



# **ZEETUG<sup>®</sup>**

Zero Emission Electric Tug Boat

Designer & Builder

**NAVTEK**  
NAVTEK NAVAL TECHNOLOGIES INC.



# THE WORLD'S FIRST ALL ELECTRIC TUGBOAT



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# NAVTEK NAVAL TECHNOLOGIES

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**NAVTEK**  
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**Our extensive know-how is based on our experience,  
since 1977...**

A proud history for more than 40 years in service and is among the highest reputable companies in Turkish shipbuilding industry. NAVTEK focus on delivering innovative unique designs and engineering solutions with the best available technologies and know-how.

NAVTEK is not only a design and engineering company, but a technology firm with innovative R&D activities and cooperates with respected Universities and high-technology institutions.

By a legacy of more than four decades of design and engineering experience, we offer a large design portfolio, each tailored specifically to the defined needs of our clients. Our know-how covers the simplest barge to sophisticated ships.

**ZESTAs.**  
Zero Emission Ship Technology Association

Member of

**WATERBORNE**

## SELECTED PROJECTS PORTFOLIO

### POWER PLANTS



Designer of the first Self-Propelled Floating Power Plants in the world.

### LANDING SHIP TANK



Designer of Turkey's biggest Landing Ship Tank (LST).

### VIRAZON II



Designer and Builder of the world's most advanced underwater archaeological research ship for INA (Institute of Nautical Archeology foundation, USA)

### ZEETUG



Designer and Builder of the world's first zero emission rechargeable and all-electric harbor tugboat





**ZEETUG SUCCESSFULLY**  
FULFILLS HER DAILY **HEAVY - DUTY**  
OPERATIONS IN LINE WITH **NOT HARMING**  
**THE ENVIRONMENT**







ZEETUG represents the new generation green and high technology by being re-chargeable and all electric with zero emission and no noise. This innovative design allows the vessels to operate powerful with higher efficiency in line with not harming the environment.

With the aid of the modular system ZEETUG can be custom build from 5T BP up to 80T BP.

ZEETUG is also a smart harbor tugboat; a power efficient electric tugboat, capable of managing its energy and reach on longer distances.

