SAFETY ADVANCES IN THE MODERN PILOT VESSEL
INTRODUCTION

- About me

- Graduate of SUNY Maritime College, Bronx NY with degrees in Naval Architecture and Marine Engineering

- Served as Unlimited Master on Tank Vessels in the Jones Act trade

- Harbor Pilot in Port Everglades (Fort Lauderdale, FL) since 2012

- Head of Sales for Baltic Workboats US
ELEMENTS OF A MODERN PILOT VESSEL

- Wave piercing hull design
- Self Righting capabilities
- Noise and vibration control
- MOB rescue capabilities
- Fire fighting capabilities
- Human Machine Interface
- Vessel control and stability
WAVE PIERCING HULL DESIGN

BALTIC WORKBOATS VESSELS PROVIDE NOT ONLY AN INCREASE IN PERFORMANCE BUT ALSO AN IMPROVEMENT IN THE WORKING ENVIRONMENT FOR THE VESSEL OCCUPANTS.

- Enhanced seakeeping ability
- Minimize vertical accelerations
- Minimum green water on deck due to integrated spray rails
- Superb maneuvering capabilities
- Low fuel consumption
- Minimum wake
HOW DOES IT WORK?

The Wave Piercing Hull design induces downforce to the bow of the vessel as it rides through a wave which counter balances the upwards directed lift force from the rest of the bow. This results in less vertical acceleration and a smoother ride.
When comparing two equally sized vessels the Wave Piercing hull design provides for a longer waterline length than a traditionally designed hull form. This increases the moment of inertia in the pitch axis which further reduces pitching motions.
It also reduces the wave-making resistance created by the hull providing for more efficient high-speed performance.
BALTIC WAVE PIERCING TECHNOLOGY
2nd Generation Wave Piercing Design

- Increased reserve buoyancy due to wider and deeper forward shoulders
- Longitudinal skeg which helps to maintain directional stability
- Tunnels allow for a reduced shaft angle which minimizes the propeller forces tendency to drop the bow. It also reduces the vessel’s wake and allows for a larger more efficient propeller which reduces vibration
- The Double chine hull form allows for variable deadrise angles which reduce impacts in heavy seas
REAL WORLD RESULTS

• The sea keeping performance has been verified in side by side full scale head sea tests against state of the art vessels of similar dimensions. Depending on speed, there is a 20% to 50% reduction in vertical accelerations and a 10-15% increase in fuel economy.
REAL WORLD RESULTS

The best measure of performance is the feedback we get from pilot organizations all over the world. In just 4 years Baltic Workboats has delivered 33 Wave Piercing Vessels. Many of the boats we are now building are for customers that already have one of our Wave Piercing vessels. This repeat business reflects the true success of our high performance design.
WAVE PIERCING VESSEL DELIVERIES

- 1 x Estonian Pilots
- 1 x Port Everglades Pilots
- 12 x Danish Pilots (4 additional vessels on order)
- Poland Pilots (1 vessel on order)

- 2 x Estonian Police & Border Guard

- 2 x Belgian Customs
- 2 x Belgian Pilots
- 2 x Romanian SAR

- 2 x Danish Pilots
- 3 x Belgium Pilots
- 1 x Estonian Pilots
- 1 x Latvian Pilots

- 3 x German Customs
SELF-RIGHTING CAPABILITIES

Baltic Workboats shipyard
NOISE AND VIBRATION REDUCTION

-Research clearly shows the adverse effects of exposure to noise and vibration. The legal climates are changing, operators now have a duty to mitigate exposure or risk litigation from PI claims.

The adverse effect to humans include:

- Nervous system damage
- Skeletal system damage
- Fatigue
HEALTH STANDARDS

- Vessels meet the DNV Comfort Class requirements

• BWB vessels are designed to meet or exceed the required levels of Noise, Vibration and Climate Controls.

• At full speed you can easily carry out conversation at a normal voice level, the engine noise is almost completely absent.

