Propelwind & UPS

Introduction

PROPELWIND is a concept development company working since 2008 on economically viable zero-emission vessels using primarily wind for their main propulsion, and based on successful technology from ocean sail racing combined with a robust shipowner experience

UPS has 534,000+ employees, 220+ countries and territories served, LY 6.4B packages delivered. 125K vehicles, 13,300+ alternative Fuel and Advanced Technology Vehicles, 585 owned and leased aircraft, 2,500+ global facilities, 28M+ square feet of automated facilities globally, $100.3B Revenue

The UPS Foundation's philanthropic approach centers on four focus areas: health & humanitarian relief, equity and economic empowerment, local engagement and planet protection and has a history of supporting innovations. During the past decade, UPS has invested more than $1 billion in alternative fuel and advanced technology vehicles. This study looked to identify if a sustainable ocean container transportation solution would provide a viable, scalable alternative to today's traditional ocean vessels.

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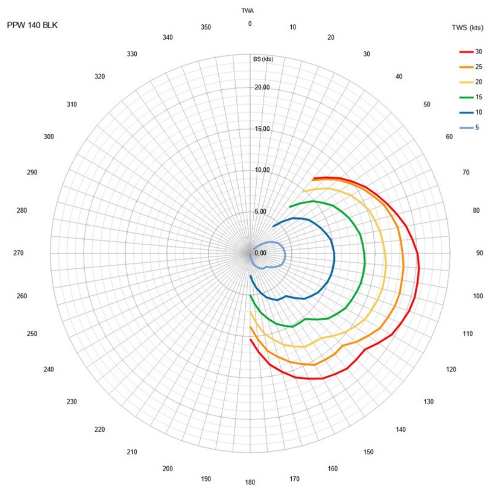
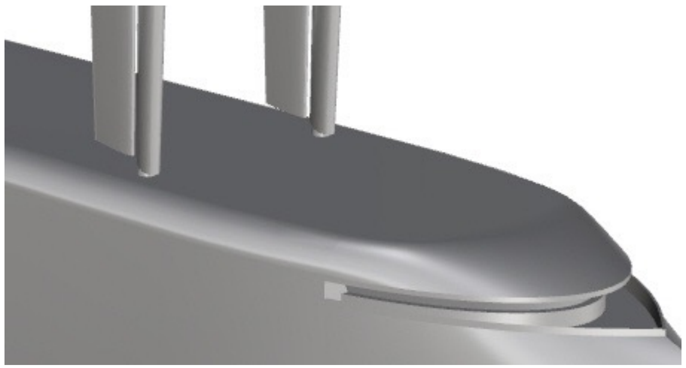
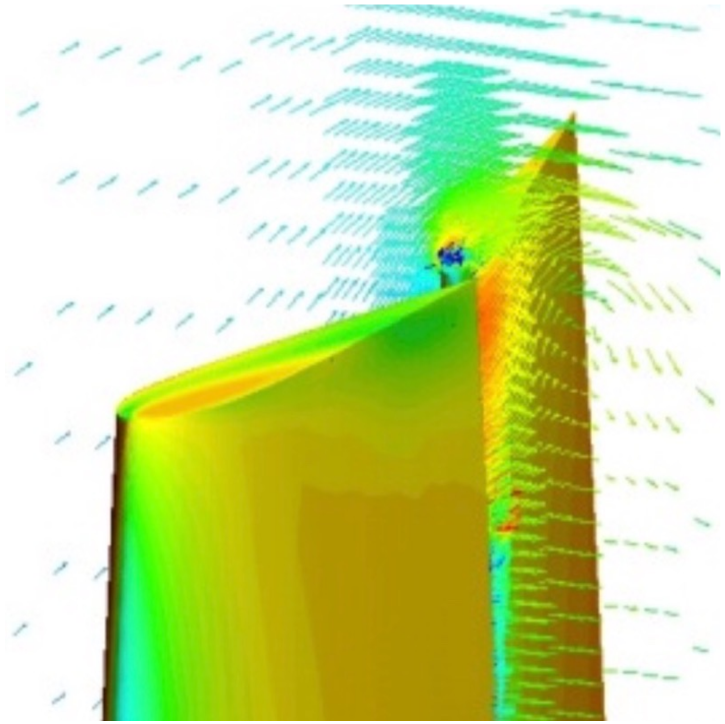
Wind for main propulsion

- The “wind engine” is the rigid articulated wingsail
- Extreme hull aerodynamics
- Maximize speed in windy areas
- Maximize the areas where wind is feasible