## ADVANTAGES

**ECO FRIENDLY**  
NO NOISE-NO EMISSION



**BUDGET FRIENDLY**  
UP TO 85% LOWER OPEX

**SMART**  
MANAGING ITS ENERGY



**POWERFUL**  
HIGHER MANEUVERING  
ABILITY



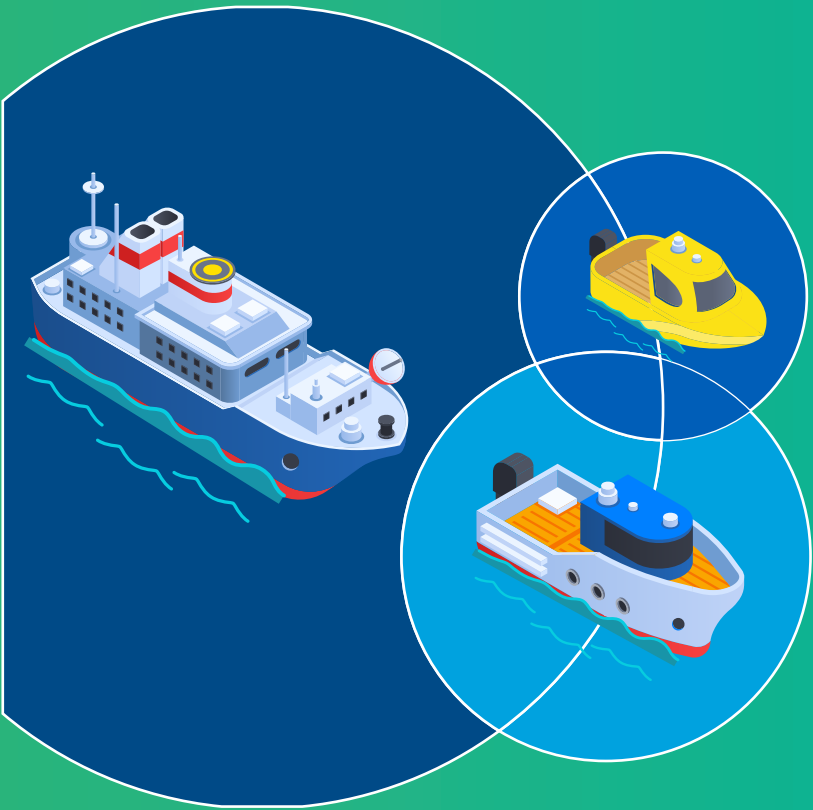
**SAFE**  
MEETS ANY IACS MEMBERS VALID  
RULES AND REGULATIONS

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**ZEETUG MEANS;**  
AN ALL ELECTRIC  
**NEW CONCEPT** FOR  
TUG OPERATORS





# THE ZEE TECHNOLOGY

Lithium-ion battery packs are used to power up ZEETUG, manufactured by our solid solution partner green craft tech specialist CORVUSENERGY.

By the powerful electrically charged battery packs ZEETUG successfully fulfills her daily heavy-duty operations, in line with not harming the environment and enables the harbor tugboat to operate even at nighttime with almost no noise.

With the aid of the modular system ZEETUG can be custom build from 5TBP up to 80TBP.

This technology can be adapted to any existing short distance watercraft. Our expertise also includes Conversion and Refit.

- ✓ Ferry / Landing Craft
- ✓ Coastal Fishery Boat
- ✓ Leisure Boat
- ✓ Workboat
- ✓ Sea-taxi
- ✓ Any other special short distance watercraft

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## WHY CUSTOM MADE?

Due to the variability of the weather conditions and operation times of the regions where the ports are located, we examine the profiles of our clients in order to obtain maximum efficiency.

We adjust the technical characteristics of ZEETUG according to the existing/requested operation profile of our clients. Thus, we ensure maximum protection of battery health and guarantee successful operations together with the NAVTEKSTEMS software.

## NEEDED INFORMATION TO BUILD YOUR ZEETUG



How often the Tugs operate?



How long an operation takes?



Distances to be sailed during the operations.



Power requirements for the different operations.





# STEMS

## SMART TUG ENERGY MANAGEMENT SYSTEM

STEMS (Smart Tug Energy Management System) software is developed by NAVTEK NAVAL TECHNOLOGIES with the objective of optimizing the electric power consumption of the electric watercraft and extending its driving range and operation cycles.

STEMS is both a browser-based and a mobile software, which has a lot of capabilities for fleet control center and tugboat operators. With its flexible structure, it can be adapted to a fleet.

STEMS collect all data coming from the devices and equipment in the tugboat and stores them in the Control Center's server.

- Tug speed,
- Motor speed,
- Power consumption,
- Battery motor temperature,
- Battery state of charge...
- Actual ambient condition's data
- Weather data

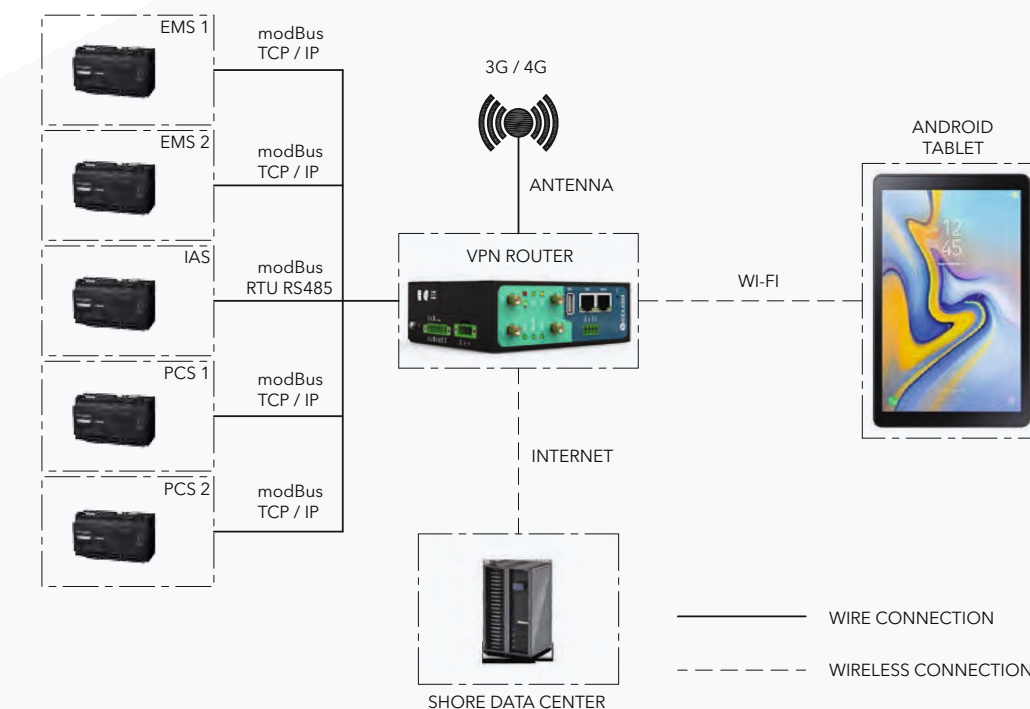
It uses the related data to performance, to optimize the electric power and gives feedback in terms of suggested actions to the Captain.