• In general BWB vessels are about 58 db at idle and 64 db at full speed. As a comparison 60 decibels can be described as the noise level of “Conversational Speech”
HEALTH BENEFITS

DID YOU KNOW?

A survey of U.S. Navy special boat operators found that only 18% of the injuries sustained to occupants occurred during unusual sea states.

• Impact exposure causes injuries to the lumbar spine, neck and knees. Shock mitigating seats help avoid these injuries.

• Studies also show that whole body vibration causes lumbar spine problems, muscle fatigue & hearing loss.

• Studies show a reduction in fatigue levels when operating in environments that are quieter and have less vibration.
There is research evidence showing the drastic effects of vibration on human fatigue levels even with only 20 minutes of exposure. Here is just one example...

*REF: Internoise 2014 Mohd Amzar AZIZAN*
BALTIC WORKBOATS, “THE QUIET BOATS”

• Research and development in the areas of vibration and acoustics to eliminate sources of noise through advanced engineering of our products.

• The wheelhouse is resiliently mounted to the hull. This helps keep noise and vibration from the machinery spaces away from the occupants.

• All rotating machinery (Engines, Pumps, Compressors etc.) are resiliently mounted to the hull and connected softly via hoses to the hard piping.

• Utilize high voltage equipment as much as possible to reduce rotating mass

• Utilize high quality sound absorbing materials through the vessel
MOB CAPABILITIES

- Every rescue situation is different and operators have varying crew manning requirements.

  As the builder it is our duty to take this into consideration by providing the following:

  - Multiple independent means of rescue
  - Provide for the possible retrieval of a MOB even with just 1 person onboard the vessel
  - FLIR system to make it easier to spot a MOB in darkness or bad weather
MEANS OF RETRIEVAL

- Retrieval systems must be designed to work in all cases regardless of the condition of the MOB who may be uninjured, moderately injured or severely injured.

- Systems should also be rapidly deployable and functional night or day, in good weather or bad.

- Ladder on the transom for an uninjured person to get back on the vessel
- Rescue platform to get an injured person back on the vessel who cannot climb a ladder
- Rescue Davit to lift a severely injured or unconscious person from the water
JASONS CRADLE IN USE WITH RESCUE DAVIT
REMOTE RELEASE LIFERING WITH SMOKE AND LIGHT

AFT LADDER
FIREFIGHTING CAPABILITIES

• Fire pump
• ER and deck fire stations for shipboard fires
• Optionally a remote operated monitor can be installed.
• Vessels fitted with a class approved fire detection system and a fixed firefighting system.
• Fire pump can take a suction from the bilge for emergency dewatering
HUMAN MACHINE INTERFACE

• Design to minimize the need for the helmsman to take his eyes off the water
  • Comfortable ergonomic wheelhouse design
  • 360 degree visibility with full CCTV coverage
  • Frequently used controls mounted to the arm rests
• Use process control and automation to reduce distractions (IAMCS)
CCTV SYSTEM

• Wide angle camera coverage of the entire deck gives the operator the ability to keep an eye on the pilot at all times and increases situational awareness.

• In addition there is a camera in the engine room.

• All cameras are equipped with night vision.

• The cameras are remotely accessible via a VPN connection.

• The cameras are recording on a 10 day loop.
Integrated Alarm Monitoring and Control System

- Touchscreen Interface
- Control and monitoring of all vessel systems
- Fully configurable alarm indication system covering: AC/DC consumers and suppliers, engines, pumps, lighting etc.
- Design to minimize the need for the helmsman to take his eyes off the water
- Tasks can be automated
  - (ex. Turn on ER fans when engines start)
CONTROL AND STABILITY ELEMENTS

• Oversized symmetrical fast acting rudders
• Manual Engine Protection override switch
• Humphree Interceptor Systems
• Seakeeper gyro stabilization
Introducing Interceptors

Model testing results with equivalent lift:

- Interceptor drag is 25% less than a Trim tab
- The centre of lift is moved aft by 35% with interceptor (Provides larger lifting moment)
Humphree Control Systems – Automatic Trim Control

