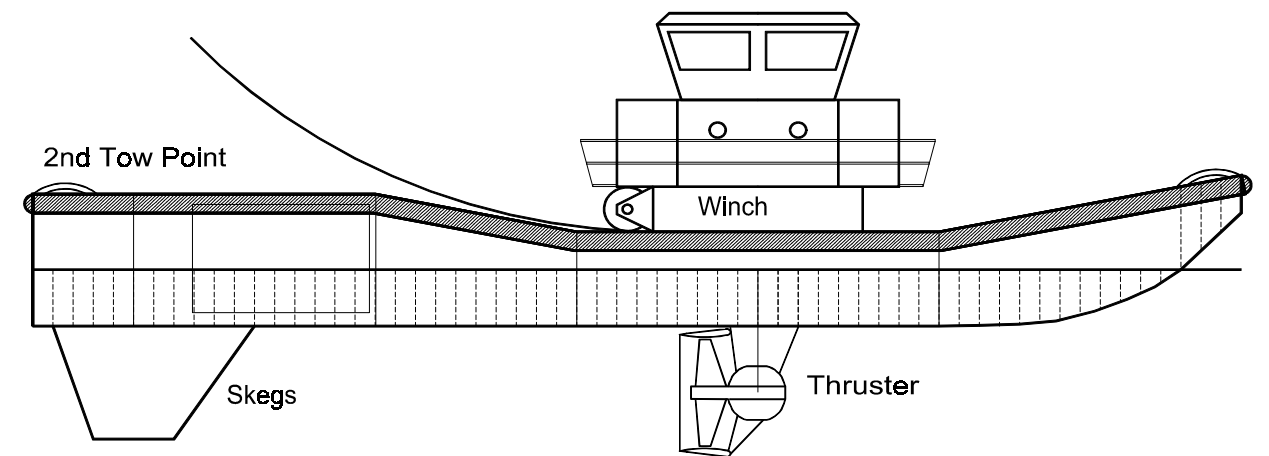


A radically new towing concept offers substantial improvements in terms of financial, operational & safety performance, based on unique feature:



360 degree rotating towing winch located above thruster, both rotate free of the ship's hull and sailing direction.

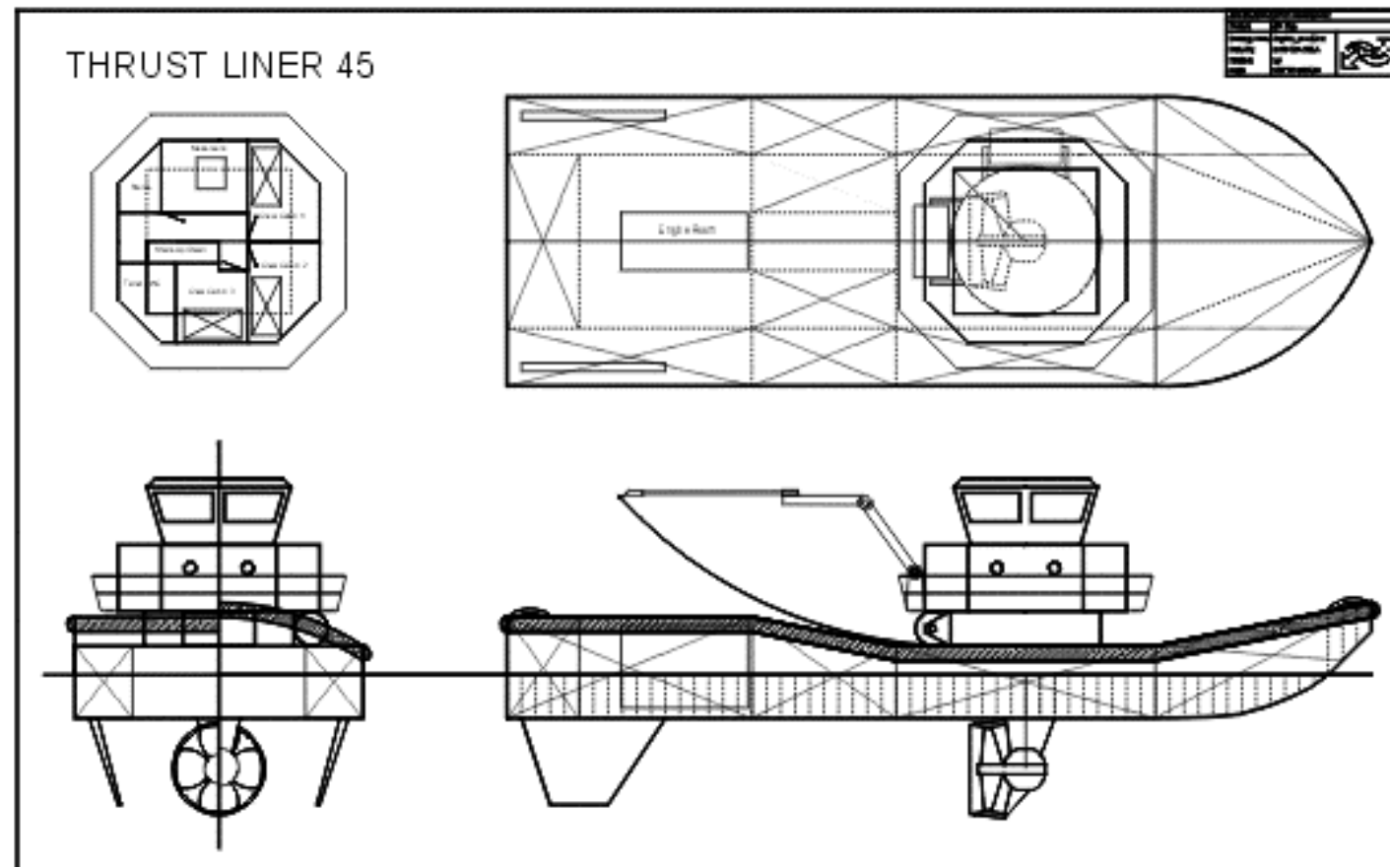
This enables: *Thrust in Line with Pull 360 degrees around*



