

STEST Briefs the Industry: Part III

The Unique Challenges of the Maritime Environment Require a Specialised Testing and Verification Approach

Navies operate a wide range of platforms and systems, including warships, unmanned maritime vehicles, submarines, aircraft and shore-based systems. These platforms and systems operate under harsh environmental conditions, including humidity, salt fog, continuous vibration and fluctuating temperatures. Some of these conditions are specific to the maritime operating environment and therefore require specialised testing and verification. This four-part series has been prepared to explain how testing and verification activities should be conducted and to present STEST's capabilities in this field. The third instalment examines testing and verification processes for naval platforms.



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The climatic, EMI/EMC and mechanical testing of the THUNDERBOLT 40/70 T Twin-Barrel Naval Gun, developed by Ermaksan for naval platforms, is being conducted by STEST.

Environmental conditions specific to the maritime domain require naval platforms and shore-based systems to undergo a different testing and verification process. Salt fog and humidity are among the principal drivers of corrosion, particularly on naval platforms. Platforms and systems commissioned following testing and verification processes that fail to account for environmental conditions specific to the marine environment may encounter significant problems throughout their service lives.

Against this background, the reliability of systems used on naval platforms depends not only on design and manufacturing quality, but also on the testing and verification process. For these processes to be effective, they must be conducted by an independent organisation using accredited test facilities and in accordance with international standards.

Well-planned testing and verification processes add value to naval platforms by:

- controlling corrosion and other environmental effects;
- ensuring electromagnetic compatibility;
- minimising unwanted interactions between systems; and
- improving operational reliability.

STEST, an independent and accredited organisation, provides comprehensive testing and verification services for naval systems.

Testing Approach for Naval Systems

Testing activities for naval systems are generally addressed under two main categories:

1. Environmental testing
2. Electromagnetic compatibility (EMI/EMC) testing

Together, these two test domains verify both the physical durability and electromagnetic performance of systems.

Environmental Testing: Conditions Specific to the Marine Environment

Environmental test conditions for naval platforms are defined with due consideration to the platform's mission profile and the specific effects of the marine environment to which it is exposed. In the marine environment, systems may be exposed for extended periods to temperature extremes, humidity, salt fog, vibration, mechanical loads and other environmental effects. It is therefore essential that testing and verification processes assess the impact of these conditions on system durability and performance.

Under MIL-STD-810 and IEC 60945, systems are subjected to a range of environmental stress factors, including:

- high and low temperatures
- humidity
- salt fog
- machinery- and wave-induced vibration
- mechanical shock caused by impact and sea conditions
- rain and watertightness
- solar radiation

Salt fog testing is particularly important for naval platforms. Corrosion caused by salt exposure can adversely affect the long-term performance of materials and components. Verifying material selection, surface coatings and corrosion resistance is therefore a key part of the testing and validation process.

STEST conducts these tests using its advanced infrastructure, qualified team and established test procedures.

Intense Electromagnetic Interaction in a Confined Space

On naval platforms, radar systems, communications equipment, electronic warfare systems and navigation equipment operate together within the limited space available on the same platform. This makes electromagnetic compatibility a critical engineering requirement.

Electromagnetic compatibility testing is intended both to control electromagnetic emissions and to assess systems' immunity to external electromagnetic interference.

MIL-STD-461: Military Electromagnetic Compatibility Requirements

MIL-STD-461 defines EMI/EMC emission and susceptibility requirements for electronic and electrical equipment and subsystems intended for military applications.

The tests conducted under this standard include:

- CE: Conducted Emissions
- RE: Radiated Emissions
- CS: Conducted Susceptibility
- RS: Radiated Susceptibility

On naval platforms, controlling electromagnetic interactions is particularly important due to the concentration of radar and communications systems. These tests minimise interference between systems, helping to maintain mission continuity.

STEST has EMI/EMC test infrastructure that meets the requirements of the applicable standards.



IEC 60945: A Dedicated Standard for Maritime Systems

IEC 60945 specifies the general requirements, environmental and electromagnetic test methods, and required test results for maritime navigation and radiocommunication equipment and systems.

Under this standard, tests and criteria include:

- EMI/EMC testing specific to the marine environment
- climatic testing
- salt fog testing
- vibration and mechanical resistance testing

IEC 60945 is an important reference standard, particularly for navigation and radiocommunication equipment used aboard civilian and military vessels.

STEST conducts testing and verification processes for naval systems in accordance with the requirements of both MIL-STD-461, MIL-STD-810 and IEC 60945.

Test Infrastructure and Laboratory Requirements

The accuracy of tests for naval platforms is directly linked to the quality of the test infrastructure. Such tests therefore need to be conducted in:

- electromagnetically shielded environments;
- semi-anechoic or fully anechoic EMI/EMC test chambers;
- controlled salt fog and humidity chambers; and
- large-volume test facilities.

Large test chambers and advanced simulation infrastructure are particularly important when testing sizeable naval systems. STEST provides testing and verification services using infrastructure designed to meet these requirements.

The next instalment in the STEST series will examine testing and verification processes for air platforms. ♦



STEST can conduct tests addressing the environmental conditions encountered by systems aboard naval platforms.



STEST's infrastructure can accommodate the testing of large and heavy systems such as naval guns.

**TAM SAYFA
İLAN GELECEK**