Advanced Training Systems for Tug Masters
- a contribution to navigational safety in ports
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Why a tug simulator?

- Previously, vector tugs were considered adequate for navigational and mooring studies.
- Simulators have been used for conventional ship handling training for ages.
- What is the difference between a conventional ship simulator and a tug simulator?
  - Equivalent to the difference between putting a dog in orbit and putting a man on the Moon, or putting a man on the Moon and a man on Mars.
- Initiative taken by Svitzer in 2003 when they invited international tenders for developing a realistic tug simulator which could be used to accelerate the training of new mates in handling their modern ASD tugs.
Realism is the key word in training

- No vector tug - real tug skipper
- Real tug’s response to control commands
- Real tug’s response to the environmental conditions
- Real tug’s response to hydrodynamic effects from others ships, banks, shallows
- Real ability to push and pull the assisted ship
- Real visual representation of the scenery
- Real equipment on the simulator bridge

How is this realism achieved?
Coupling of multiple interactive simulators
Realistic mathematical tug models

- Mathematical model formulation allows consideration of all effects (DENMark 1)
- Mathematical models based on extensive physical model tests and sea trials (speed, manoeuvrability, seakeeping)
- Extensive validation by experienced tug skippers
- Control response characteristics properly implemented
- First principle modelling of physics (F=M a) in 6 D.o.F.
• Hydrodynamic interaction between tug and assisted ship
• 3-D collision and fender interaction between tug and assisted ship
• Wave effect on tug performance
• ROTOR tug with thruster-thruster interaction
Full Mission Bridge with 27 52” LCD Monitors
Increased realism in the visual systems
EFFORTS: Use of 3D technology

Advantages
- Full 360 degr. View (app 45degr FOV)
- Depth perception
- Speed perception

Disadvantages
- Uncomfortable
- Difficult to see instruments

Improvements
- Lighter materials and wireless connection
- 140-180 degree FOV
- Instrument data inside helmet
Demo tug simulator

- ASD tug "Svitzer Mars"
- ROTOR tug "Geest"
- Container vessel
- Port of Hamburg model based on Port ECDIS data
- Interface to Marimatech PPU
- Tug masters from Svitzer and URAG to give instructions to those who wish to try