### ADVANTAGES

- STEMS can be used on more than one ZEETUG® (a whole fleet)
- Towage operations can be scheduled on considering the availability of the charged (ready to operate) ZEETUG®.
- The final charge of batteries can be estimated.
- Both the control center operator and the tugboat operator can change predefined route on chart.
- Any type of Android mobile tablet (personnel or industrial type) can be used.
- All data coming from the ZEETUG® are being stored in the control center servers.
- STEMS can prepare reports of all operational output.
- Due to the possible operational profile changes the software can be revised...

### FEATURES

- A single platform to control the entire ZEETUG® fleet.
- Integration with Marine Traffic charts.
- Collecting data coming from all devices and equipment of the electric tugboats and storing them in the server.
- Displaying real-time wind data from ground stations.
- Monitoring all relevant data related to performance of the tugboats and giving feedbacks.
- Charging time estimation by considering the battery' state of health.
- Reporting tools for operation and personnel performance...





# ZEETUG 30 (NV 712) - GİSAŞ POWER



32T BP



EQUIPMENT

Main Engine (Electric Motors)
Gearboxes and Propulsion System
Batteries
Automation System
Drive System
Navigation Equipment
Bridge Navigation Alarm System

MANUFACTURER

SIEMENS (2x925kW)
REINTJESS
CORVUS Energy (1450 kWh of battery capacity)
BMA TECHNOLOGIES
ABB
NAVICO SIMRAD; COBHAM/SAILOR; LILLEY&GILLIE; SPERRY; NETWAVE
VEINLAND

OPERATIONAL FACTS

Avoiding apprx. 9 tons of Nox and 210 tons Co2 per year, compared to similar tugs with diesel engines

%10 Smaller than similar Tugs

Charging time less than 1 hour

Battery Packages’ calculated for 10 years

Lithium Ion batteries are fully serviceable and are 99 % recyclable by weight and disposable at their end of life ensuring that all battery components are recycled using the top recycling processes to minimize waste.\*

*\*The information based on Corvus Energy Company.*

MAIN PARTICULARS

Lenght (O.A)	Abt.	18.70 m
Breadth (MLD)	Abt.	6.70 m
Depth (MLD)	Abt.	4.65 m
Draught (Design)	Abt.	3.50 m
Speed at Design Draught		10 knots
Electric Motor		2x925 kW
Personel Number		4 Persons

This product's technical characteristic is designed in accordance with Gisaş Shipbuilding Industry's operation profile. The technical configuration of ZEETUG30 may vary according to project requirements / operation profile.

