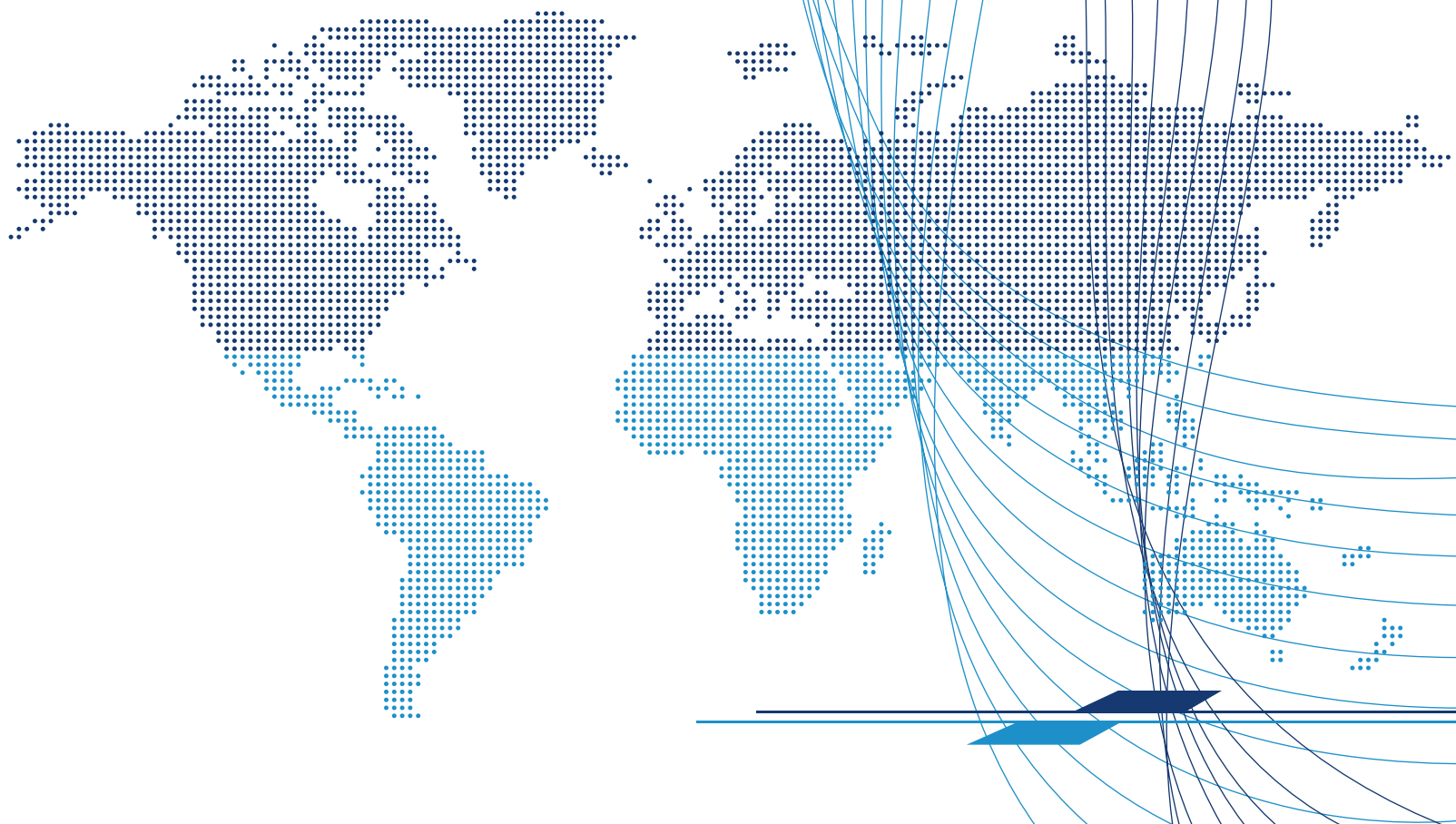
SAES

SAES SOLUTIONS

DEFENCE & SECURITY



electronica-submarina.com

SPECIALISTS IN UNDERWATER ACOUSTICS AND ELECTRONICS

ANTI-SUBMARINE WARFARE

MARINE SECURITY & ENVIRONMENTAL PROTECTION

SYSTEMS FOR SUBMARINES AND SURFACE SHIPS

SONARS
ACOUSTIC CLASSIFICATION
OWN NOISE MONITORING SYSTEM
SONAR PERFORMANCE PREDICTION SYSTEM

UNDERWATER SIGNATURE MEASUREMENT

ENGINEERING & TRAINING SERVICES

NAVAL MINES

MINEA – MULTI-INFLUENCE NAVAL MINES
MILA – LIMPET NAVAL MINE

TRAINING & SIMULATION

SAES

High Technical Qualification

Own Technical Capability

Specialists in Underwater Electronics

SAESSOLUTIONS

DEFENCE & SECURITY

WELCOME

SAES is a Spanish company specialized in submarine electronic equipment and systems for undersea security and defence that provides advanced solutions technologically adapted to the need of clients and offers security services in the civil and military fields.

SAES offices and electronic workshop are located in Cartagena and Cádiz, where the Spanish Navy has its main facilities and schools related to Submarine, Mines Warfare and Antisubmarine Warfare.

Our engineers are highly skilled and experienced in electronics, acoustics, design, software and hardware development, methodologies, quality and operational requirements on underwater based needs.

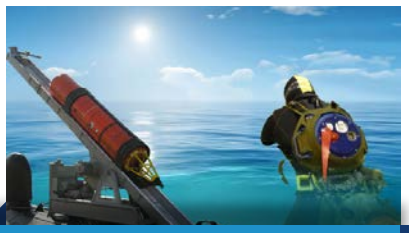
SAES, founded in 1989, is classified as a strategic national company being NAVANTIA, INDRA and THALES their shareholders.

SAESSOLUTIONS

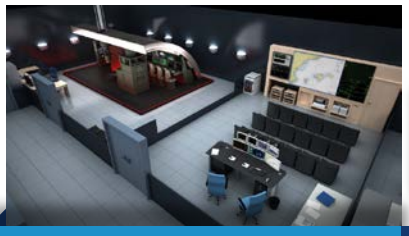
CONTENTS

From our engineering and manufacturing facilities, we have successfully developed and integrated solutions tailored to the governments needs.

Cost effectiveness, reliability, modularity and open architecture defines our systems, which are in-service around the world.