New features include:

- Free 360 degree rotation of towing wire
- A large stability range eliminating the risk of capsizing.
- Single / Double thruster unit(s) below winch centre
- A second towing point above the aft skegs for optimal dynamic sheering forces during escorting

WINCH 360 DEGREE ROTATION



THRUST LINER 45

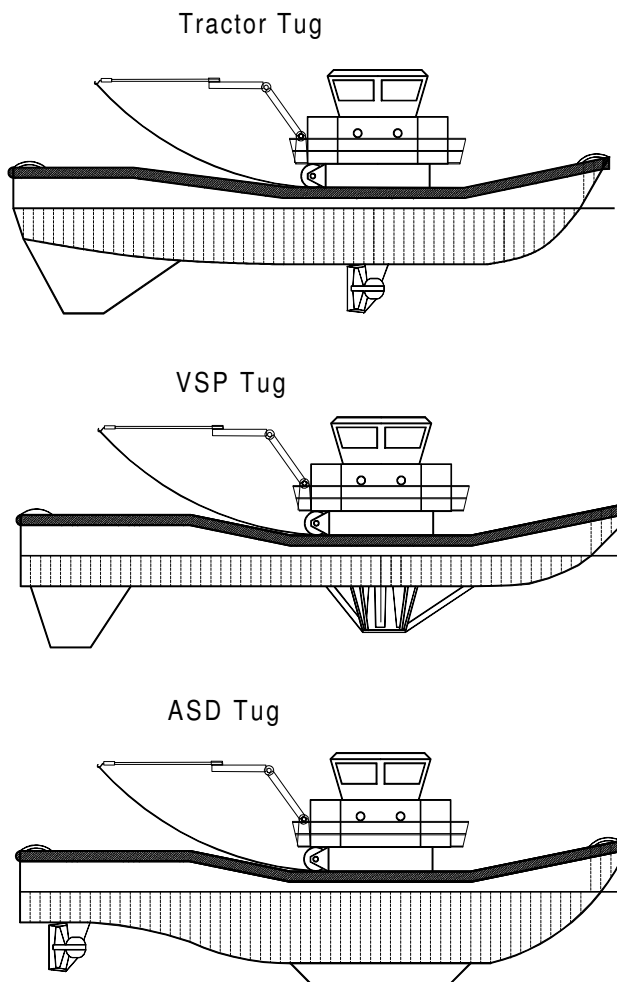
Various alternative / features

- 360 degree winch on
 - * Tractor Tug
 - * Voith-Schneider Tug
 - * ASD tug
- Partial deck railing
- IMC's ATC (Automatic Tug Connection) System eliminating the need for personnel on deck during operations.
- A planing hull form in combination with CPP thruster to facilitate speeds up to 22 knots in free sailing condition.
- Single or Double thrusters (standard range FPP, CPP or VSP)