For more ( 5T BP up to 80T BP ) please contact [info@navtek.net](mailto:info@navtek.net)



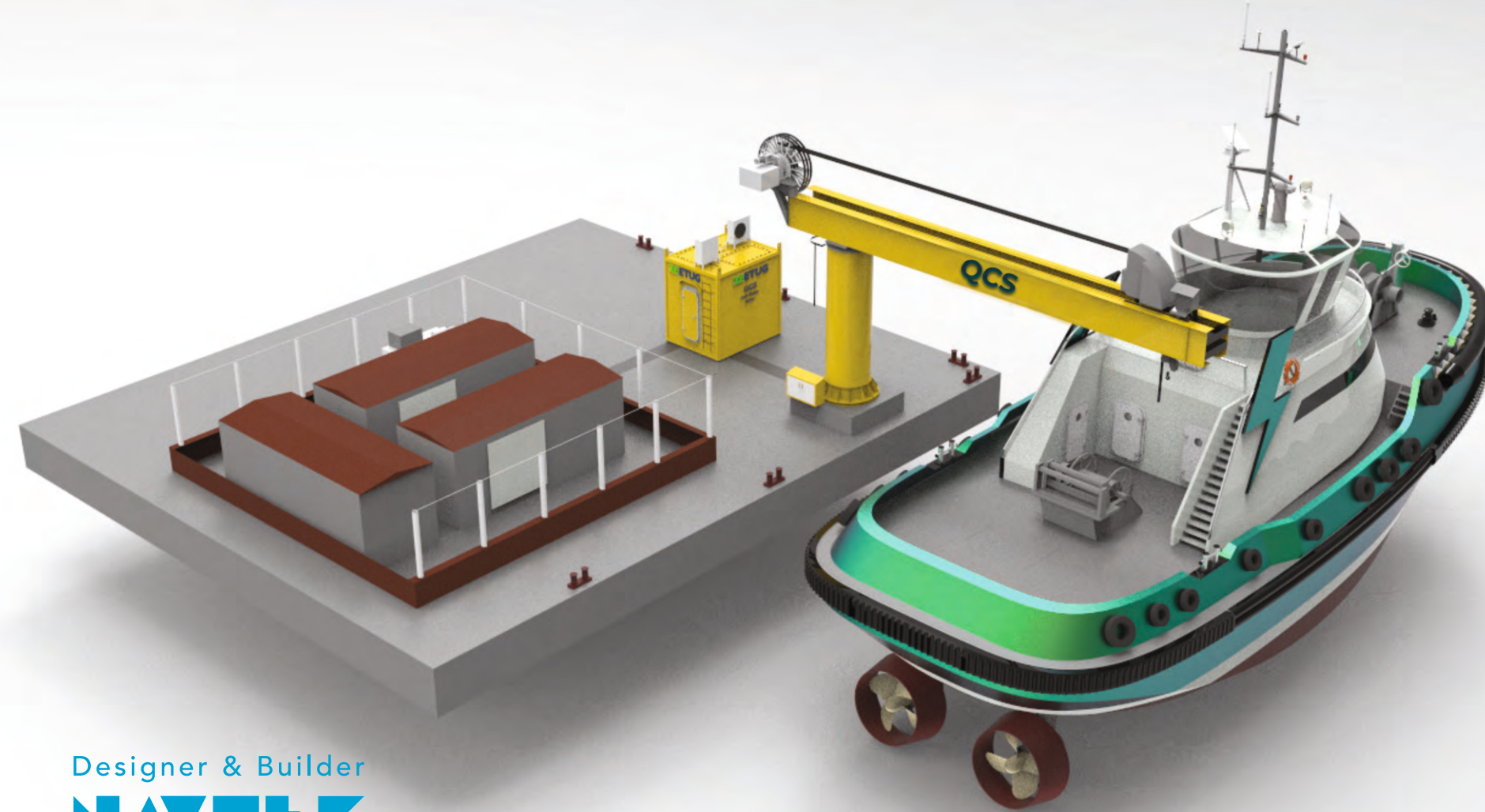


# QUICK CHARGE STATION



This product is developed in accordance with the infrastructure of Tuzla Harbor, Turkey and ZEETUG30 (NV712).

\* The technical configuration of QCS may vary according to project requirements and to the port infrastructure. The Quick Charge Station is designed (tailor-made) for ZEETUG® by NAVTEK NAVAL TECHNOLOGIES INC.



