

Washington State Transportation Commission

Auxiliary Wind Propulsion for Ferry Vessels

Stuart F. Platt
Chairman and CEO

February 16, 2010



HARBOR WING
TECHNOLOGIES



Harbor Wing Technologies, Inc.



Harbor Wing Technologies has designed and developed a proprietary computer controlled, primarily wind driven, Autonomous Unmanned Surface Vessel "AUSV" for military and homeland defense missions, and WingSails™ for commercial and recreational applications.

HARBO

HWT Proprietary

Harbor Wing Technologies Management Team

Stuart Franklin Platt

Rear Admiral, United States Navy, Retired
Chairman and CEO of Harbor Wing Technologies, Inc.

Mark Ott

Director and Executive Vice President and Project Manager

Ken Childress

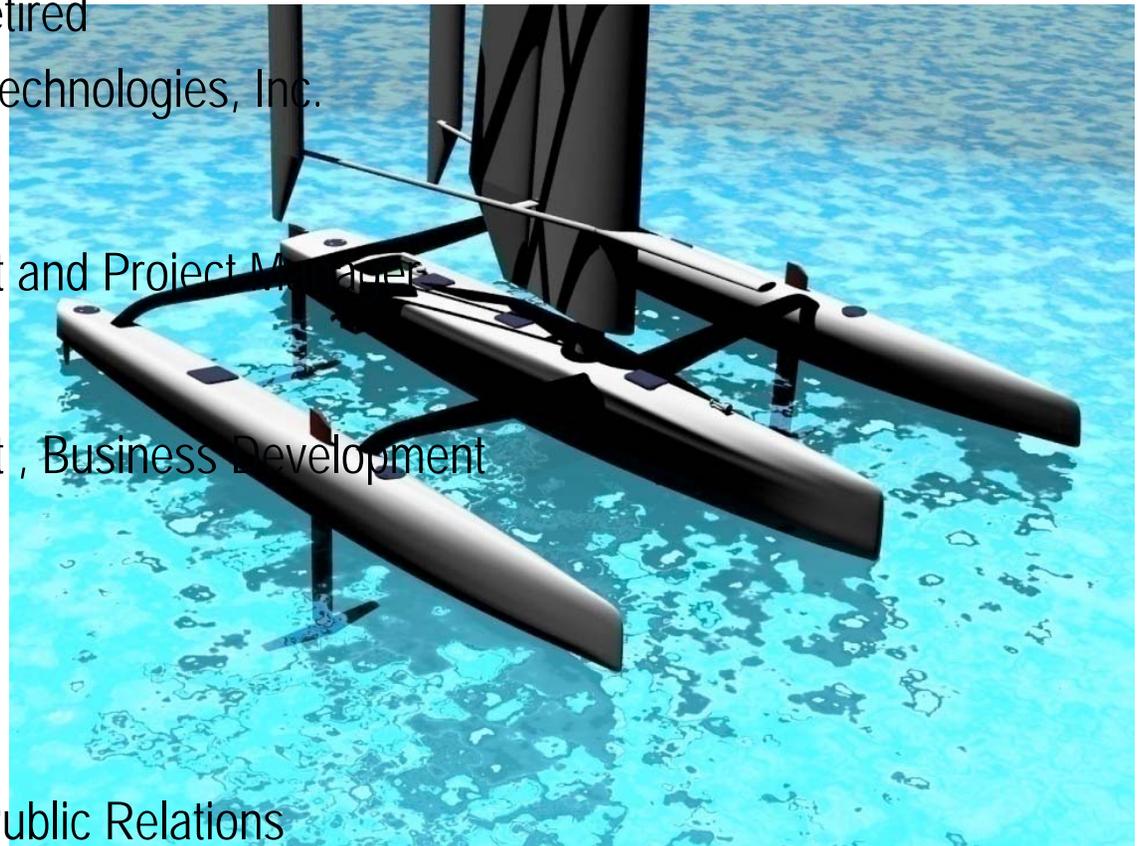
Director and Executive Vice President, Business Development

Rebecca Yeatman

Executive Vice President, Finance

June Lee

Director of Government Liaison and Public Relations



Technical Team

WingSail

- SeaLion Associates: David Hubbard, design
- MacLane Marine Design: Duncan MacLane, design
- Henry Elliot Boat Yard: fabrication
- Stan Honey: Commercial WingSail Interface

