



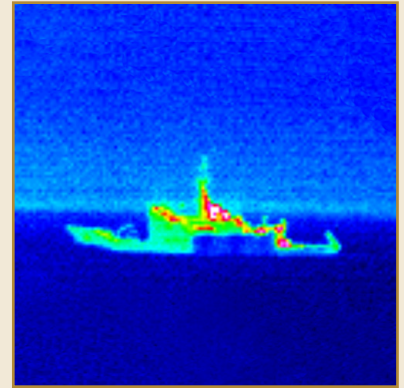
## APPLICATIONS

The Onboard Signature Manager (OSM) provides the control function for the Active Hull Cooling and engine exhaust Sea Water Injection IR suppression systems. Real-time on board IR signature prediction can be achieved with a software upgrade (under development).

### Active Hull Cooling (AHC)

AHC actively controls the temperature of the ship skin in order to minimize contrast IR signature with the background. OSM monitors the environment to determine optimal skin temperatures, and controls the sea water flow to the AHC sprinkler array.

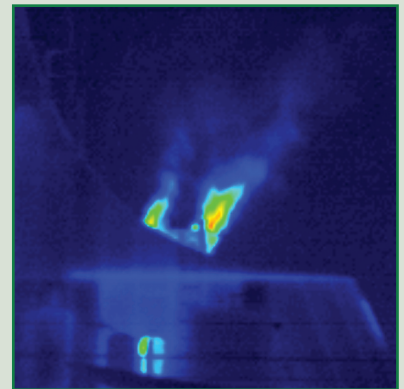
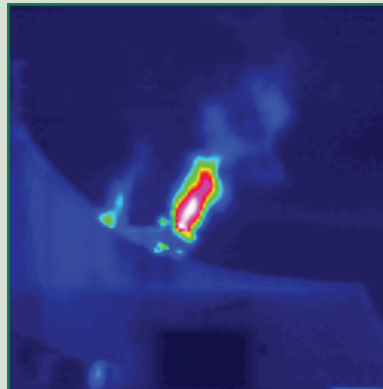
Left: Hull cooling on experimental ship;  
Right: MWIR measurement of ship with AHC on hull section (at 5.5 km).



### Sea Water Injection (SWI)

The SWI system cools the engine exhaust by the injection of a fine water mist. When augmented with a passive Eductor/Diffuser, SWI can produce plume temperatures below 100°C. OSM controls the flow of injected water as a function of the current operating state of the engine.

Unsuppressed and suppressed exhaust plume viewed in the mid-wave IR band.



### Real-time Prediction

OSM builds upon the validated accuracy of the NATO standard code, ShipIR, to predict the IR signature of the ship in real-time. Real-time prediction allows the ship operator to understand its susceptibility to IR threats in the current operating environment - a key component of situational awareness. This capability will be available as a software upgrade.



Conceptual rendering of real-time prediction within OSM.



SOFTWARE

The OSM graphical user interface provides control and display of active IRSS systems either through the navigation of a three dimensional representation of the ship, or with the display of control schematics. The interface provides access to all control points and sensor data. The operator can either manually control the IRSS systems, or can select OSM to perform automatic control as a function of the selected threat state.

Touch-sensitive screen

**A** User configurable Top Panel Display of key system data

**B** System Status Panel displays system clock, overall system status information, and status of the selected system

Tab-Stack Display area consists of overlapping panel displays allowing the user to switch between different views of the OSM system (i.e. skin temperature, graphical and tabular sensor status, control schematic)

Onboard Signature Management (OSM) V0.0-x3

[S] System [H] Mode [V] View [O] Options [R] Reports [A] About [H] Help

Ship Information:  
System Info L01 = ( none )  
System Info L02 = ( none )  
System Info L03 = ( none )  
System Info L04 = ( none )  
System Info L05 = ( none )  
System Info L06 = ( none )  
System Info L07 = ( none )  
System Info L08 = ( none )  
Weather Station:  
Weather Info L01 = ( none )  
Weather Info L02 = ( none )  
Weather Info L03 = ( none )  
Weather Info L04 = ( none )  
Weather Info L05 = ( none )  
Weather Info L06 = ( none )  
Weather Info L07 = ( none )  
Weather Info L08 = ( none )  
GPS Data:  
GPS Info Label 01 = ( none )  
GPS Info Label 02 = ( none )  
GPS Info Label 03 = ( none )  
GPS Info Label 04 = ( none )