Longitudinal vessel trim is automatically adjusted to provide optimum running trim for highest speed and lowest fuel consumption.
With Automatic List Control the captain simply sets the target angle (usually zero) and the system will automatically adjust accordingly.
The Coordinated Turn controls heel characteristics during turns for best comfort and safety. Additionally, the function can be used to significantly reduce the turning circle.
Humphree Control Systems – Active Ride Control

• Efficient roll- and pitch damping at semi-planing and planing speeds, for comfort and safety
• “All in one” system – Trim and Stabilisation (includes Automatic Trim Control and Automatic List Control)
• Integrated processor and sensor package
• Minimal added drag and weight
• Easy upgraded from any other Humphree boat control systems

Wave disturbance 500000Nm with Tpeak 6s
Humphree Active

Humphree Control Systems
– Active Ride Control

January 2019
Humphree benefits

• A clean transom area with possibilities for customization
• Inboard electric servo actuators (no filthy hydraulics)
• Low weight
• No corrosion or marine growth – low maintenance
• Fully automatic functions, captain can focus on navigation
• Fast and simple installation – cost effective
• Average 5% improvement in fuel efficiency
Benefits of Seakeeper gyro stabilization

• Safety
• Fight Fatigue
• Crew Retention
• More time on station
• Wider weather operating window
# SEAKEEPER USE IN A BWB PILOT VESSEL

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**PERFORMANCE DATA**

![Graph showing 82% roll reduction with Seakeeper On and Off]

- **Seakeeper On**
- **Seakeeper Off**

82% Roll Reduction
REMOTE MONITORING SYSTEM

• Cellular GSM connection provides connectivity to the vessel

• Vessel can be accessed via iphone, android, pc or mac

• Remotely view CCTV camera system (Live and historical)

• Remotely view Engine and systems data (Live and historical)

• Fleet maintenance staff receive critical alarms in real time via text/email

• GSM connection can also be used to create a WIFI hotspot on the vessel
REMOTE MONITORING SYSTEM

BENEFIT is an increase in vessel reliability

• Ability to predict equipment failures allowing maintenance staff to take early action before the failure happens

• Shoreside maintenance staff can monitor vessel systems taking some of the pressure off the captain, he can focus on driving the boat.

• Automatic notification of PM’s when they are due

• Remote diagnostics allow for a rapid more efficient response which helps to get the vessel back in service faster
## Remote Monitoring System

### Data Table

- **Main Engine PS Actual Torque**: 0 %
- **Main Engine PS Alternator 1 Current**: 0.0 A
- **Main Engine PS Alternator 2 Current**: 0.0 A
- **Main Engine PS Charge Air Pressure**: 290 psi
- **Main Engine PS Charge Air Temperature**: 116.6 °F
- **Main Engine PS Coolant Pressure**: 0.000 psi
- **Main Engine PS Coolant temperature**: 111.2 °F
- **Main Engine PS Crankcase Pressure**: 14.645 psi
- **Main Engine PS Demand Torque**: 0 %
- **Main Engine PS Exhaust temperature**: 102.2 °F
- **Main Engine PS Fuel Pressure**: 0.000 psi
- **Main Engine PS Fuel Rate**: 0.000 gal/h
- **Main Engine PS Fuel Used**: 4957.2990 gal
- **Main Engine PS Gear Oil Pressure**: 0.00 psi
- **Main Engine PS Gear Oil Temperature**: 89.6 °F
- **Main Engine PS Hours**: 972.5
REMOTE MONITORING SYSTEM
REMOTE MONITORING SYSTEM
REMOTE MONITORING SYSTEM
Baltic Workboats Pilot Vessels
PILOT 2000 WP
LOA 65 ft – 30 knots – 1300 HP
BELGIUM, LATVIA, DENMARK, GERMANY
WORKING ENVIRONMENT
MINIMUM NOISE AND VIBRATION LEVEL
LOA 72 ft – 27 knots – 1500 HP
BELGIAN PILOTS
THANK YOU