UNDERWATER SOLUTIONS

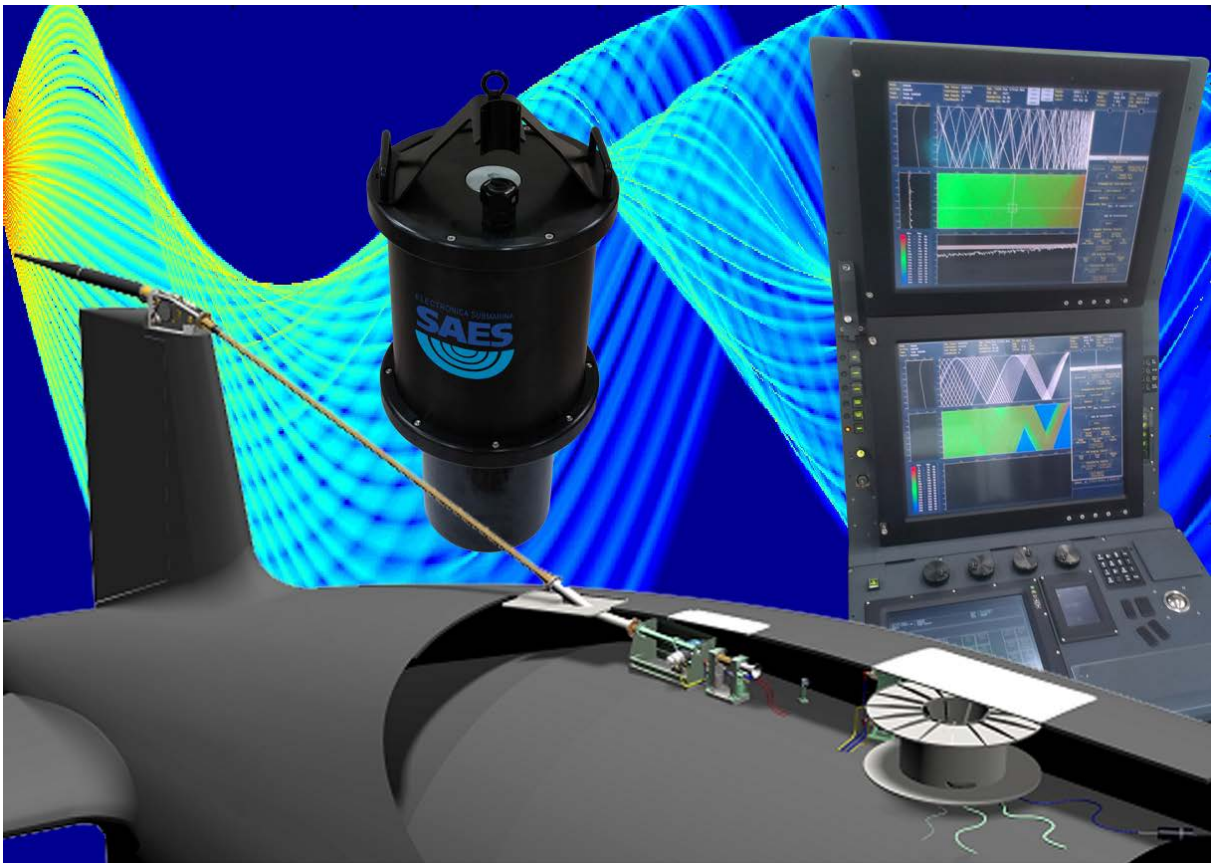


SAESSOLUTIONS

SAES is specialized in the area of acoustic underwater processing, and develops the most advanced technology for security and defence in the underwater environment.

Our sonar systems and onboard equipment offer high reliability, easy operation and low maintenance cost.

"We are expert in underwater signal processing"



SOCILSUB - Cylindrical Sonar Upgrading

SOLARSUB RDTAS & TAHS - Reelable Towed Array Sonar & Handling System

DDS-03 - Intruder Detection Sonar

SICLA - Acoustic Classification System

SEAPROF - Undersea Acoustic Performance Prediction System

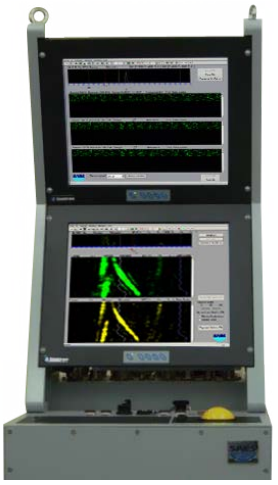
ONMS & CRV - Own Noise Monitoring Systems

SVB - Battery Monitoring System

Underwater Acoustic Generator System

SONAR & ONBOARD SYSTEMS

SOCILSUB
The cost-effective solution against the obsolescence.



SOCILSUB is a passive Cylindrical Array Sonar (CAS) based on the more powerful electronics today, allowing the incorporation of new and advanced signal processing algorithms to improve the sonar directivity, detection range and audio quality. Keeping the same cylindrical array in the bow of the submarine, will save money and minimizes the complexity of system installation on board.

SOCILSUB can be integrated in any Combat System.

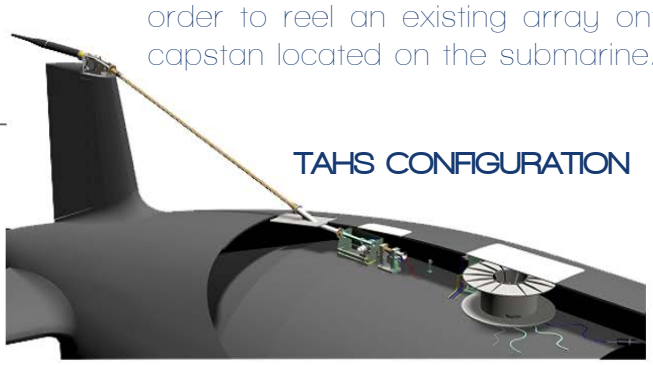
SOLARSUB RDTAS & TAHS
Reelable Digital Towed Array Sonar

SOLARSUB RDTAS is a high performance sonar which provides a greater detection range and able to integrate with the rest of the combat system sonars, being easy to install on board.

- 360 º surveillance area including surface and submarine stern.
- Broadband and Narrowband processing: LOFAR, DEMON, Threat Analysis and Multi LOFAR.
- COTS modularity, small footprint and low power consumption.
- Long range detection.
- Multiple track capability.
- Preclassication aids.
- Transients detections.
- Antijamming.
- Interceptions.
- Audio & Recording.

Towed Array Handling System (TAHS) can be provided both together with the **SOLARSUB RDTAS** or independently in order to reel an existing array onto a capstan located on the submarine.

TAHS CONFIGURATION

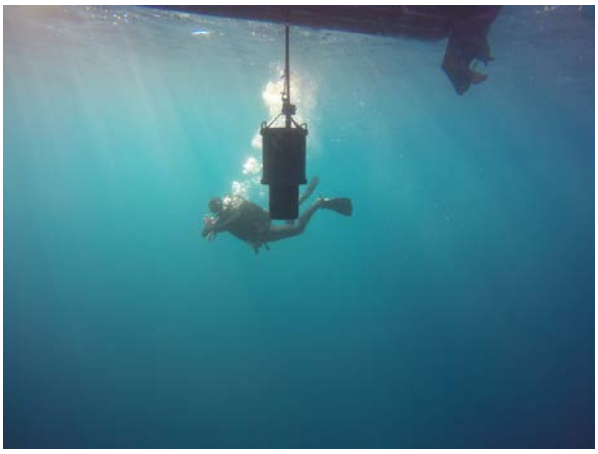


CLIP-ON CONFIGURATION

SAES SOLUTIONS

DDS-03
Intruder Detection System

DDS-03 is a high frequency active sonar specifically designed to protect harbours, anchored vessels and critical infrastructures against underwater threats as divers and underwater vehicles.



DDS-03 sonar has been verified and validated successfully in a wide variety of operational environments: deployment from harbour piers and from anchored vessels, presence of open and closed circuit divers, presence of swimmers, exposure to the tidal effect, etc.

DDS-03 can be integrate with any surveillance system.

More information on page 24.

OPTIONAL FEATURES:

Wireless deployment.
Integrated Training.
Acoustic Performance Prediction.

SICLA
Acoustic Classification System

The acoustic classification capability onboard submarines, surface ships and ASW platforms is one of the most important complementary functions for contact management. SICLA is designed to provide a real time advantage on board.

SICLA is a highly versatile system that can be adapted to any hardware and software configuration. It can be integrated into any Combat system, pc or laptop, and connected to any acoustic device such as sonars, sonobuoys and recorders.

SICLA is a powerful tool that allows the operator to obtain the target classification and identification in a fast and precise way by means of the multiple and simultaneous contact analysis, intuitive graphic tools and the management of an acoustic intelligence database - ACINT.

SICLA can work in 'stand alone' way or installed in a Mission Center.

SEAPROF
Undersea Acoustic Performance Prediction System

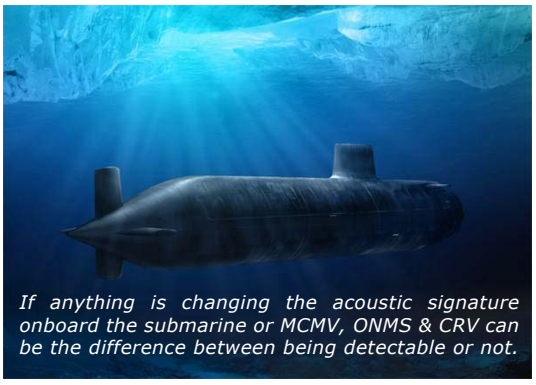
SEAPROF is a complete sonar performance and prediction system that uses internationally validated propagation models and global databases, which allow the evaluation of any sonar in any underwater environment (ray tracing, propagation losses, sonar Figure of Merit - FOM, detection and counter-detection probabilities and ranges).

