



**QUALIFY**  
LIGHTWEIGHT



**Enabling Qualification of Hybrid Structures for Lightweight and Safe Maritime Transport**

# ABOUT QUALIFY

## Enabling Qualification of Hybrid Structures for Lightweight and Safe Maritime Transport.

At present, there are no certification guidelines to orient the naval industry when certifying new designs using hybrid assemblies (adhesively bonded, composite to metal connections), which limits their application to secondary structures.

The Qualify project will produce these guidelines, based on the knowledge obtained from an extensive testing and simulation plan, which will help to understand the long-term behavior of hybrid-joints operating in demanding marine environments. This will ultimately enable the increased use of adhesively bonded hybrid structures in primary structures in shipbuilding, and will also generate spin-offs to other industries.

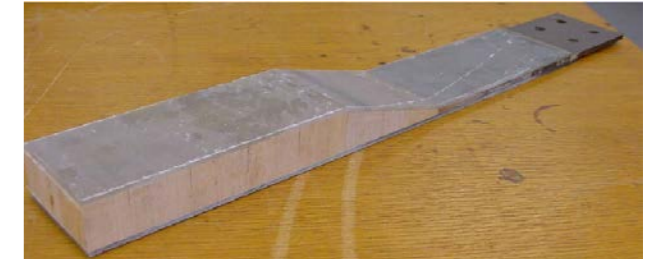
## EXPECTED OUTPUTS

- 1 Tests to assess the sensitivity to the environment of the adhesive material properties and the structural performance of the joint - at different scales;
- 2 Tailored equipment to evaluate the performance of the hybrid joint under combined loading and environmental conditions;
- 3 Accelerated tests type 1 = Rapid determination of basic fatigue properties for design purposes - at different scales;
- 4 Accelerated tests type 2 = Testing of corrosion assisted fatigue to evaluate components in a representative environment and at different scales;
- 5 Monitoring and inspection protocol;
- 6 Structural health and condition monitoring tests;
- 7 Guidelines for the qualification of adhesively bonded hybrid structures in primary structures for marine applications.

# WHY IS MARINE INFRASTRUCTURE INTERESTED IN HYBRID JOINTS?

The application of hybrid bonded structures, where steel parts are adhesively bonded to plastic or composite parts can reduce the top weight of naval ships. An overall structural weight reduction of 10% translates into a 1-7% decreased fuel consumption and a similar reduction of harmful emissions, significant cost savings. A lighter composite superstructure also improves the ship stability.

Adhesive joints are increasingly used in marine construction, as they also offer the possibility of joining dissimilar materials, together with advantages brought by the adhesive process itself, which is cost-effective and provides the ease of maintenance and repair.



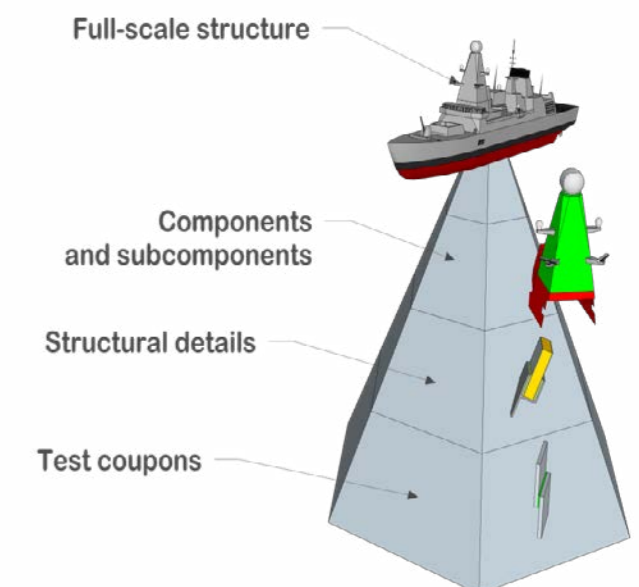
Adhesive bonding and lightweight materials have each gained widespread adoption in the aerospace and automotive industries, but adoption in the shipbuilding industry – particularly for manufacturers of large vessels such as freighters or naval ships – has lagged behind. The manufacturing processes in the aerospace and automotive industries are often conducted in controlled environments where dust and debris are uncommon and the temperature is regulated, whereas shipbuilding operations are often exposed to the open air, making the tight process control required for effective adhesive bonding more difficult. This difficulty contributes to general concerns regarding the reliability and fatigue life of an adhesive bond exposed to a harsh marine environment during its service lifetime.

## PROJECT OBJECTIVES

QUALIFY will remove the barriers that currently prevent the application of adhesively bonded structures in primary structures, through an innovative combination of tests and techniques.

The project will pursue the following three main objectives:

- ✓ Evaluate the long term structural performance of the adhesively bonded hybrid joint under representative operational and environmental conditions
- ✓ Develop a reliable inspection and maintenance methodology for adhesively bonded hybrid joints
- ✓ Develop guidelines for the qualification of adhesively bonded hybrid joints in primary structures in marine applications.



# CONSORTIUM

The Qualify consortium brings together a consortium of 11 EU partners, consisting of shipyards, class societies, academia and technology providers.



**BAE SYSTEMS**



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