

MASS

MARITIME ACOUSTIC SCORING & SIMULATION

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A waterborne, virtual-targeting, live-fire, portable range system for naval gunfire training



DEFENCE

MASS



DEFENCE

NEXT GENERATION GUNFIRE SCORING & SIMULATION SYSTEM

- Live-fire training & qualification system for shipboard Naval Surface Fire Support (NSFS) & Naval Gunfire Scoring & Simulation (NGSS) teams
- Equipped with over-the-horizon Iridium satellite telemetry and UHF/VHF radio frequency
- Low cost, deployable & recoverable simulator & scoring ocean based system
- Waterborne, portable, ship deployable & recoverable
- Enables training & calibration against virtual targets
- Eliminates the need for live bombardment ranges
- Operates in any environmentally suitable open-ocean area
- Dual communication channel



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DEPLOYABLE AND RECOVERABLE

Automatic precise detection versus visual spotting

- Circular Error of Probability ~ 1 metres
- Complete independent functional check of NSFS & NGSS process & gun system

Real Gunfire Training

- Software based land mass overlaid on real world coordinates
- System operates anywhere in the world
- Independent of all ship systems
- Detects HE/BL/P

Cost & Time savings

- In-situ training
- Minimal support & maintenance
- No range cleanup / BL&P (Non-Explosive)



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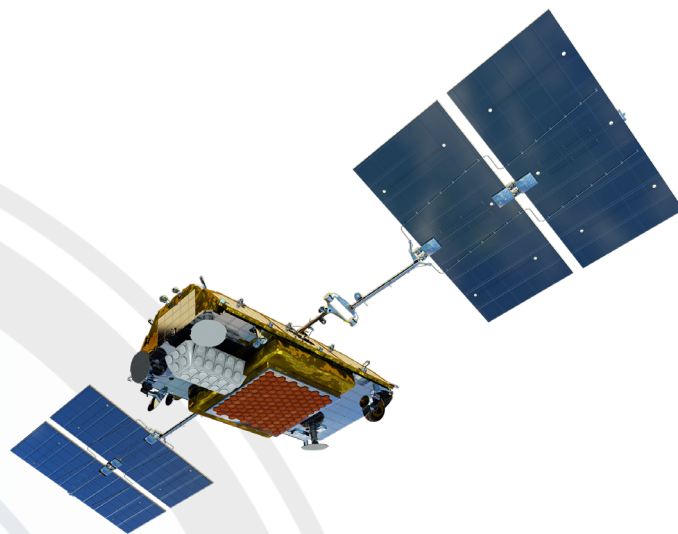
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Iridium Satellite Network

- Retains unique LEO architecture with 66 new operational satellites
- Compatible with existing network
- Low Latency
- Redundancy
- Truly Global Coverage



 iridium

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System Components

- 6 Buoys
- 2 Repeaters
- 2 Base Station
- Accessories (battery chargers, mounting parts, etc...)



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System Containers

- Facilitate compact storage on ship
- Wheeled for easy transport
- Protect system components during transport
- 6 buoy containers
- 1 accessory container
- 2 tubular antenna/mast containers

Buoy Case Contents:

- Buoy
- Radar Reflector
- Hydrophone

Accessories Case Contents:

- Battery Charger
- Base Station
- 2 x Repeater
- 2 x Antenna Arrays
- Accessories



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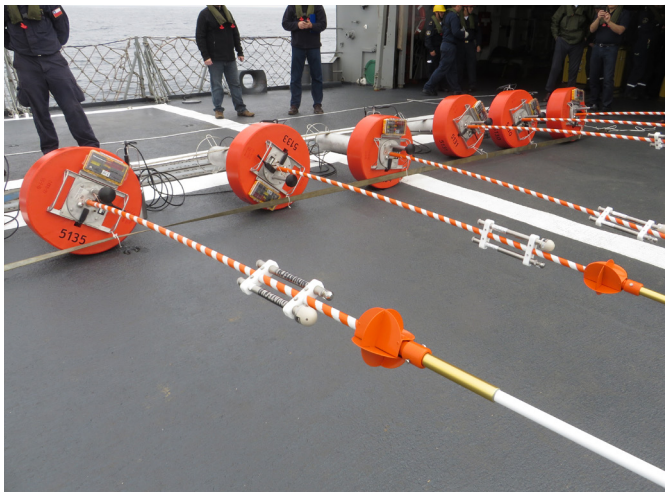
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Acoustic Sensing Buoys