SEAPROF Performances

Propagation models for low and high frequencies validated by NURC.
Reverberation calculations for active sonar.
Global bathymetry database.
Global Sound Velocity Profile (SVP) database.
SVP, platforms and sonar manual databases.
Ambient Noise based on sea state and ship traffic.
Complete and friendly tools to configure environment and sonar settings.
Transmission Loss.
Probability of detection by the sonar through 2D and 3D computations and analysis.
Stand-alone or integrated with a combat system.

ONMS & CRV
Own Noise Monitoring Systems

ONMS measures vibration and noise of the platform, using accelerometers and hydrophones sensors, strategically distributed, to monitor noise sources.



If anything is changing the acoustic signature onboard the submarine or MCMV, ONMS & CRV can be the difference between being detectable or not.

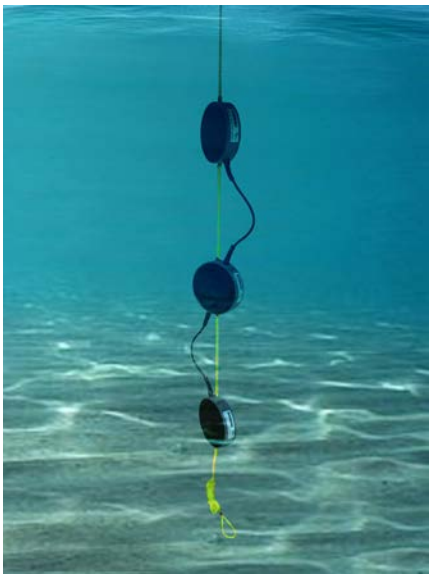
ONMS Performances

Adaptable to any type of Submarines or Surface Ships (CRV version).
Automatic Alarms when noise or vibration levels exceed a set threshold, providing data to cancel the own noise in sonars.
Easy integration with the Combat System.
Small footprint and easy installation into the platform.
Scalable system.
Successfully tested against shock and vibrations, EMC and environmental standard test.

SAESSOLUTIONS

Underwater Acoustic Generator System

An auxiliary system to sea testing of sonars as well as to hydrophone calibration.

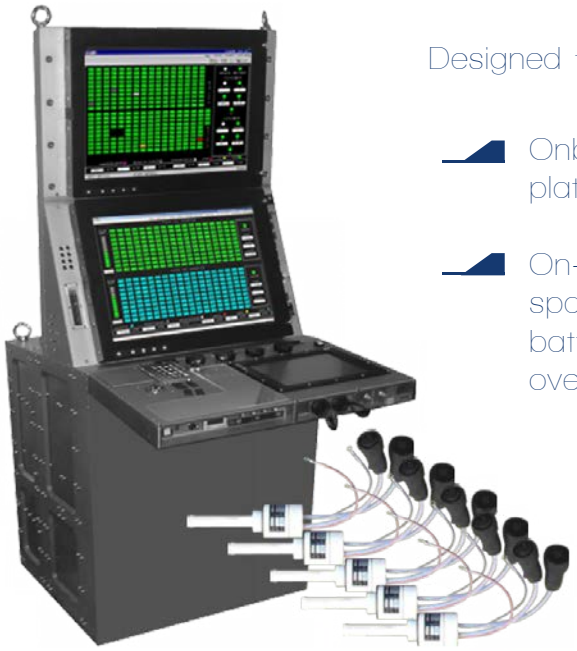


- Broad Band (BB) & Narrow Band (NB).
- Transmission CW and FM pulses.
- DEMON (NB).
- Programmable in real time.
- Transponder.
- Pre-established codes for coordination of functions during tests.

SVB Battery Monitoring System

SVB is a monitoring and surveilllance system for batteries of submarines, which provides real time information concerning to battery status and operational parameters: charge level, H2 level, global voltage and current and evolution predictions.

By monitoring the functional parameters of battery, the battery life increases.



Designed for lead-acid batteries, SVB can be installed:

- Onboard submarines, integrated with the platform control system or stand-alone.
- On-ground for maintenance, to be used on spare batteries, activation of new ones, and battery maintenance during submarines overhaul.

UNDERWATER SIGNATURES MEASUREMENT

Environmental Pollution
Maps of acoustic, electric and magnetic underwater influences in offshore structures.

SAES leads underwater monitoring researching projects for studying the noise emitted to sea

MIRS - Multi-Influence Range System

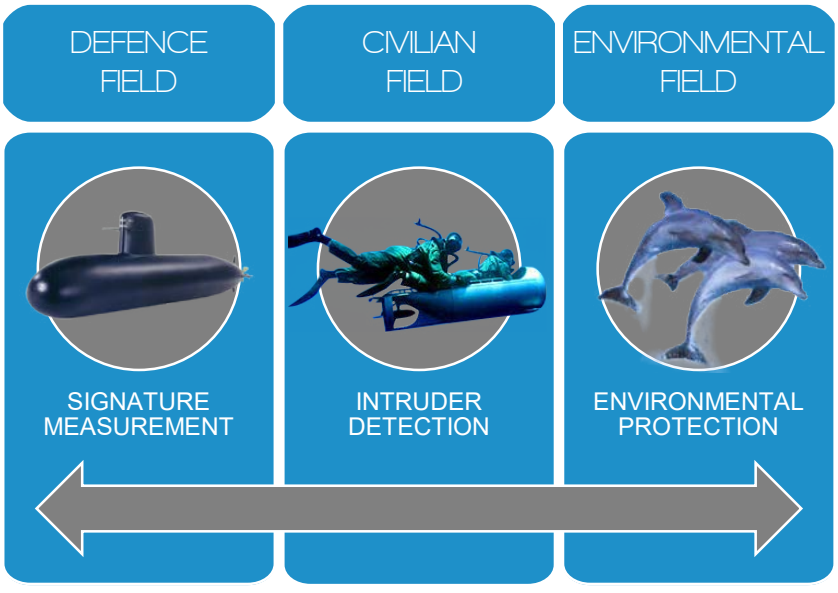
SET 200/P - Underwater Electric Potential Sensor

SWAMEG - Sea Water Magneto-Electric Generator

DEWARS - Deep Water Acoustic Range System

ACINT & SIGINT - Acoustic & Signature Intelligence

UNDERWATER SIGNATURES MEASUREMENT

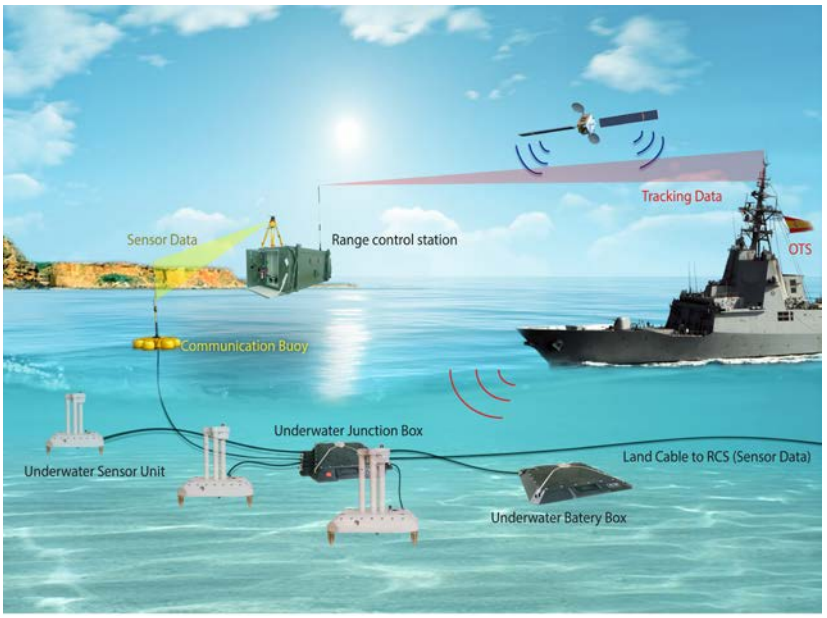


The use of the most advanced multi-influence processing techniques allows the development of the last generation systems in the segments of activity in which SAES operates.