Design parameters

- Wide body hull & flat bottom shape for planing (optional 'V'-shape in bow)
- Cheap flat panel hull structure
- Thruster and winch structural support directly integrated
- Safe 'double side' to improve damage stability
- Engine room in aft end

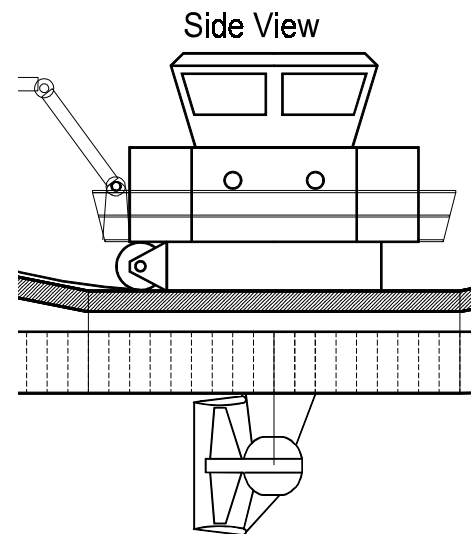
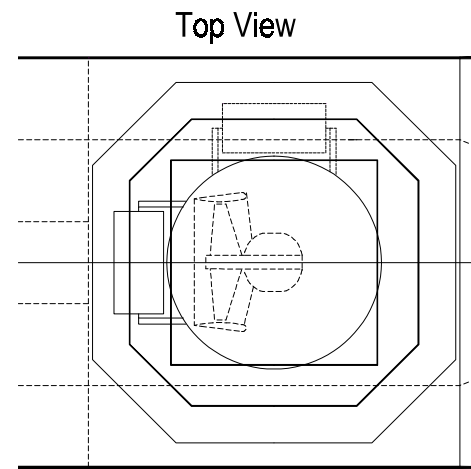
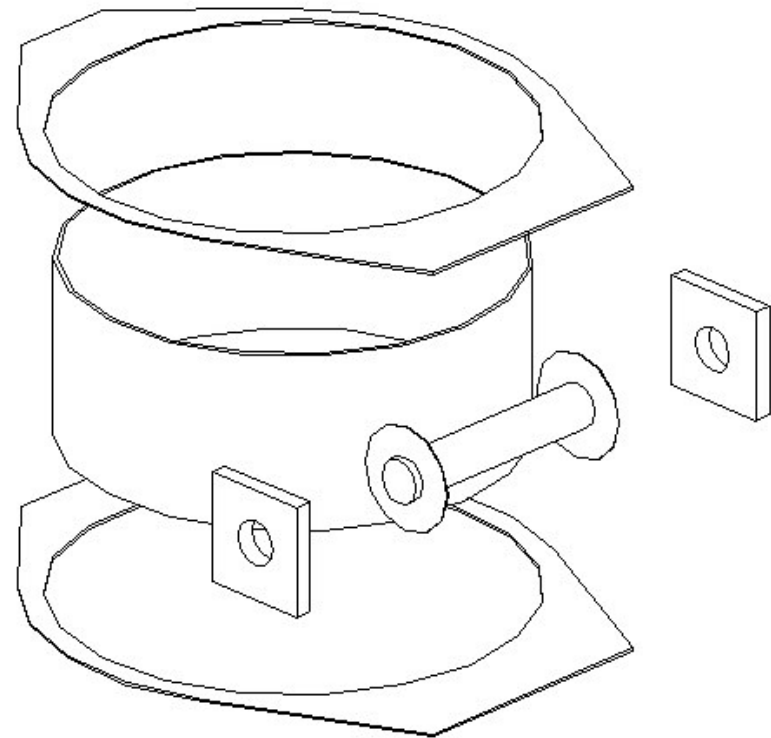
More information from
 IMC Shipping & Offshore Design
 tel. 31 - (0)10 - 2417403
 fax. 31 - (0)10 - 2417404