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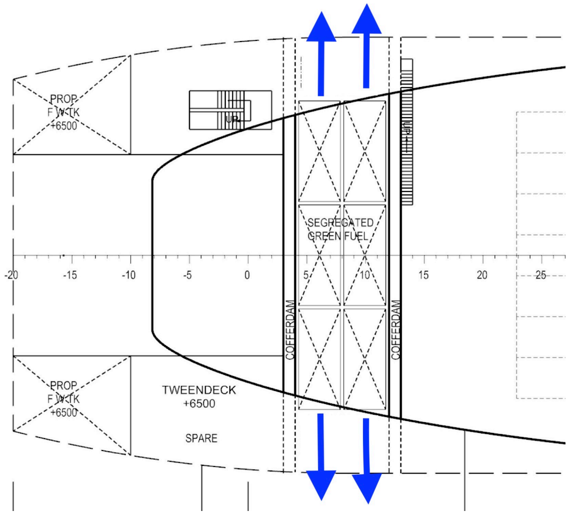
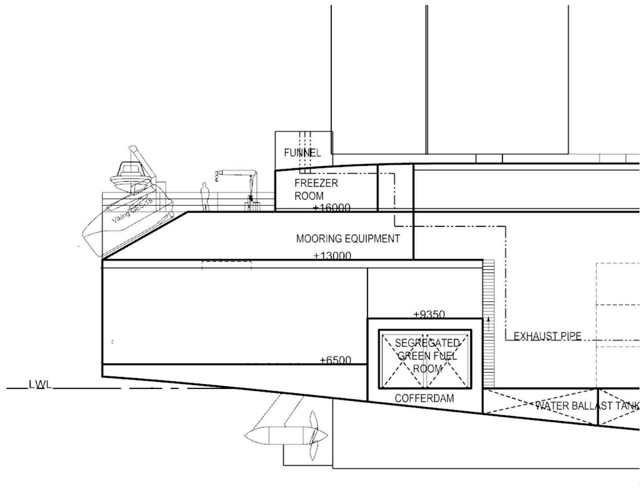
Other energy users

- Green fuel for mechanical propulsion as back-up; reduced use allows for:
    - minimal inventory
    - fuel in tanktainers
    - safe storage (segregated compartment), overpressure protection
    - horizontal no-lift handling
- Auxiliary power for on board electrical loads (accommodations, navcoms, pumps, ..) from system with solar panels on wingsails (very large area) and batteries





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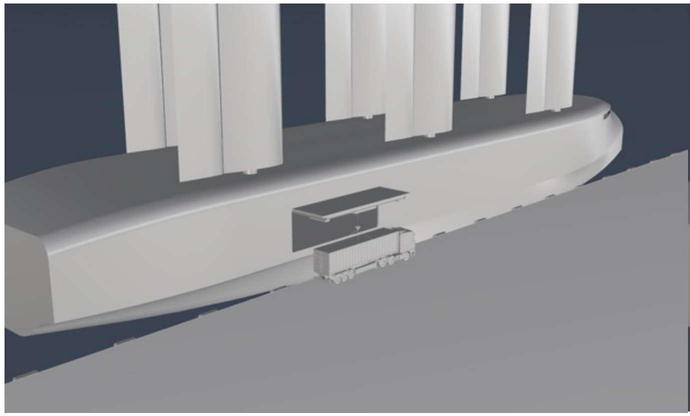
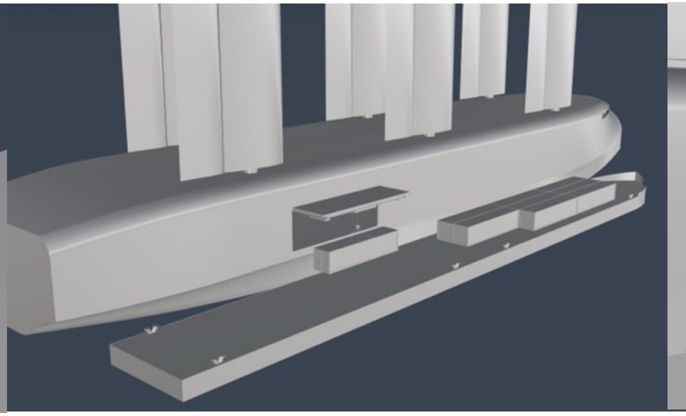
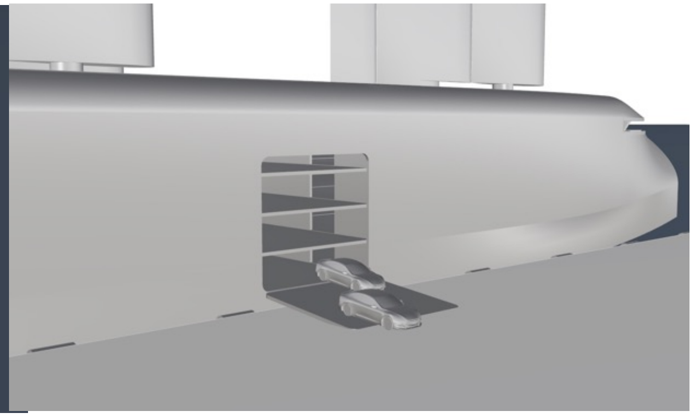
Cargo