Command and Control

- Dr. Gabriel Elkaim: Software, algorithms
- Dr. Lee Boyce: Systems integration
- Dr. Chad Jennings: Shore Control Station
- Raytheon Integrated Defense Systems: Over the horizon communication/data transmission interface; Shore Control Station development

Hull Development

- Morrelli & Melvin Design & Engineering, Inc.
- Dr. Sam Bradfield: hydrofoil design and operation

WINGSAIL PROTOTYPE IN OPERATION

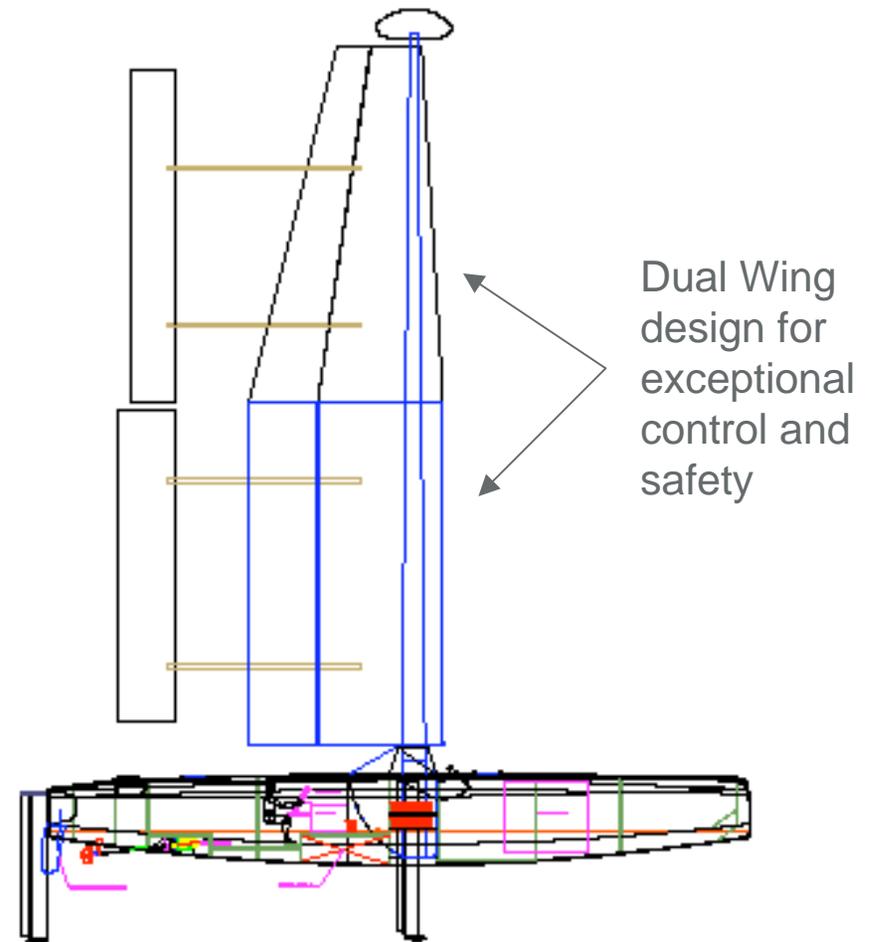
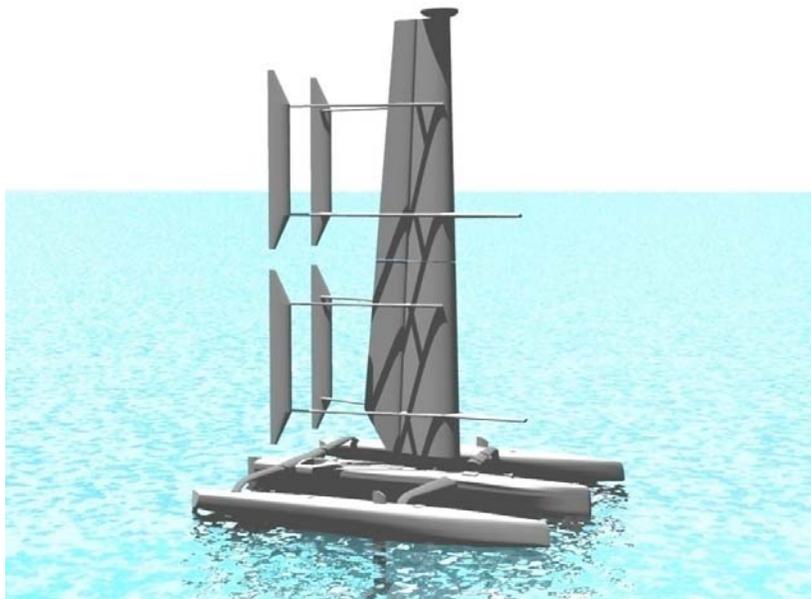
- **5 Years of Successful Development**
- **\$10 mm in Investment**
- **Rigorous Testing**
- **Patented Control**