SAESSOLUTIONS

MIRS
Multi-influence Range System for surface ships and submarines

"Are you safe from new Multi-influence Naval Mines?
MIRS can help you."



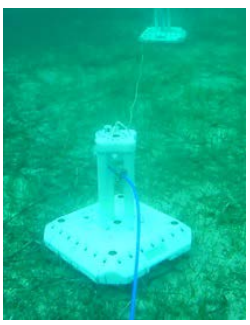
MIRS provides real influence measures (magnetic, electric, pressure, acoustic, and seismic) in a real and controlled scenario, to successfully counteract related threats.

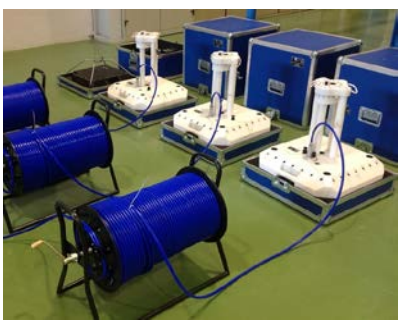
MIRS is also a tool for testing and calibration of systems developed to reduce those influences as degaussing systems, ASG, etc. and MCM systems as mine sweeping.

Portable station. Maximum precision anywhere.

It can be used in any scenario and with multiple objectives: for obtaining the vessel's signature in a real scenario, used on a fixed station, as a discreet way of obtaining intelligence in strategic areas, routine signature checks or prior to a mission...

MIRS is a high performance and precision system which, thanks to its light weight and low consumption, is easily deployable by two people from a rubber neumatic boat and installed at the desired location





UNDERWATER SIGNATURES MEASUREMENT

SET-200/P
Underwater Electric Potential Sensor

SAES UEP SENSOR is a precise and ultra-low noise device that enables measurement of low-level Underwater Electric Fields.

MIRS incorporates SET-200/P as UEP sensor.

SWAMEG
Sea Water Magneto-Electric Generator

SWAMEG generates magnetic and electrical signatures of known levels, facilitating the maintenance and calibration of measuring stations.

SAESSOLUTIONS

More than 30 Years of Innovation and Quality

AENOR ER Empresa Registrada ER-0402/1999

CERTIFIED I.Net MANAGEMENT SYSTEM

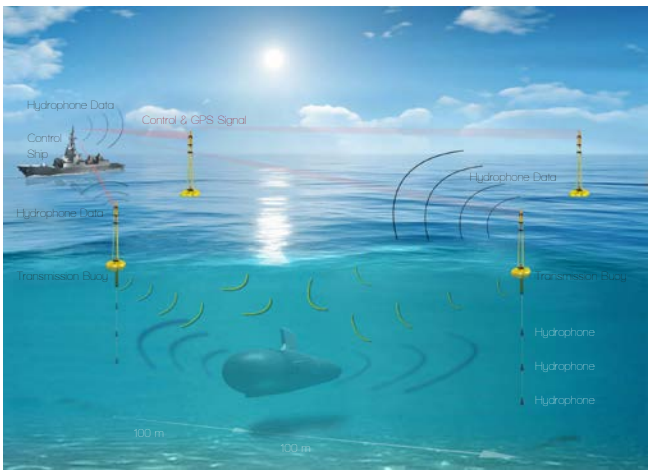
PECAL 2110 PECAL 2210

I.A.Q.G. UNE-EN 9100

SAES

UNDERWATER SIGNATURES MEASUREMENT

DEWARS
Deep Water Acoustic Range System



DEWARS provides Noise levels and Spectrum levels measures in a real and controlled scenario of Surface Vessels and Submarines (including on periscope, snorkeling or in immersion).

These measures let to:

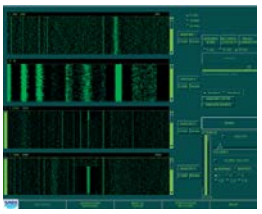
Establishing noise levels of the ship in different operational conditions, such as patrol speed, ultra quite speed and inception speed. In the case of submarines with different machinery speeds and depths.

Establishing the status of the vessel within its class.

Developing and validating studies for signature reduction and mathematical influence propagation models.

Provide a Signature Database to record and retrieve recorded information:
- Ship characteristics and metadata
- Broadband noise analysis
- Narrowband noise analysis

ACINT & SIGINT



SAES is specialized in Acoustic Intelligence and Signature Intelligence. ACINT allow the identification and classification of vessels at a long range by acoustic signal analysis. Our developments includes the most advanced techniques to Broadband, Narrowband, DEMON, LOFAR and Transient analysis, maximizing the information obtained from raw data.

The **SIGINT** great advantage in the face of ACINT (Acoustic Intelligence) is that it allows the classification of a contact more accurately and in any situation and operating environment. Due to the greater amount of information managed, SIGINT is more robust against signature reduction techniques.

Modeling and Prediction of Multi-influence Signatures

Defence Field	**Own Units protection.** Task and studies to reduce own signature to decrease probability of being detected. **Threats Detection.** Multi-influence data permit to characterize the vessel signature, increasing the detection capability.
Civilian Field	Marine environment preservation. To detect hostile intruders and protect critical facilities.

SAESSOLUTIONS

ASW systems based on sonobuoys for MPA, Helicopter and Surface Vessels.

More than 30 years of experience have positioned our company at the forefront of ASW systems installed on any platform.

SPAS - Sonobuoy Acoustic Processing System
ROASW - Remote Operation ASW System

ANTI-SUBMARINE WARFARE

SAES ASW developments meet the new requirements of the ASW missions.

Collaboration in a Network Centric Warfare (NCW) allowing to share tactical and intelligence information between the resources deployed in the ASW mission.

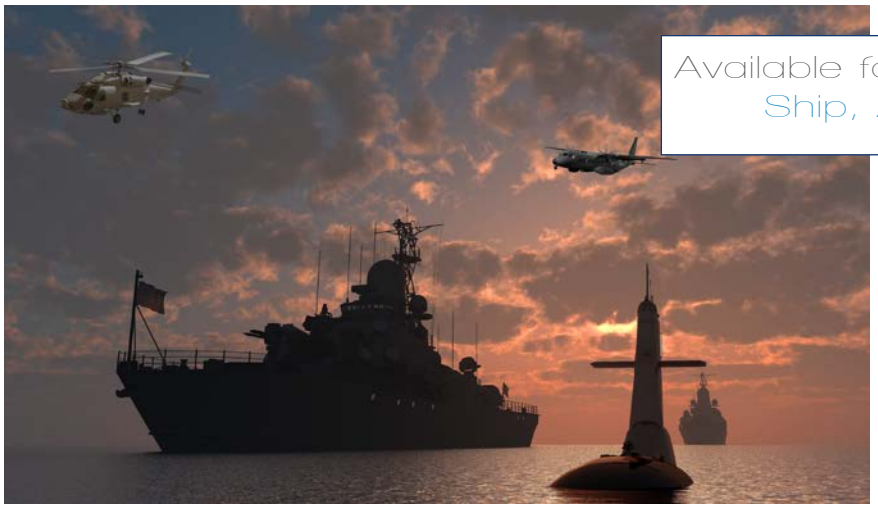
Smaller and faster combatant ships to preserve areas near the coast.

Use of both manned/unmanned air vehicles.

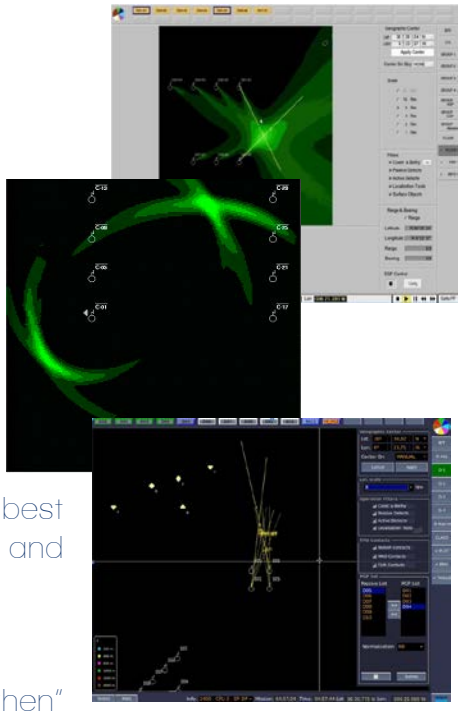
State of the art in acoustic analysis and new digital sonobuoys to increase the effectiveness of the ASW system.