- Buoy: 90 lbs.
- Battery powered (rechargeable)
- Equipped with Iridium satellite telemetry
- GPS enabled
- RF/Iridium communication link
- Acoustic & digital signal processing
- Hydrophone (25' depth)
- RF antenna for radio (902– 928 MHz)
- When antenna coupled, top of antenna is 3.8m above ocean surface
- Radar reflector observable on navigational radar
- Flashing beacon observable to a distance of up to 5Nm, and during daylight



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Repeater

- Relays RF or Iridium communication between the buoy field & system controller
- GPS enabled to track ship position with system controller
- Provides gun-target-line calculation for NSFS
- Quick mount to bridge wing railing
- Battery powered (rechargeable)
- GPS position is used to establish corrective action
- 2 Repeaters per system to facilitate ship firing from either port for communications over RF
- 1 repeater is required for Iridium communication



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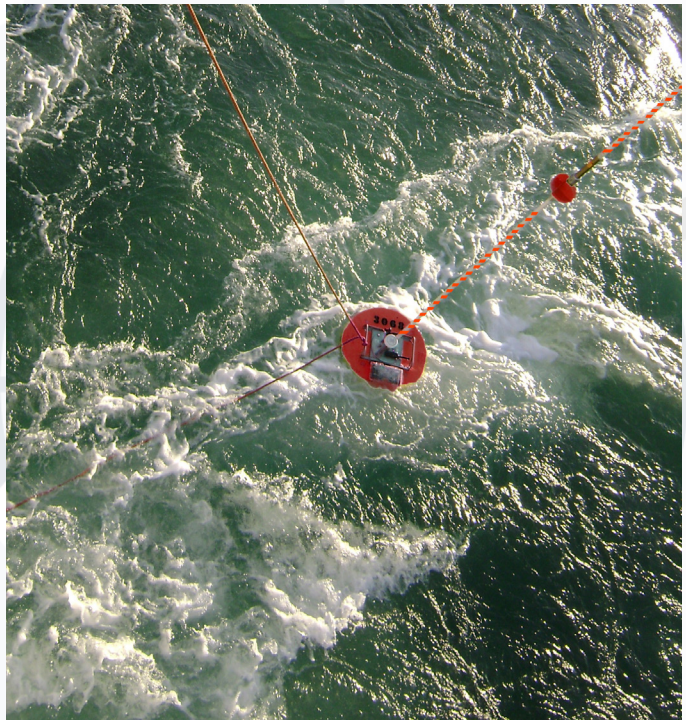
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Buoy Deployment



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System Controller

- COTS PC laptop provides system Graphical User Interface (GUI)
- Runs 11 NSFS missions according to NATO publication ATP 4
- Provides virtual range display
- Provides real-time data to spotter
- Tracks impact locations & distance from intended target - Initial Salvo Error (ISE)
- Tracks buoy positions
- Logs all event information during exercise
- COTS transceiver provides communication link to repeaters