## GENERAL SPECIFICATIONS

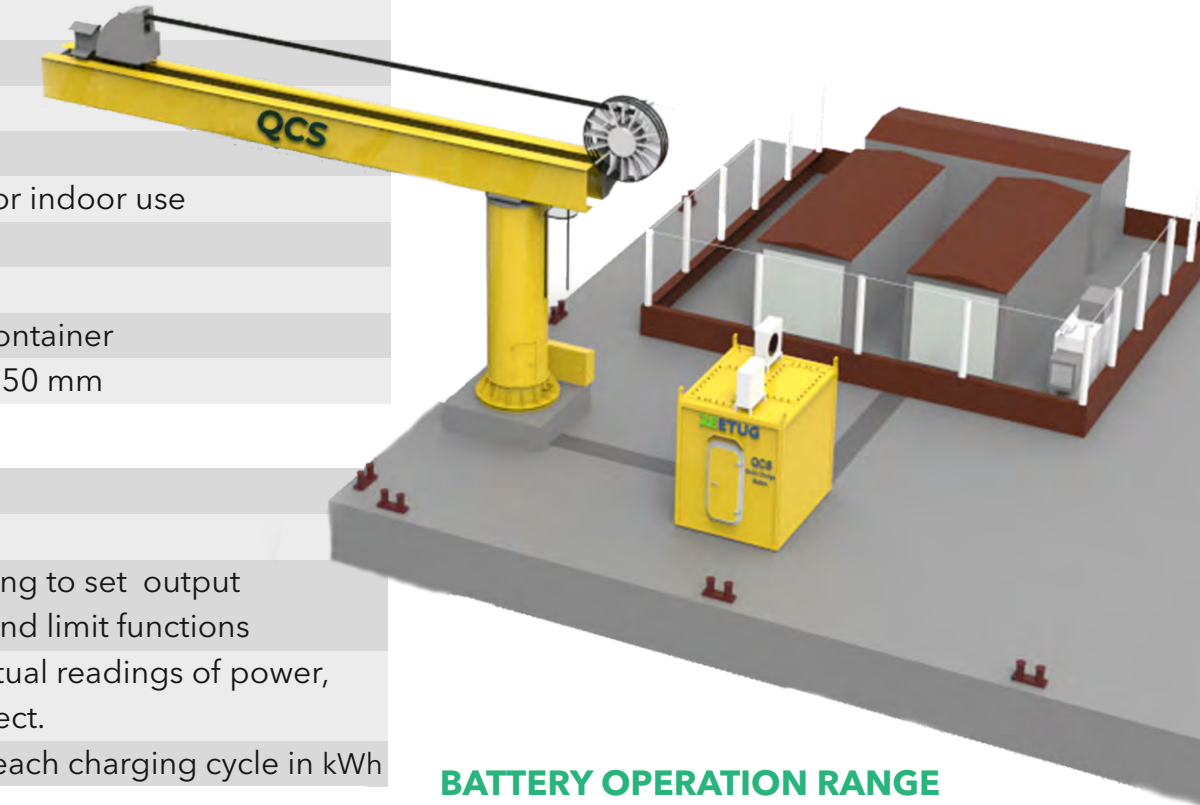
Input	3- phase 500VAC $\pm 10\%$ ; 50-60Hz $\pm 5\%$
Output	750Vdc
Efficiency	>96%
Power factor	0.99
Output power up to	2x500 KW
Protection degree	IP54 Cabinets for indoor use
Ambient temperature	0°C to 40°C
Ambient humidity	0% to 95%
Heating/Cooling is controlled	by A/C inside container
Dimensions (W x D x H)	1500 x 650 x 2250 mm

## CHARGING TECHNOLOGY

Switch board	ABB
Cooling system	Air cooling
Optimizing	Boosting input voltage according to set output voltage, active power control and limit functions
Human machine interface	Hand terminal used as HMI, actual readings of power, voltage, current, temperature, ect.
Energy import	Energy import is recorded for each charging cycle in kWh

## CONNECTORS

Connectors	Marechal DS4 1000 V
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## BATTERY OPERATION RANGE

%20-%90 SOC for ZEETUG NV712 :  
995 KWH, 55-65min



Safety first! ISU is designed to not starting up before the charging plug is connected properly !