SPAS
Sonobuoy Acoustic Processing System

Acoustic sonobuoy processor for detecting, locating and tracking underwater threats from aerial platforms. It incorporates the most advanced processing techniques for all types of passive and active sonobuoys, implemented analogically and digitally.

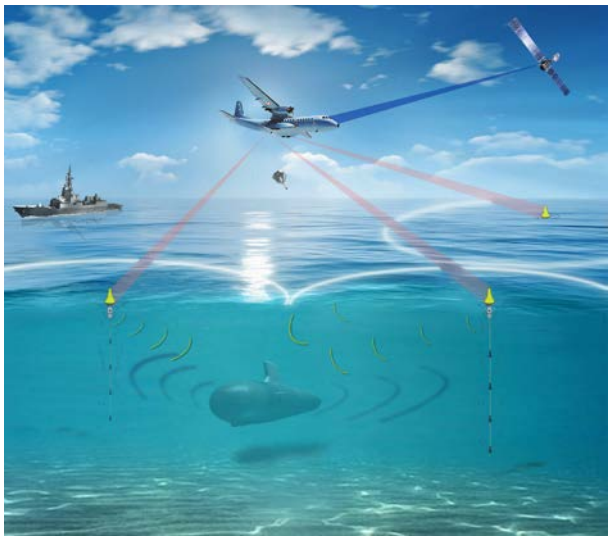


Available for any ASW platforms: Ship, Aircraft and Helicopter.



Main Features

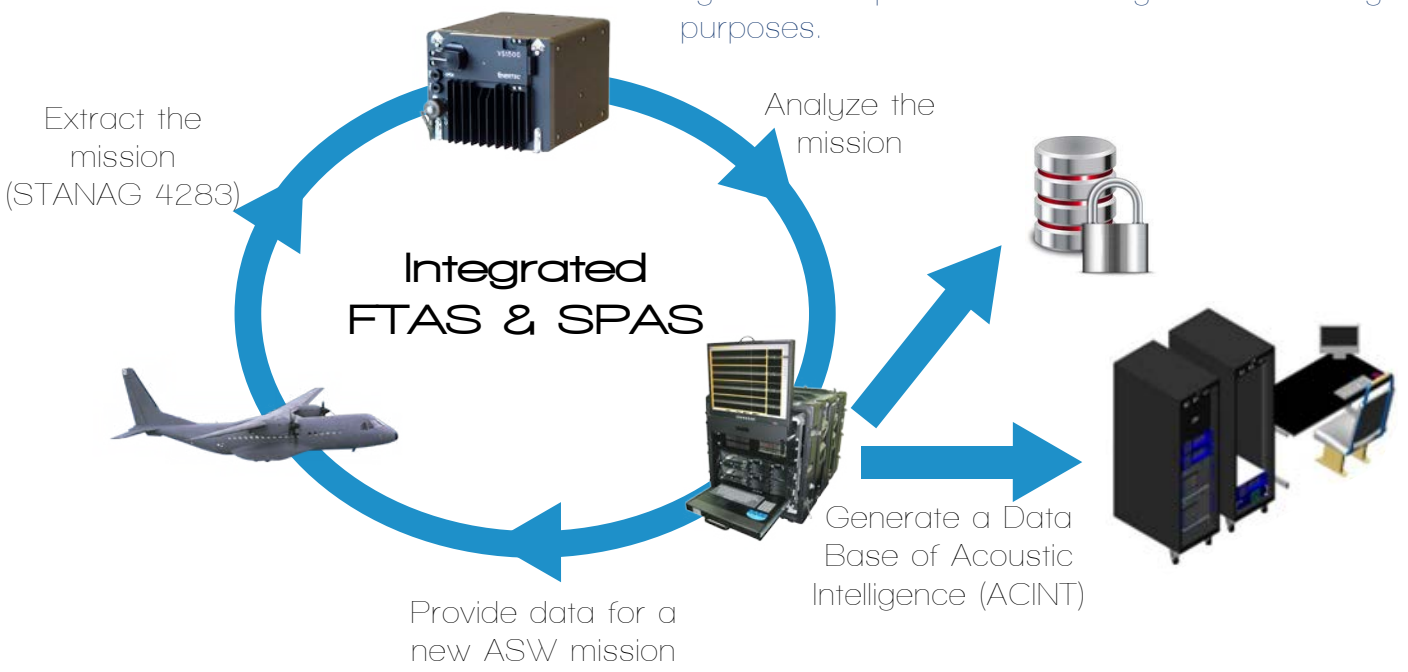
Performance Prediction System to calculate the best configuration for launching sonobuoys: Ray Tracing, MDR and PDR.
Analysis tools as NB, BB, Transient, Demon, Swath, etc.
Integrated Classification system – ACINT Database included.
Automatic Alerts in order to warn to the acoustic operator "when" and "where" the threats have been detected.
Tactical plots to show the position of the threats as well as their evolution: ACF, CPA, HCPA, DopCPA, TMA, Energy Plot and **Multistatic.**
Open architecture able to be integrated with any TMS (Tactical Mission System).



SAES delivers a **complete ASW solution system**; SPAS is integrated with other equipments as a Digital Recorder (DR), Digital Sonobuoy Receiver (SDSR), Preamplifier/s, V/UHF Transceiver, Directional Finder, Data Link, Sonobuoy Launcher, etc... conforming a complete Sonobuoy Processing Acoustic System.

SPAS
Ground Support Equipment

As support for on-board SPAS acoustic processors, SAES provide ground support systems for post-mission analysis and training purposes.



FTAS
Fast Time Analyzer System

Fast Time Analyzer System (FTAS) allows to analyze the acoustic and tactical data (STANAG 4283 Ed. 5) recorded during the ASW Mission.

TAT
Tactical Acoustic Training

Tactical Acoustic Training (TAT) System for training and coaching of Acoustic Operators.

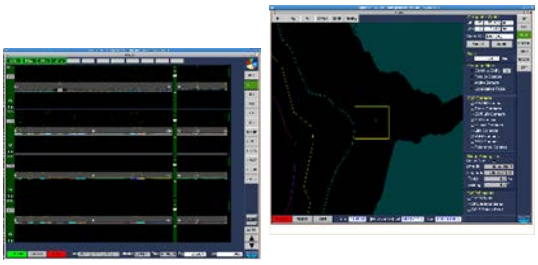
SAESSOLUTIONS

ROASW
Remote Operation ASW System
Antisubmarine warfare solution

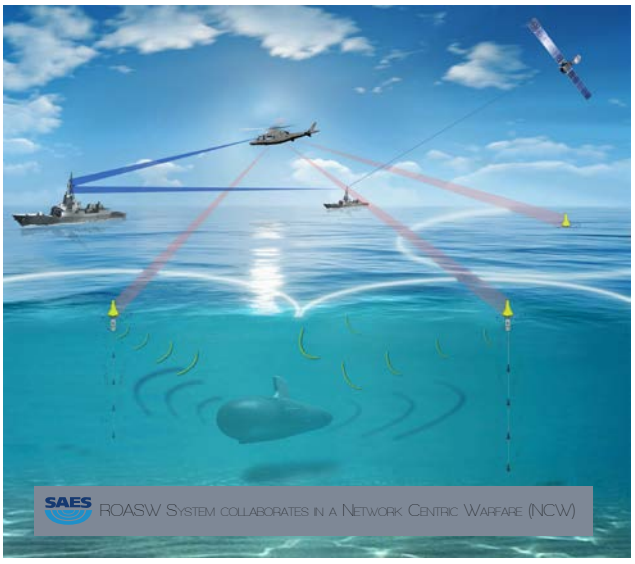
ROASW, the most modern and advance ASW system based on sonobuoys in the world, covers the main requirements of the new ASW missions.

ROASW small footprint, less weight and low maintenance (LRU approach) allow installation in small combats ships like OPV, FAC or Patrols.