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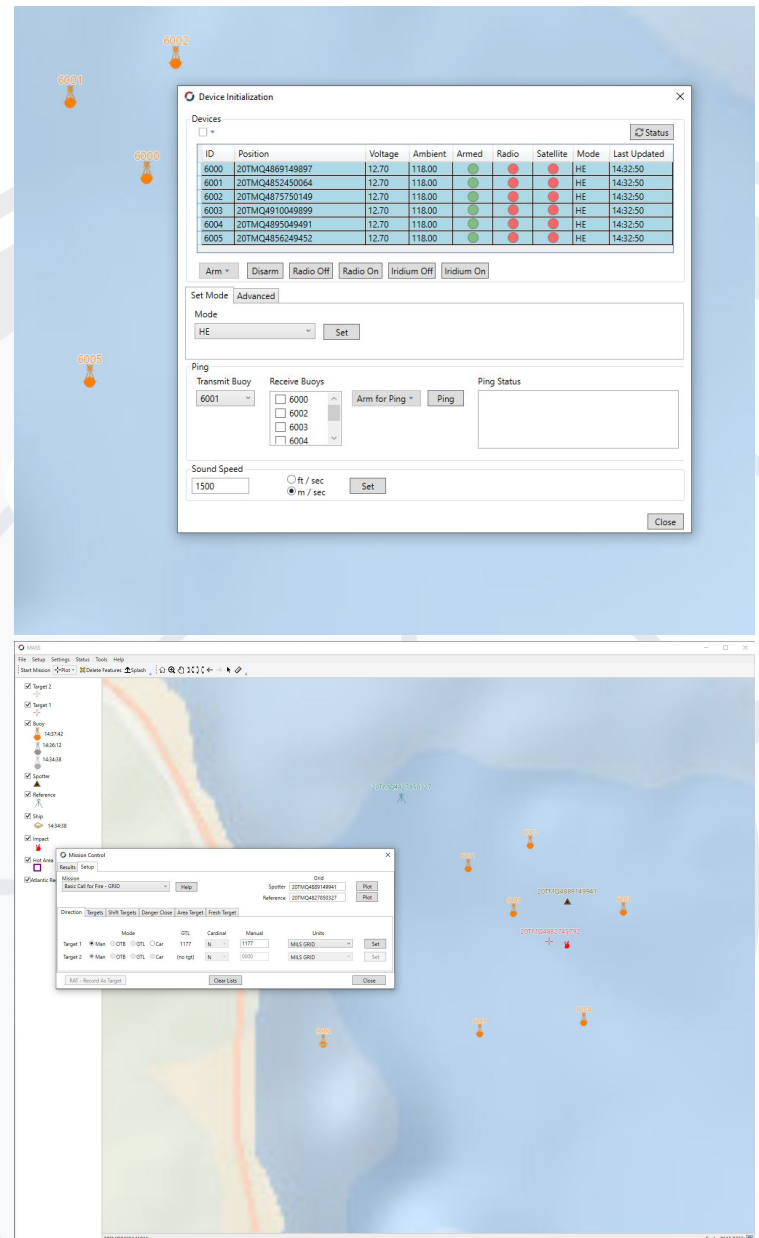
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System Controller Display

- System arming for acoustic detection
- Environmental input parameters
- Buoy electrical and position status
- Communication control
- Speed of sound analysis
- Acoustic detection mode settings

Mission Control Display:

- Actual impact location
- Adjustments
- Triggers detected by the buoys
- ISE (Initial Salvo Error)
- NATO mission planning
- Reference and spotter plotting