- Feasible cargo's:
  - containers
  - cars
  - project cargo
  - light bulk
- No maximum filling of the hull volume
- Smart handling equipment as part of the green concept package

Statistical Tradelane Analysis

		distance	aver. voyage duration	% time with engine	average speed	total MDO consumpt	duration statistics: longest	duration statistics: shortest
		Nmiles	days	%	kts	t / voyage	days	days
1	St Nazaire - New York	3 032	10,9	13,4%	11,7	6,1	13,3	8,7
	New-York - St Nazaire		9,6	9,2%	13,2	3,7	12,6	7,3
2	Shanghai Los Angeles	5 660	18,4	10,0%	12,9	7,7	23,1	14,9
	Los Angeles - Shangshai		20,4	15,2%	11,6	12,9	25,4	17,0
3	Anchorage - Panama	4 804	20,0	19,4%	10,0	16,2	23,2	16,7
	Panama - Anchorage		20,7	21,8%	11,6	12,9	25,4	17,0
4	Los Angeles - Seattle	1 063	4,9	39,5%	9,0	8,1	5,9	3,5
	Seattle - Los Angeles		4,5	24,9%	9,8	4,7	6,3	2,9
5	Honolulu - San Francisco	2 091	8,0	17,1%	11,0	5,7	9,4	6,1
	San Francisco Honolulu		7,7	10,5%	11,3	3,4	9,7	6,2
6	Jacksonville - Puerto Rico	1 115	4,4	27,0%	10,5	5,0	5,9	2,9
	Puerto Rico - Jacksonville		4,3	19,6%	10,9	3,5	5,6	3,1
7	*Oostende - Puerto Rico*	*3 759*	*13,5*	*13,3%*	*11,6*	*7,5*	*16,0*	*11,2*
	Puerto Rico - Oostende		*12,6*	*11,4%*	*12,5*	*6,0*	*15,9*	*9,3*

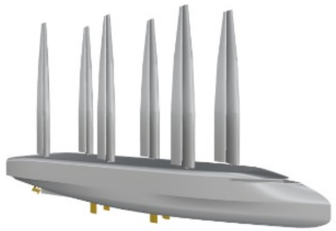
			reference ship: size	reference ship: norm. speed	reference ship: eco speed	reduction factor: normal speed	reduction factor: eco speed
			TEU	kts	kts		
1	North Atlandic	St Nazaire - New York	4 000	19,0	14,5	4,63	3,06
		New-York - St Nazaire				7,62	5,02
		St Nazaire - New York	*10 000*	*21,0*	*15,0*	*3,49*	*1,73*
		St Nazaire - New York				*5,73*	*2,84*
2	North Pacific	Shanghai Los Angeles	10 000	21,0	15,0	5,15	2,56
		Los Angeles - Shangshai				3,06	1,52
		Shanghai Los Angeles	*15 000*	*20,0*	*16,0*	*3,38*	*2,20*
		Los Angeles - Shangshai				*2,01*	*1,31*
3	N America West Coast	Anchorage - Panama	2 000	17,4	14,0	3,43	2,14
		Panama - Anchorage				4,29	2,68
4	California Coast	Los Angeles - Seattle	2 000	17,4	14,0	1,52	1,00
		Seattle - Los Angeles				2,62	1,72
5	California - Hawaii	Honolulu - San Francisco	2 000	17,4	14,0	4,23	2,64
		San Francisco Honolulu				7,12	4,44
6	Florida - Puerto Rico	Jacksonville - Puerto Rico	2 000	17,4	14,0	2,58	1,61
		Puerto Rico - Jacksonville				3,68	2,30
7	*Europe - Puerto Rico*	*Oostende - Puerto Rico*	*2 000*	*17,4*	*14,0*	*5,79*	*3,62*
		Puerto Rico - Oostende				*7,23*	*4,51*

Main conclusions:

- Trades 3, 4 and 6 show engine use above 19% in both directions, too much to qualify for *wind for main propulsion* in line with IWSA's opinion: 15% engine use is considered as a maximum;
- With trades 1, 2, 5 *and 7*:
  - the difference between the *average* durations in the 2 directions is about 10%, but the slower direction requires about 50% more engine use;
  - the difference between the *longest* and the *shortest* durations is relatively small – say about 50% of the smallest, allowing to consider efficiently a roundtrip operation and fleet based on the longest duration.
  - the required fuel on board is *negligible* (up to 12.9 t for 5,660 Nmiles) compared to the displacement (est. 6,000 t)
  - *this quantity is less than the capacity of a standard 20 ft ISOTAINER (33 m^3)*

Source: UPS Foundation Research Study

Vessel Statistics and Information



Concept Vessel

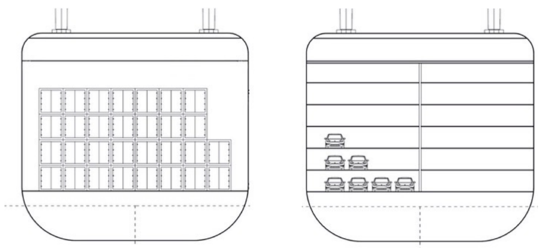
*Prototype wind powered vessel –
A UPS Foundation funded study*

Qualities

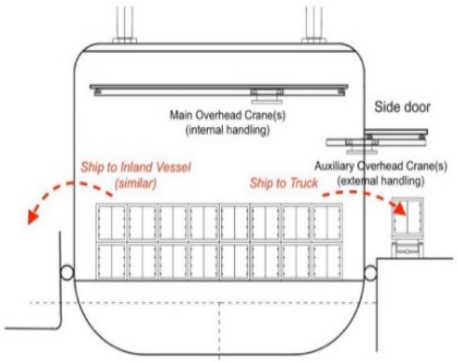
- Wind propulsion used as the main power source
- Proven wing-sail design for maximum efficiency; significantly reducing the fuel requirement
- GHG footprint per TEU much smaller than large vessels
- Closed hull design to enclose and protect cargo during voyage
- No need for large port infrastructure allows for more creative routing and solutions

Key Features

- ✓ **Average Speed 12.0 kts**
- ✓ **250 TEU** Capacity
- ✓ Scale up to **600 TEU** Capacity
- ✓ **Wind use – 88%** of the time
- ✓ **Closed hull to Protect Cargo**
- ✓ **Side Loading/Unloading**
- ✓ **Access to Smaller Ports**



a generic hull for containers, cars, project cargo's,...



250 TEU
Q1 - 2026

600 TEU
2030

2,000 TEU
2040

Source: UPS Foundation Research Study
https://propelwind.com

What are some of the sustainability and logistical benefits?

Origin/Destination

- Agile vessel routing - reducing road mile transportation
- Not reliant on port cranes/large vessel infrastructure
- Avoiding port congestion / Labour disputes
- Self load from quay to vessel or barge to vessel
- Reduction of terminal handling costs

Port to Port

- Use of renewable energy for 90% of journey - Less Fuel
- Clean Hydrogen Fuel – Stored in compressed tanktainers
- Long Term Forecastable costs - avoiding fuel fluctuations and carbon taxes
- Marine conservation – zero underwater noise – harmless to sea fauna
- Cargo Protection – Fire and Overboard risk
- Reduced Operating Cost - Crew & Insurance
- Refer operations supported – renewable solar energy
- AI Wind Optimisation Technology – proven routing software from ocean sail racing

Barriers to Success

Challenges	Response
Wind is not available everywhere	Impossible routes are limited to Europe – Asia and West Africa Maximum aerodynamic efficiency broadens the range of possible areas
Wind propulsion is too slow	As an average, wind propulsion is faster than slow steaming
Carriers continued strategy ULV and fuel choice	Both for supply chain efficiency and on-time performance smaller providers have consistently provided a more reliability
Wind is not economical	From all the decarbonization solutions, wind is the most effective for branding
Wind is for dreamers	Ask CARGILL, MICHELIN, MOL, YARA, NEOLINE, WALLENIUS, ALFA LAVAL, CANOPEE.. UPS
Wingsail area cannot be reduced in case of a storm	In-depth stability and seaworthiness studies, in accordance with rules Routing to avoid areas with wind speed above 30 kts

MOVING OUR WORLD FORWARD BY DELIVERING WHAT MATTERS

FAST-TRACK TO ABSOLUTE ZERO EMISSIONS