ROASW is a two Segment System.
ROASW-AS (Airborne Segment) is a distant and elevated platform for sensors and provides remote operated ASW capabilities.

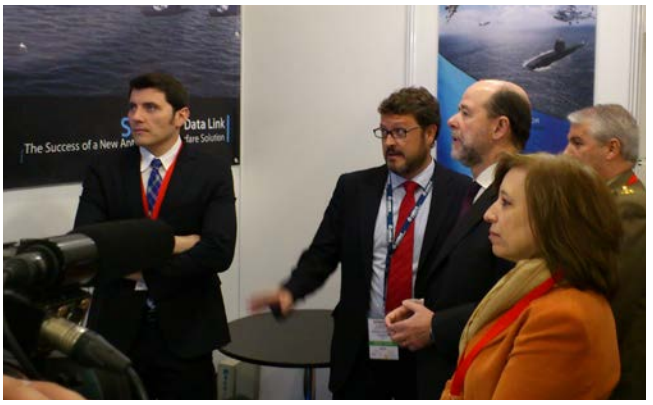


ROASW-SS (Surface Segment) controls and monitors ROASW-AS operation from the Surface Segment. Through the data link (STANAG 7085 compliance), acoustic and non-acoustic sensors (RADAR & FLIR) and tactical data are downlinked and interchanged with other Surface Segments through either a Line Of Sight (LOS) or through Satellite (SATCOM).



ROASW is a powerful and advanced acoustic processor for detecting, locating and tracking submarine threats from combat ships using sonobuoys. It provides multistatic processing and interoperability between the different ASW platforms: corvettes, frigates, helicopters, MPA aircraft.

ROASW permits a wider area of coverage on a typical ASW mission.



The core of the ROASW system is based on a powerful engine of acoustic analysis, underwater detection and classification tools as well as a KU band communications LOS system and satellite.

The **Naval Mines** are a strategic weapon par excellence, apart from being one of the Naval Weapons of greater efficiency for their ability to deny the naval space only with the knowledge that a country owns them.

Combining a wide variety of sensors and sophisticated processing algorithms, we have developed a polyvalent set of **Naval Mines** which are the state of the art in the contemporary naval warfare scenario. Also the **Multi-influence Range Systems** for measurement and analysis of signatures of surface ships and submarines, provides the Navies with necessary knowledge for to be applied in mine warfare.

MINEA - Multi-influence Naval Mines:
Moored Deep Water Mine
Conical Shape Shallow Water Mine
Cylindrical Bottom Mine
MILA - Limpet Naval Mine for Special Forces
MIRS - Multi-Influence Range System for Surface Ships and Submarines
SET-200/P - Underwater Electric Potential Sensor
Underwater Fixing System
Systems for Minehunting

MINE WARFARE

MINEA

MINEA naval mines are the most advanced smart marine mines manufactured today. They are intended for training minesweeper crews. Knowing how an advanced smart mine works is essential to the safety of the vessel. Each mine is equipped with:

- Triaxial magnetic sensor.
- Triaxial electric sensor, UEP and ELFE.
- Acoustic sensor.
- Triaxial seismic sensor (except moored mine)
- Pressure sensor
- Counter-detection mechanisms.
- The advanced algorithms implemented in the mine are capable of interrelating the various signals of influence.

MINEA Exercise version is available to be used for MCM training and to gather intelligence information through the measuring and recording of ship signatures.

MOORED MINE

SHALLOW WATER MINE

CYLINDRICAL BOTTOM MINE

MILA

MILA is a limpet-type underwater mine that incorporates a computer-controlled detonation system. It is used by combat divers in covert underwater operations to neutralize threats or for underwater cargo demolition.

Its dimensions and light weight enable easy transport and deployment. The low hydrodynamic resistance allows it to be used in longer distance operations and a single diver can carry two units.

MINEA & MILA mines has been successfully tested against environmental test and performed extensive sea trials.

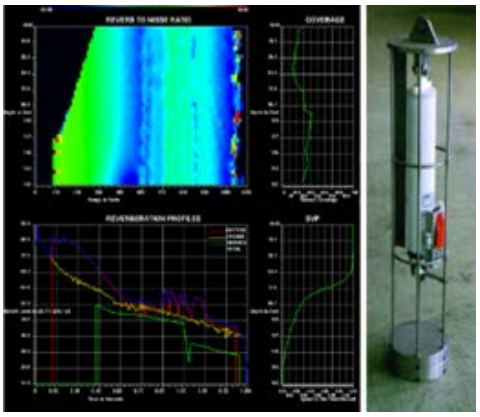
Nail shooter is an underwater tool used to fix MILA into a non-magnetic surfaces.

SYSTEMS FOR MINEHUNTING. The high specialization and experience in underwater acoustics allows us to offer systems and technological support for the construction or upgrade of Minehunters.

CRV
Vibration and Noise Monitoring System

CRV is a system to monitor in real time the hull vibrations and other sound sources of ship (machinery, thrusters, cavitation of propellers, etc.) etc. Designed to be used in surface ships, CRV is installed in the last generation of Minehunters.

CRV gives the alarm
when changes the silence condition.



PCS
Sonar Performances Prediction System

The PCS system, based on SEAPROF system validated by NURC (NATO Undersea Research Centre), performs predictions of range, probability of detection, feature width and depth recommended for deployed VDS sonar, based on environmental conditions, seabed features and sonar and target parameters.

Mine Hunting Training System

SAES developed and integrated Sonars and ROV simulators for Mine Hunter Training System of the Spanish Navy, providing integration and interfacing with the Combat System of the ship in a simulated environment.

SAESSOLUTIONS

ATS
Acoustic Tracking System

Integration, supply and maintenance of the acoustic positioning and tracking systems on VDS Sonar and ROV units.

Launching System of Minesniper® Vehicle

SAES has designed and manufactured a launching system for Minesniper.

ROVs Installation and Integration

Our company was responsible for incorporating Pluto Plus ROV vehicles for the Spanish Navy Minehunters. The complete ROV assembly, installation, integration, setting to work, and maintenance was conducted by SAES.

TECHNOLOGIES FOR SECURITY AND DEFENCE

SAES

Specialists in Underwater Electronics

MARITIME SECURITY

CRITICAL INFRASTRUCTURE SECURITY AND ENVIRONMENTAL PROTECTION

Ports, power plants and offshore petrochemical complexes are particularly vulnerable to underwater threats.

Evaluating the noise produced by ships, offshore wind farms, oil and gas platforms, fish farms and other marine facilities will be mandatory to comply with environmental regulation.

SAES provides solutions for underwater security of critical infrastructures and underwater noise measurement.

Underwater Protection

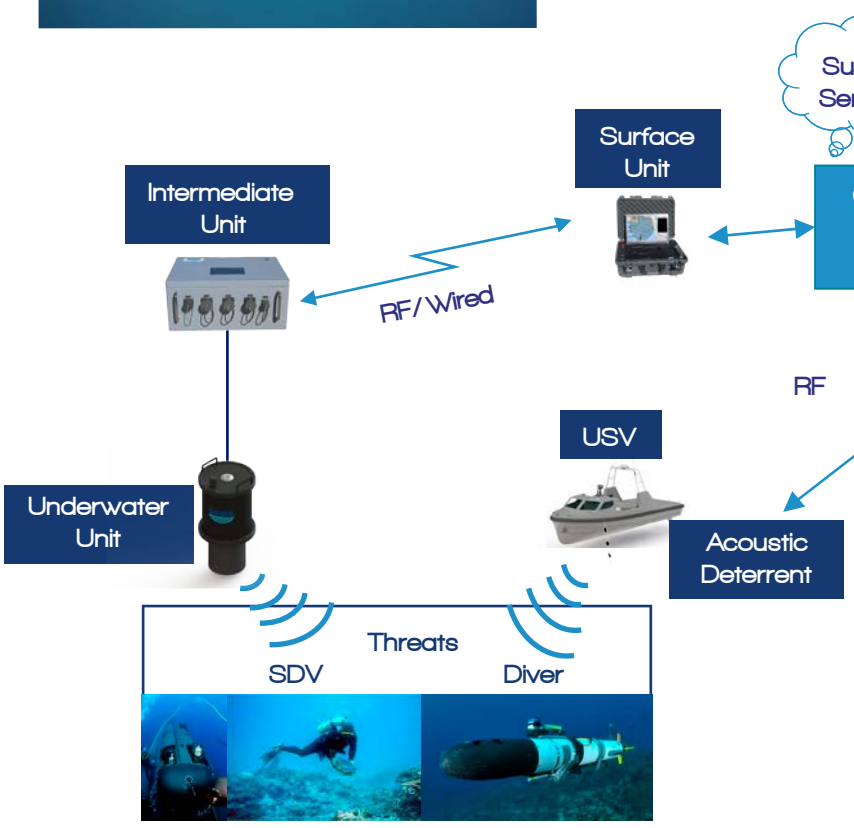
Are you really safe from underwater threats?