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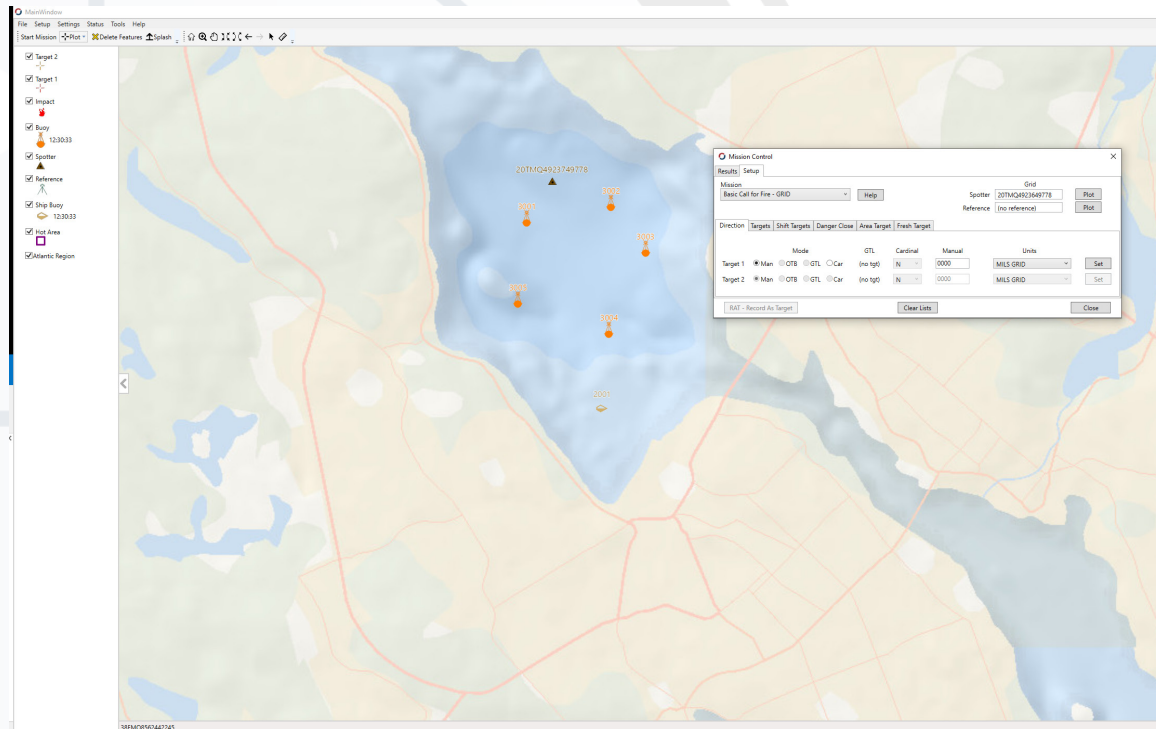
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Combat Chart

- Provides “common display” between system controller and gun team in CIC for training realism
- Paper chart has blank grids. Real world grids are passed from system controller to CIC to “lock down” the chart with current location



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Real-Time Data Feedback

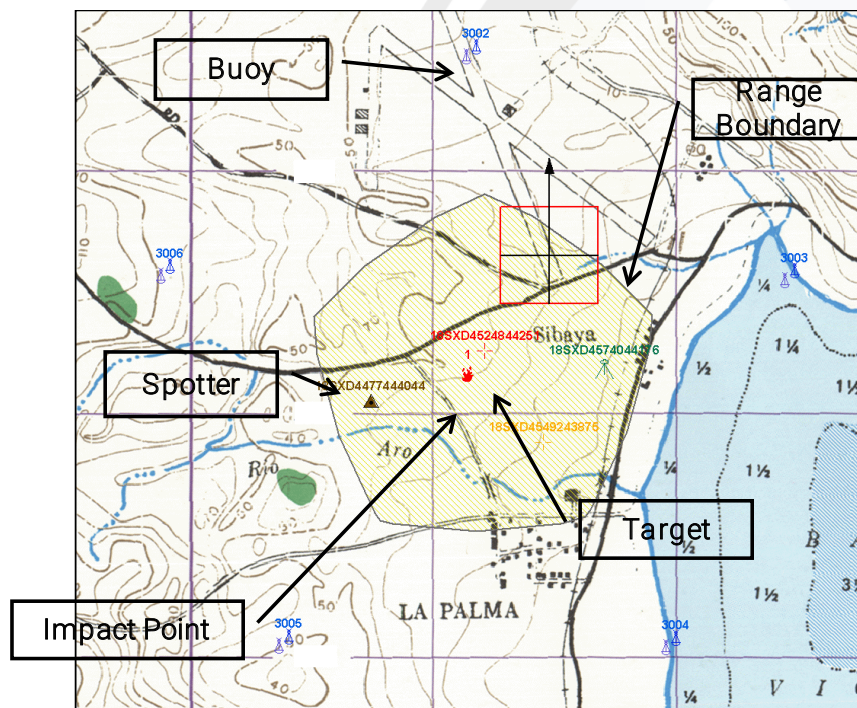
Display provides:

- Mission selection & parameters
- Target & spotter display
- Solution & impact point display

Buoy Triggers (used to
triangulate impact)

Triangulated Solution,
Adjustment, and Initial
Salvo Error

NSFS Mission
Selection



Graphical Feedback

The Mission Window is a software interface for mission selection and target management. It includes sections for Triggers, Solutions, Mission, Grid, Width, Direction, Mode, GTL, Units, Target 1, Target 2, Grid Targets, Shift Targets, Geodetic Targets, Danger Close First Salvo At, Area Target, and Fresh Target. The interface contains various input fields, buttons, and checkboxes for configuring the mission.

Mission Window

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Buoy Recovery



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Advantages

- **Operation:** System is rapidly assembled, deployed & recovered from the warship
- **Proficiency:** Significant Fleet readiness improvement by increasing training opportunity with real-time analysis and calibration under live-fire conditions
- **Simple Implementation:** MASS operates independent of ALL ship systems
- **NATO / Allied Interoperable:** Runs 11 NSFS missions in accordance with NATO publication ATP4
- **Iridium Connected:** Over the horizon gun fire training
- **Limitless** NSFS/NGSS training using OTH Iridium satellite Telemetry
- **Proven History:** Certified NSFS & NGSS training & qualification system for numerous international navies



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TECHNICAL SPECIFICATIONS

SYSTEM COMPONENTS

- Vessel base station comprising of standard laptop computer and radio transceiver
- Vessel based radio repeater
- Buoy operating array, typically 5 units
- Each buoy equipped with GPS, radio, hydrophone, radar reflector and flashing warning beacon

VESSEL BASED COMPONENT SPECIFICATIONS

Base Station (PC)

- Size: 30 cm x 23 cm x 7 cm
- Features: Provides acoustic event location data in numerical and graphical form. Map overlays are optional.

Radio

- Size: 23 cm x 10 cm x 5 cm plus 10 cm omni-directional antenna

- Features: 900 MHz spread spectrum radio, 1 watt RF power. Powered from vessel, 110/220 V

Repeater

- Size: Approximately 38 cm x 38 cm x 15 cm plus 50 cm omni-directional antenna
- Operating Time: 48 hours on internal battery
- Weight: Approximately 9 kg
- Features: Mast mounted at a minimum of 15 meters height above water for range. Self-contained in environmentally seal enclosure, +12 V rechargeable battery, 900 MHz spread spectrum radio, 1 watt RF power

BUOY SYSTEM SPECIFICATIONS

- RF range: At least 20,000 m line of sight, maximum depending on conditions and repeater height, 900 MHz spread spectrum radio, 1 watt RF power
- Buoy GPS self-location accuracy: Less than 10 m 99% of locations. Less than 2 m for 1 standard deviation
- Buoy accuracy for reported time of arrival of acoustic event: 150 microsec (equivalent to spatial resolution of 23 cm)
- Acoustic event detection range: At least 5,000 m in open ocean (low sea state conditions)
- Buoy acoustic projector range: Maximum 2,000 m
- Active operating time: 48 hours with fully charged battery pack
- Flotation collar: Diameter 61 cm, depth 20 cm. Materials: ionomer foam. Colour: Yellow
- Hull: Diameter 15 cm, length 120 cm. Materials: stainless steel. Weight: 36 kg
- Antenna mast: Diameter maximum 5 cm, length 390 cm. Materials: marine grade aluminum and stainless steel. Colour: White. Weight: 3.1 kg
- Hydrophone: Diameter 14 cm and suspension cable, length 6.6 m. Materials: piezoelectric ceramic. Colour: Black. Weight: 10.5 kg in protective cage

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