Thu Sep 28 15:02:48 2006

Overall System Status

[ System Status ]  
AHC: --- 0.0%  
SHI: --- 0.0%  
DATA: --- 0.0%  
[ Connectivity ]  
IMCS: --- 0.0%  
NETED: --- 0.0%  
ETH: --- 0.0%  
Status of Selected System  
Zone 01: ---  
Zone 02: ---  
Zone 03: ---  
Zone 04: ---  
Zone 05: ---  
Zone 06: ---  
Zone 07: ---  
Zone 08: ---  
Zone 09: ---  
Zone 10: ---  
Zone 11: ---  
Zone 12: ---

LOCAL OFF  
PERCETIME

3D ship model

Operator Set-Point View Schematics View Channel I/O

Mode: AUTO Manual: STOP  
Selected AHC Zone: zone06  
Temperature Set-Point: ---  
Avg Zone Temperature: ---  
Valve Actual State: ---  
Valve Set State: ---  
AHC06-HT01A --- [deg C]  
AHC06-HT01B --- [deg C]  
AHC06-HT02A --- [deg C]  
AHC06-HT02B --- [deg C]  
AHC06-HT03A --- [deg C]

Zoom In Rotate  
-Z-  
ISO VIEW 01 Hide Panel

Events: <MESSAGE> No sensor in AHC tab view is selected...<MESSAGE> Sensor [AHC06-HT01A] & [AHC06-HT01B] have been selected...

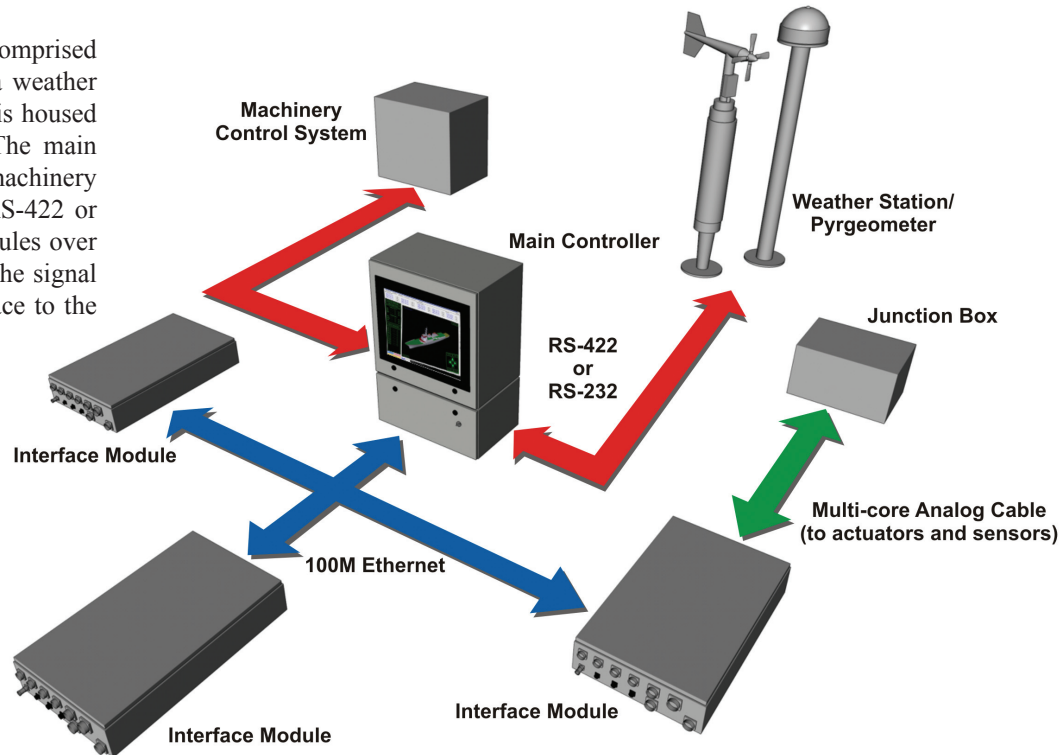
Mode Displays & Switch Buttons display current states of the control system and allow the user to toggle operation modes and threat state levels in the OSM system