SIMOAC - Acoustic Monitoring System to surveillance and underwater environmental protection
DDS-03 - Intruder Detection Sonar
SDH - Smart Digital Hydrophone
DES - Underwater Deterrent System

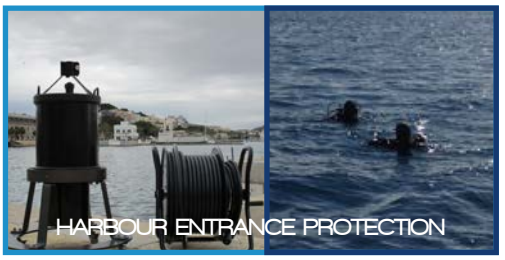
MARITIME SECURITY

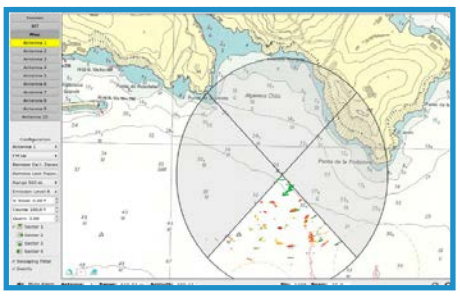
DDS-03
Intruder Detection System

DDS-03 is a high frequency active sonar specifically designed to protect harbours, anchored vessels and critical infrastructures against underwater threats.
DDS-03 can be integrate with any surveillance system.



Three Operation Modes





Wireless Optional

DES
Underwater Deterrent System

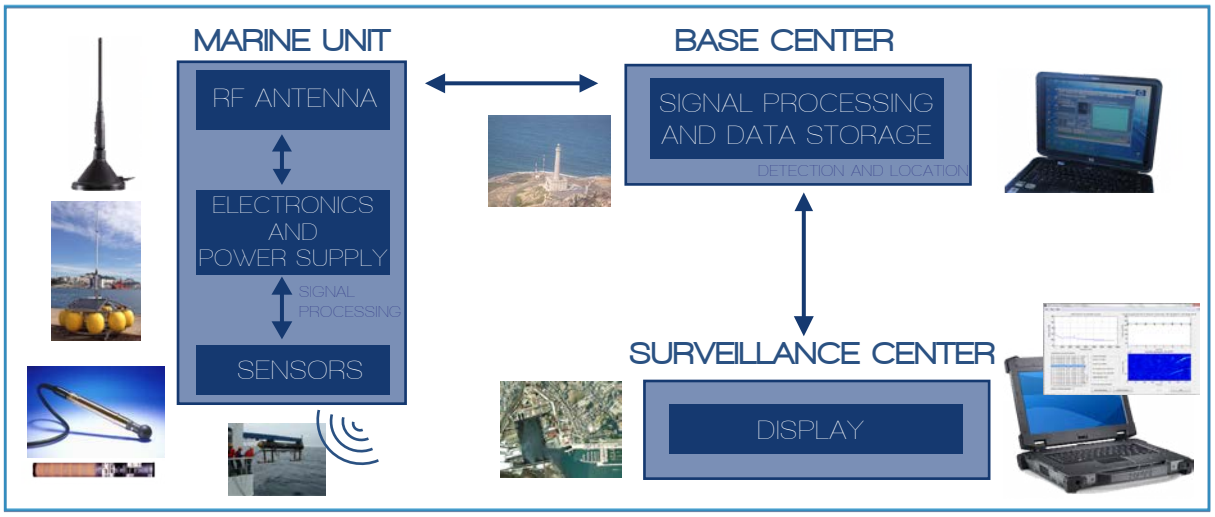
The DES system emits messages or sounds into the water to dissuade the diver from continuing his approach. These messages can be live, from a microphone in the system, or pre-recorded.

SAESSOLUTIONS

SIMOAC
Acoustic Monitoring System

Environmental protection configures nowadays as one of the areas of highest interest worldwide.

- The system is based on calibrated acoustic sensors, which permit to measure and analyze the underwater acoustic environment as well as to detect and localize the presence of marine mammals in a specific area.
- SIMOAC is the perfect tool to perform Acoustic Environmental Impact Studies.
- Versatile system, completely respectful with the environment and powered by renewable energy.
- Based on marine nodes with capability of
  - _Including additional sensors
  - _Unwired communication with a base center on shore
  - _Automatic processing of the signals
  - _Communication data via internet to specific surveillance centers



SDH
Smart Digital Hydrophone

SDH is an autonomous and smart hydrophone for underwater acoustic recordings over long periods of time. It is appropriate for several scientific and technological purposes.

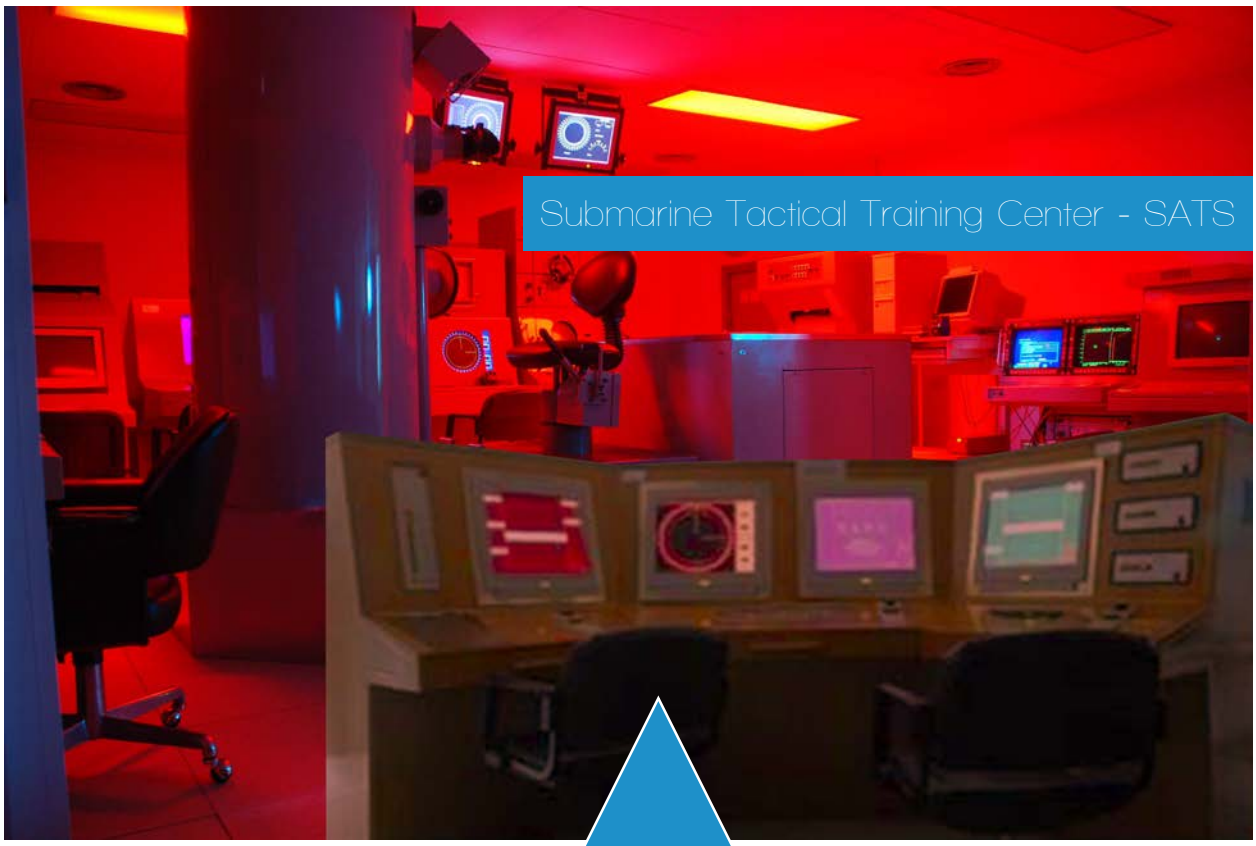
- Battery or external power supply
- Recording of descriptor 11
- Deep waters
- Data processing: SLP, SEL, DEMON, transient
- Programmable and easy to operate

Simulation and Training of system components, Interface Simulators, Sonar Simulators, Combat System Simulators, Tactical Simulators and Naval Warfare Simulators. Real Time Simulation.