HA

Second Generation WingSail

- Advanced Computer Drive
- Wing on Wing Design
- 360 deg. Rotation
- Single Pilot Management
- No additional Crew
- Feather into the Wind when off
- Scalable to any size



HWT Proprietary

Wind Assist Ferry Project

- Proposed for routes on the San Francisco Bay Ferry System
- Pilot project to kick off in 2011
- Congressional support from various CA Representatives and Senators
- **Project backed by:**
 - San Francisco Bay Area Water Emergency Transit Authority (WETA)
 - Golden Gate Bridge, Highway, and Transportation District (GGBH&TD)
 - Blue & Gold Fleet
 - *These three entities are responsible for 100% of the commuter ferry services on the San Francisco Bay*



Hybrid WingSail™ Passenger Ferry Vessel

Proposed Wind Assist Design

Reduces fuel consumption by up to 42%.

CO2 reduction of 3250 tons per year

No additional crew required

Vessel

- Double ended
- Dual pilot house
- 17 knot
- USCG certified and ADA compliant

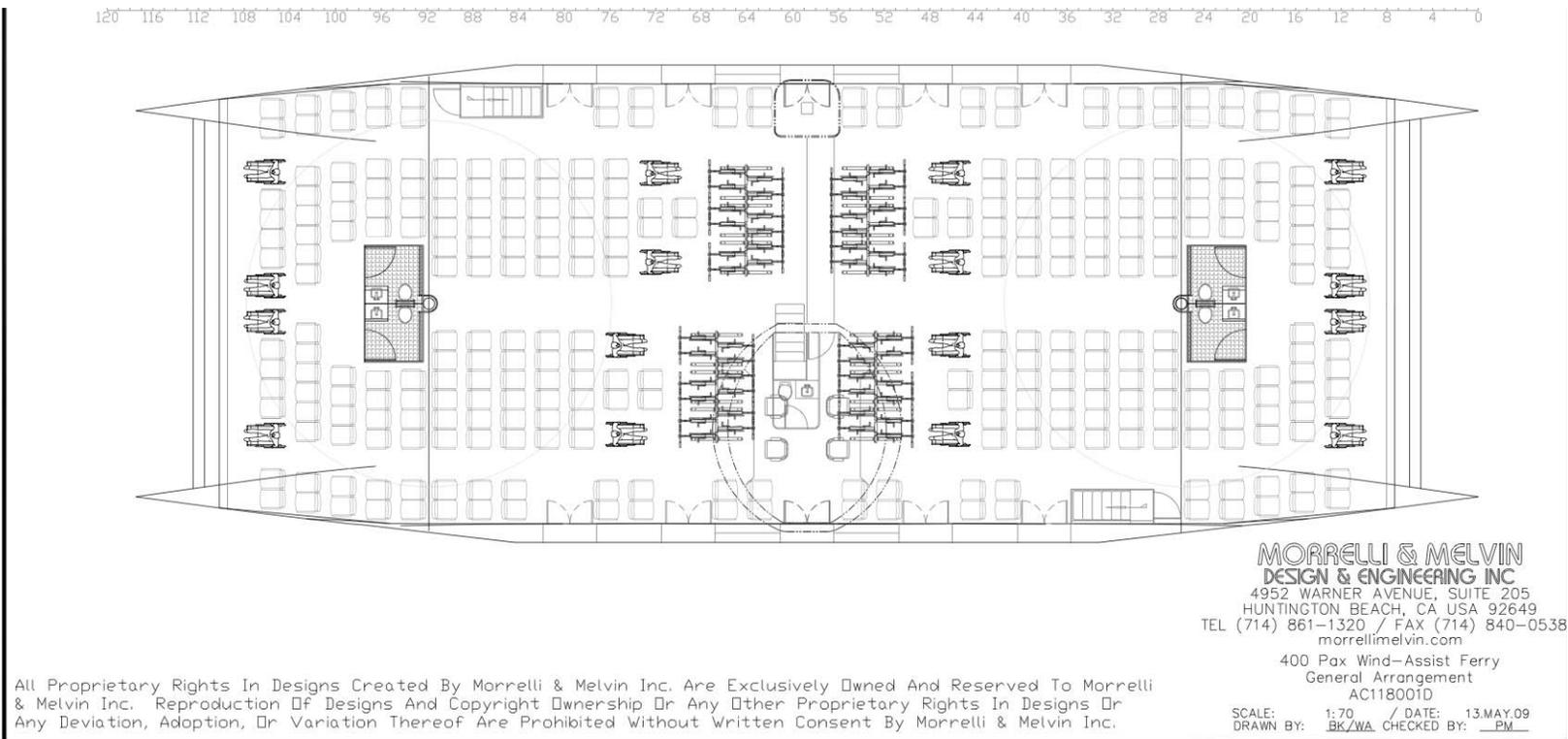
Configuration:

- TLB Hulls
- WingSail™
- Clean Diesel propulsion or Diesel-Electric Hybrid propulsion



Bay Area Passenger Configuration

300-400 Passengers
50-100 Bicycles



Proposed Passenger Ferry Efficiencies

Proposed 400-passenger Ferry

- Without wind-assist, it would use 80 gallons of fuel per round trip
- With wind-assist, it would use 46 gallons per round trip, a 42% reduction

The equivalent increase in fuel economy for an automobile would be

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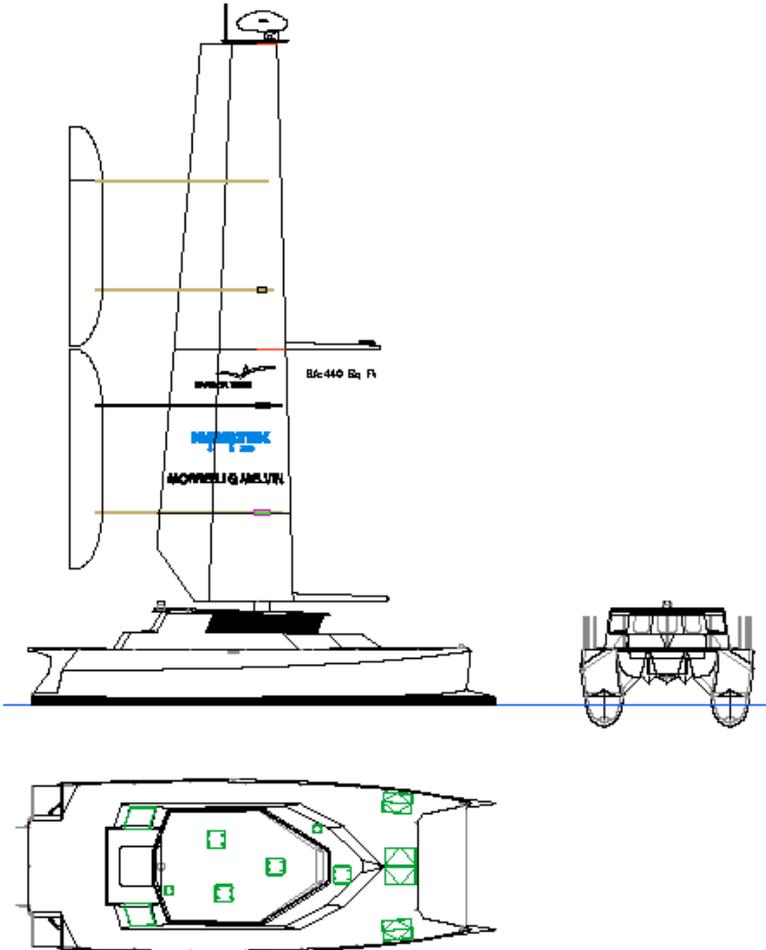
- A 23 mpg car increasing to 39 mpg
- A 30 mpg car increasing to 52 mpg
- A 41 mpg car increasing to 70 mpg



Data extrapolated from 2008 Morelli & Melvin study of 148 passenger, wind assist ferry for S.F. Bay

Bay Area WingSail Ferry Demonstrator

50' Passenger Vessel



- **Harbor Wing WingSail**
 - **Computer Control**
 - **Patented Control Tails**
 - **360 deg. Rotation**
- **Lifting Body Hulls**
 - **Improved Sea-keeping**
 - **Improved Efficiency**
 - **Enhanced Stability**

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40' LIFTING BODY / HARBER VESSEL
GENERAL ARRANGEMENT
NH4000
2002 BY  02/25/02