THRUST LINER CONCEPT

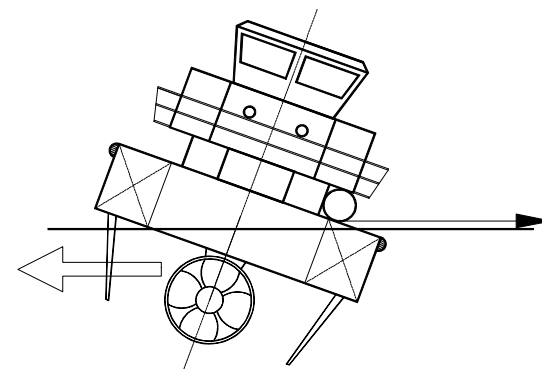
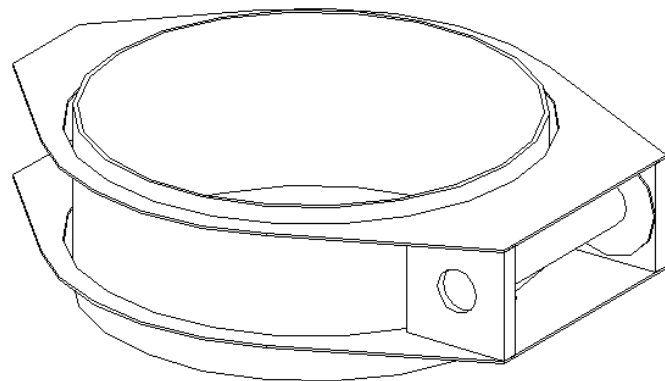
Structure Centre of Winch

- Centre of winch is formed by a hollow pipe.
- The hollow pipe is fixed to hull structure at bottom and accommodation on top
- Access from accommodation into hull is done via hollow pipe
- Hollow pipe is used as centre axis of winch, winch structure can rotate free on bearings around this pipe.



Structure Winch

- Winch structure built up by circular frames around hollow pipe with bearing. Frames support a conventional winch with small height
- Towing wire turns total winch structure around hollow pipe
- Winch drum with small diameter & large breadth

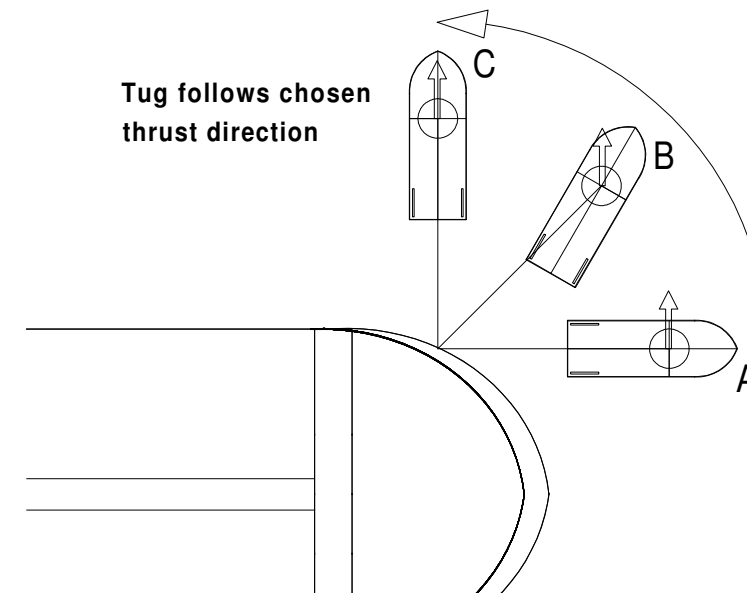


- Large stability: Force acting at low height and near the side

- Totally free 360 degree rotation without restrictions
- Energy transfer either by powerpack on winch structure or high speed rotation ring with generator / hydraulic packs.
- Direct wire pull from winch, less chafing / wear of the towing wire

Conventional tug operations:

- Step 1 : Manoeuvre tug to right position and direction from towing object (both position of the tug and the direction of the towing arrangement need to be controlled)
 - Step 2 : Manoeuvre slowly when loading the towing wire (concerning load on wire and risk of capsizing)
 - Step 3 : Start towing with increasing power (up to full bollard pull)
- Typical time to start towing 2 – 3 minutes



New Thrust Liner operations:

Single step : Set thrust direction and magnitude

Thruster will be directly set to the entered value and tug will sail rapidly along outer circle of towing wire from point A along point B to point C and tow in the selected direction at selected magnitude.

Typical time to start of towing 1 minute. Time is crucial to control motions of towing object.

Automatic course correction will redirect thruster to manoeuvre from point A, along point B to point C.

- Limited snap / peak loads
- No risk of capsizing

Operations / manouvring

- Flexible use both at bow and stern side
- Increased towing efficiency during manouvring
- Large dynamic sheering forces from skegs during escorting (using 2nd towing point aft)

Control

- Tractor tug steering performance
- Absolute thrust direction based on gyro compass input
- Manouvring of tug's hull follows automatically thrust control direction
- Ergonomic control system for master
- Direct control input from pilot possible