Sonar Stimulation and Scenarios modelling.

Development, Integration and Validation of Systems and Equipment. Our software stimulators emulate acoustic signals and may be used as part of a training or for the testing processing chains.

Engineering Development Models Modelling. Mathematical Models. Scenario modelling. SAES develops these solutions which are fully adapted to customer requirements



Submarine Tactical Training Center - SATS

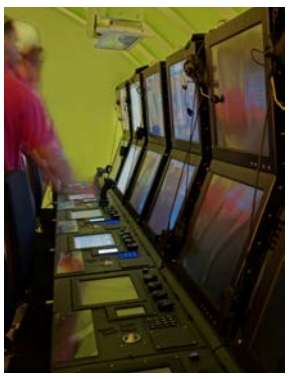
Submarine tactical Simulator SIMTAC - S80

Submarine Tactical Simulator.
Naval Warfare Simulator.
ASW Tactical Acoustic Trainer.
MCM Training System.
SEAPROF - Underwater Acoustic Performance Prediction Model.
SIM/STIM - Sonars Simulator & Stimulator.
EDM - Environmental Development Model.

SIMULATION & TRAINING

Submarine Tactical Simulators

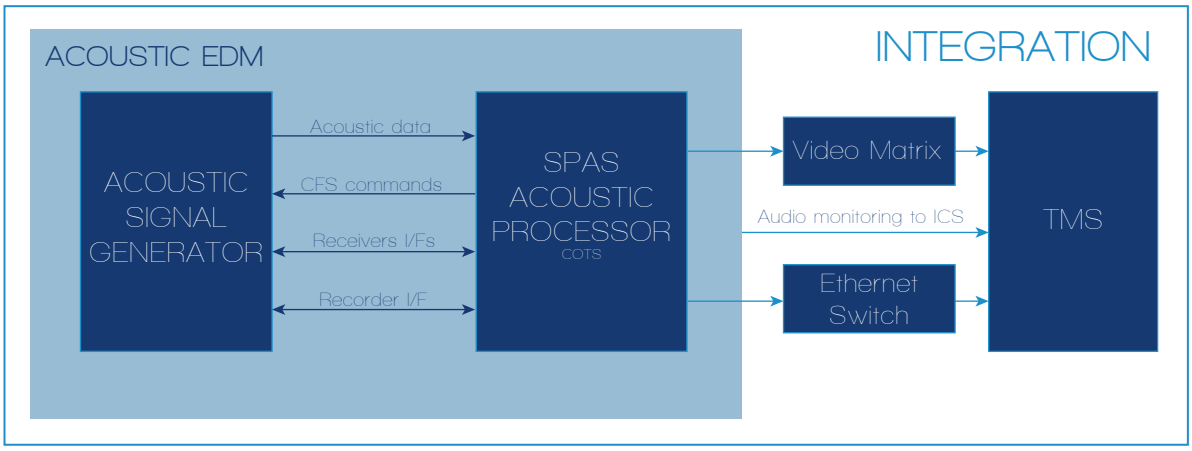
Among the most important SAES developments should be noted two tactical simulators developed for the Spanish Navy: the SATS, for S-70 submarines, and the SIMTAC for the new S-80 submarines.
SIMTAC S-80 has been developed in collaboration with Navantia and Indra.



The wide and contrasted experience of SAES in acoustics and underwater technologies and simulation, allows us to offer our customers solutions faithfully adapted to their needs and requirements. We know that underwater there are no second chances and that training in simulated conditions should not seem so. Based on the premises of the highest quality at the lowest cost, the result is a simulator that realistically reproduces the scenarios, teams, aspects and sensations that a submarine crew would have in a real situation.

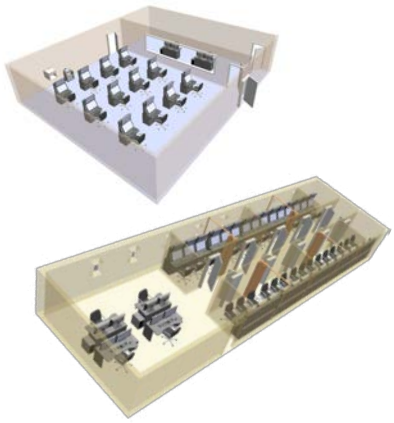
SPAS EDM
Engineering Development Model for Sonobuoy Acoustic Processing System

The SPAS EDM is an emulator/simulator/stimulator of the complete SPAS Acoustic Subsystem, allowing the integration in ground with the Platform Mission System, facilitating the integration phase and, consequently, diminishing risks. Additionally, the SPAS EDM system is a powerful tool for training acoustic operators.



SIM/STIM
Submarine Sonar Suit Simulator & Stimulator

SIM/STIM is a system which is able to synthetically generate the same signal that a real sonar would receive.
SIM/STIM for Sonar Integration. Reduce risk in all phase of the program and accelerate the works.
SIM/STIM for Simulation. A powerful real time sonar simulator. Stan-alone or integrated into naval tactical simulator.
Based on COTS elements.



SIM/STIM produces the signal to stimulate the processing of the following types of sonar

- Cilindrycal Sonar
- Passive Ranging Sonar
- Flank Array Sonar
- Acoustic Intercept
- Mine Detection and Obstacle Avoidance Sonar
- Towed Array Sonar
- Own Noise Monitoring System

SAES SOLUTIONS

ENGINEERING & SERVICES

SAES offers its customers a complete line of technical and engineering services on underwater technology area and ASW, from design phases up to training of personnel.

These services are offered to companies, Ministries of Defence and system integrators, either from our facility or at the customer's facilities with the highest degree of confidentiality.

Engineering Services
Maintenance and Customer Support
Test & Validation systems
Education & Training

ENGINEERING & SERVICES

"30 years working with you."

SAESSOLUTIONS

Engineering Services.

Our engineers' expertise and experience are at the service of your project, from the initial design to formation and training. We have in-depth experience and are of the firm conviction that there is no better way to work than to work with the client.

Maintenance and Customer Support.

Maintenance works performed by a dedicated technical team, in direct contact with engineering development staff and according with the original requirements of the equipment:

- Preventive and corrective maintenance works, both in SAES facilities or at customer premises.
- Supply of spares and obsolescence program.
- Training and education.
- After-sales support in tasks related to the equipment and systems supplied.

Test & Validation Systems.

SAES offers clients their wide experience in development of simulators and tools to assist the verification of systems and projects at all life cycle stages. We provide the automation of unit testing, functional test automation chains, automatic validation of Human-Machine Interfaces (HMI) and validation of algorithms and mathematical models used in the developments.

We develop interface simulators and functional simulators of equipment and systems to make progress on integration and to detect errors in early stages, thus avoiding the costs and delays that occur if they are detected and solved at the final phases.

Education & Training.

As a result of more than 30 years of work and research in the underwater acoustic environment and with the acquired knowledge, SAES offers customers the performance of generic courses of specialized topics:

- Theory of underwater acoustic.
- Sonar detection, analysis and classification.
- Operation in sonar environment.
- Theory of vessel signatures.
- Operation in acoustic ASW environment.
- Systems operation and maintenance.

Expert engineers
In-house technical knowledge
Specialists in Acoustics and Underwater Electronics Electronics

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