WA State Ferry Fuel Challenges

- June 1, 2015 –State agencies must satisfy 100% of their fuel usage in vessels and vehicles from bio-fuel or electricity if practical
- WSF spends approx. \$50 mm gallons of diesel fuel per year (\$3.75/Gal)
- Use of “clean fuel” B20 bio-diesel increases cost to \$4.18/Gal
- Emphasis is currently on engine replacement/upgrades
- Similar efforts in BC Ferry system have produced about 1% per year fuel reduction in each of the last 4 years

HARBOR WING
CORPORATION



Large Scale Vessel with WingSail Assist

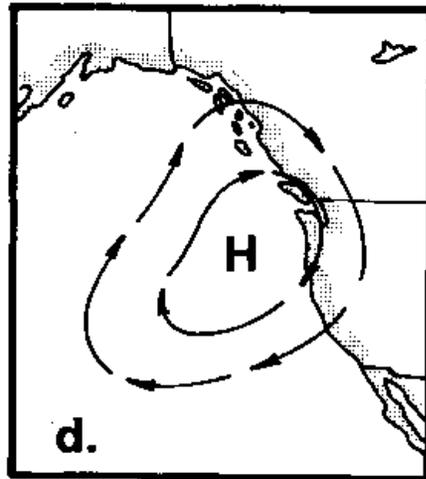
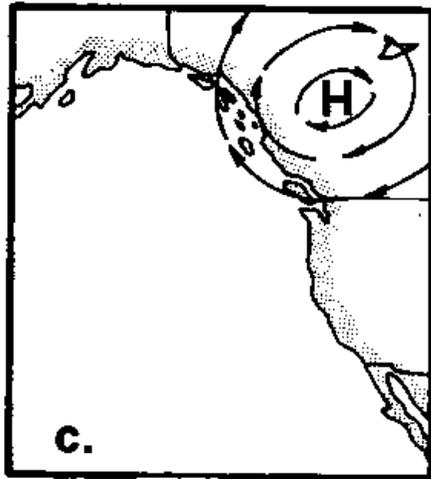
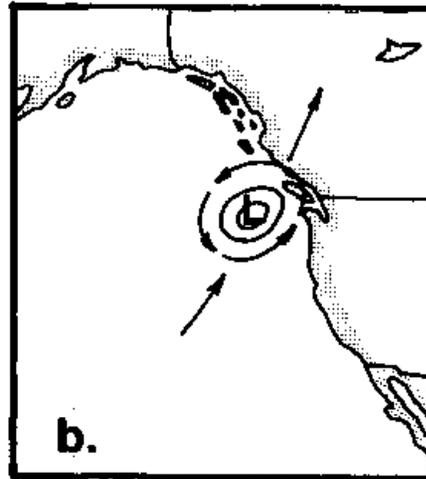
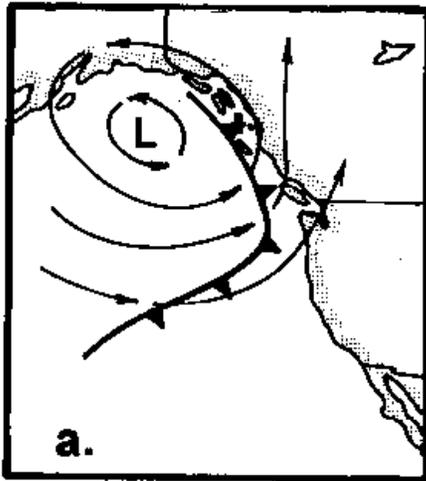
Wing Ht.	117 ft
Area	3729 sq ft
Speed	8 knots

Each WingSail generates 2,250 lbs. of thrust

Anticipated Fuel Savings of up to 30%

Significantly reduces carbon emissions

Prevailing Puget Sound Winds



Why it would work

Southerly winds prevail in
Autumn, Winter, Spring

Sustained winds of 20 – 33
knots are common

Summer velocities are
reduced to average of 7 – 8
knots

Puget Sound Ferry Routes

Puget Sound is a Maritime Highway

Routes run largely East/West

Prevailing winds provide favorable angle of attack for WingSails

Estimated that WingSails could cut fuel consumption by 30% on most routes

Combined with other initiatives, wind assist could greatly reduce carbon emissions



What We Propose

The Washington State Ferry System undertake a pilot project to test auxiliary wind propulsion

- Enlist the help of State Congressional Delegation for D.O.T pilot program appropriation
- Greenhouse Gas and Energy Reduction program



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