NATIONAL TECHNICAL UNIVERSITY OF ATHENS

LABORATORY FOR SHIP AND MARINE HYDRODYNAMICS

(Member ITTC, HELLAS LAB. ISO 9002 CERTIFIED)

Main Scope

- Education (undergraduate and post-graduate)
- Research in the area of ship and marine hydrodynamics
- Services to the Greek Shipbuilding and Shipping industry
- Services to Hellenic Navy and to the public sector
- Services to clients from abroad

The Laboratory of Ship & Marine Hydrodynamics (LSMH) of the National Technical University of Athens (NTUA), is a major testing and computing facility operating since 1979 within the School of Naval Architecture & Marine Engineering.

The experimental capabilities of LSMH are based on a industrial size towing tank which is 100 m long, 4.6 m wide and 3 m deep.

The towing tank has a paddle-type wave generator for producing regular and random waves at one end and a damping shore at the other end.

The towing carriage runs at speeds are up to 5.3 m/s

Academic Staff

Prof. G.Grigoropoulos (Director)

Prof. G. Triantafyllou

Prof. K. Belibassakis

Prof. K. Spyrou

Prof. I. Chatzigeorgiou

Asst Prof. G. Papadakis

Research Engineers

D. Liarokapis

G. Katsaounis

E. Papakonstantinou

D. Triperinas

Technical and Educational Staff

F. Kasapis

I. Trahanas

G. Mylonas

Post-Graduate Students (5-8)

FUNDING

- **Ministry of National Education**
- **General Secretariat for Research and Technology**
- **Participation in European research programs**

  (EFFORT, EFFISES, COMPASS, VRSHIP, GIFT, ESPRIT,

  SAS, RORODES, ERASTAR, SEAROUTES, ERAMAR, SEATECH etc.)
- **Hellenic Navy and Greek public sector**
- **Private Sector (Greek Ship owners, Shipyards, Shipping**

  Companies, Technical Offices, Classification Societies)

SCIENTIFIC ACTIVITIES

- **Ship Propulsion**

  Resistance

  Self Propulsion
- **Seakeeping Performance**
- **Maneuvering**
- **Damage Stability Experiments**
- **Hydrodynamic Design**
- **Analytical and Experimental Analysis of Wave Climate**
- **Computational Hydrodynamics (CFD)**
- **Advanced Experimental Techniques (e.g. Pitot, Laser, PIV)**
- **In Situ Measurements on Ships and Large Scale Models**

  Passenger Comfort

  Ship Maneuverability

  Seakeeping performance

  Wash wave effects

Towing tank Experiments

Calm water, regular and random wave tests

Hydrodynamic design of conventional ships (design of hull forms, bulbous bows, sponsors, anti-rolling devices, appendages etc.)

Modern ships (fast and planing ships, single hull and catamaran). Design of ship **propulsion systems**.

Sailing yacht experiments using a five-component balance.
Floating structures for sustainable energy production on the basis of solar, wind or wave energy.
We have our own model manufacturing workshop and a fully equipped electrical and electronic workshop.

Experimental and Computational Equipment to Support Model Tests in the Towing Tank

Determination of the Free Surface geometry around a towed ship model using Laser Technology.

Particle Induced Velocimetry (PIV) and multi-hole Pitot tubes to evaluate the Flow Field around a towed ship model.

Flow Visualization

Nominal Wake Measurement

Estimation of the Flow Field in model and physical scale using Potential Flow and CFD methods.

Optimization of hull form for improved performance in clam and rough waters

2. IN SITU & ON BOARD MEASUREMENTS

- During the last three decades the LSMH developed methods to carry out tests of large manned or radio-controlled models at sea. In both cases we monitor their performance via onboard equipment.
- To serve this activity we have special equipment to monitor the wind and wave prevailing in a sea region as well as the performance of the ship or the model in these conditions.
- Special measuring equipment on board of ships and floating structures to monitor the track and the dynamic responses provide data to modern data acquisition systems.
- Cooperation with other Labs of NTUA (Higher Geodesy, Harbor Works, Marine Engineering etc.)
- Chase boat to support the in situ tests
- Mobility of the activity. We have organized model tests in Austria and in France.

3. Computational Hydrodynamics (CFD)

Viscous Methods (N-S solution)

- Calculation of free surface past a ship with bulbous bow
- 2D sloshing in tanks
- Resistance and self-propulsion of ships and models

Potential Methods

- Boundary element method to compute the steady and unsteady propeller flow including ducted propellers (wake rollup)
- Unsteady propeller-hull interaction. Calculation of unsteady excitations at the stern
- Design and optimization of special propulsive device

4. MARINE ENVIRONMENT

- Wave propagation
- Wave-body interaction problems
- Hydro-acoustics
- Analysis of wave environment
- Data bases for marine environment
- Wave energy
- Stochastic modeling of environmental parameters
- Autonomous vehicles
- Atlases of wind and wave distributions