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[www.zeetug.com](http://www.zeetug.com)



BE A PART OF  
THE SOLUTION,  
NOT A PART OF  
THE POLLUTION



LET'S MOVE  
TOWARDS  
**GREEN** TO KEEP  
THE PLANET  
CLEAN

THERE IS  
NO PLANET  
" B "







**NOT ONLY DESIGN,  
BUT ALSO BUILD  
AND DELIVER  
TURNKEY!**

*subsidiary of*



Together with our parent company TK Tuzla Shipyard (located in the Tuzla suburb of Istanbul, north east of the Sea of Marmara at the entrance to the Bosphorus), NAVTEK also has shipbuilding identity. This allows us to provide a complete service to our clients. TK Tuzla Shipyard is one of the largest shipyards in Turkey and has been recognized for its remarkable naval works throughout its history. Also ensures high quality and punctual delivery times and focuses on orders of specialized vessels.

[www.tktuzlashipyard.com](http://www.tktuzlashipyard.com)



# STATE OF **ZEETUG** AVAILABLE SERIES

5T BP up to 80T BP

Bollard Pull (t.)	5T BP	30T BP	45T BP	55T BP
Loa(m.)	11	18,7	25,5	27
B(mld.m.)	4,4	6,7	10,6	10,8
H(mld.m.)	2,06	4,65	4,27	4,7
T(bl.m.)	1,7	3,5	3	3,45
Total Motor Power (kW)	300	1900	2900	3440
Propellers (n)	2	2	2	2
Propeller diameter (mm.)	1000	1800	2200	2300
Steering Type	asd	conv.	asd	asd
Endurance@6 knots abt.	6h:18m @ 38 nm	5h:18m @ 31.8 nm	9h:30m @ 57.1nm	10h:30m @ 63.3nm
Endurance@7 knots abt.	3h:12m @ 22.1 nm	3h:54m @ 27.1 nm	7h:42m @ 54.1 nm	8h:36m @ 60.4 nm
Endurance@8 knots abt.	2h:6m @ 16.9 nm	2h:48m @ 22.2 nm	6h:30m @ 52 nm	7h:18m @ 58.5 nm
Endurance@9 knots abt.	1h:12m @ 10.4 nm	1h:48m @ 16 nm	4h:30m @ 40.1 nm	5h:6m @ 45.9 nm
Endurance@10 knots abt.	0h:48m @ 7.9 nm	1h:18m @ 13.1 nm	3h:24m @ 33.9 nm	3h:54m @ 39.2 nm
Estimated top speed (knots)	10,2	11,3	13,3	13,2
Proposed crew number	2	4	6	7

60T BP	65T BP	70T BP	75T BP	80T BP
27,9	28,7	29,6	30,5	31,4
11,1	11,4	11,8	12,1	12,5
4,9	5	5,2	5,3	5,5
3,5	3,55	3,6	3,65	3,7
3800	4100	4400	4700	5000
2	2	2	2	2
2400	2500	2600	2700	2800
asd	asd	asd	asd	asd
9h:54m @ 59.2 nm	10h:48m @ 64.8 nm	10h:6m @ 60.4 nm	9h:24m @ 56.2 nm	10h:0m @ 60 nm
8h:0m @ 58.3 nm	8h:48m @ 61.4 nm	8h:12m @ 57.1 nm	7h:30m @ 52.7 nm	8h:0m @ 55.9 nm
6h:48m @ 54.2 nm	7h:24m @ 59 nm	6h:54m @ 54.8 nm	6h:18m @ 50.3 nm	6h:36m @ 53.1 nm
4h:42m @ 42.6 nm	5h:12m @ 46.4 nm	4h:48m @ 43.3 nm	4h:24m @ 40 nm	4h:42m @ 42.5 nm
3h:36m @ 36.4 nm	4h:0m @ 39.7 nm	3h:42m @ 37 nm	3h:24m @ 34.3 nm	3h:42m @ 36.6 nm
13,1	13,1	13	12,9	12,8
7	7	7	8	8



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