Event Message Window displays all status messages

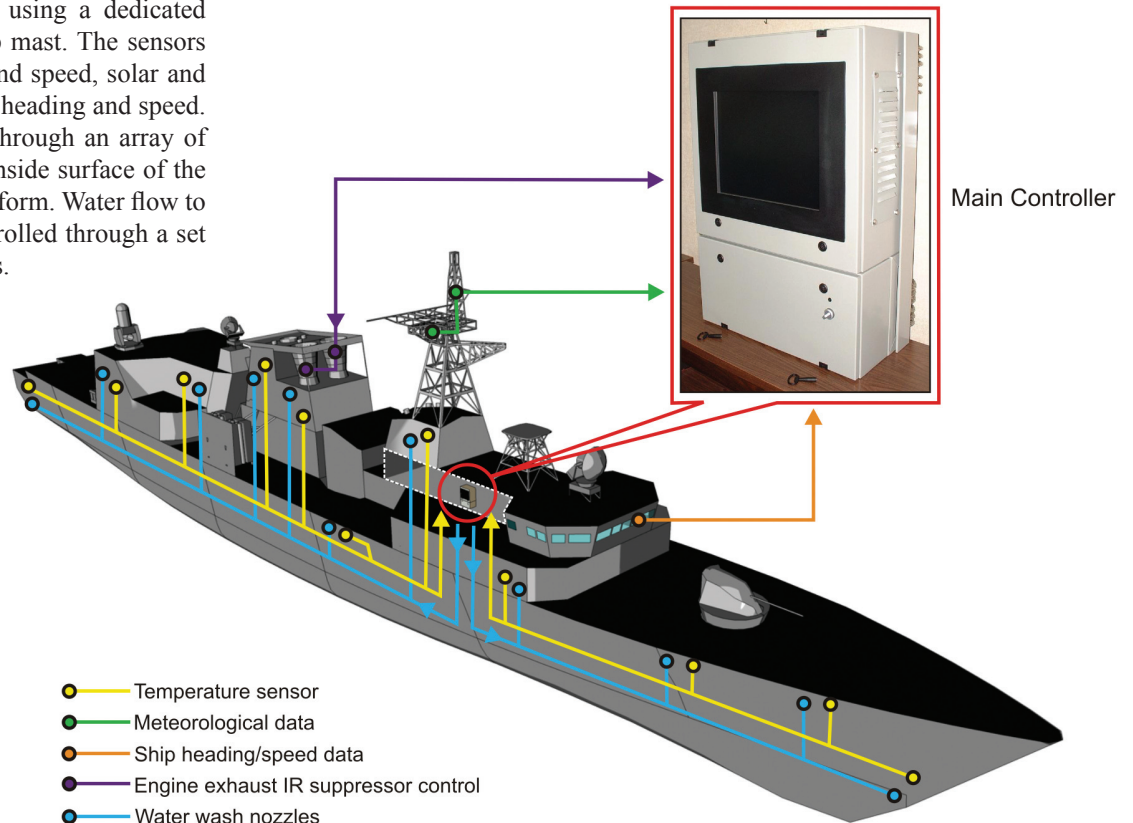
Full 3D navigation of ship display (zoom, rotation, and translation)

## ARCHITECTURE

OSM is a distributed control system which is comprised of a main controller, interface modules, and a weather station. The OSM software and user interface is housed in a rugged wall mounted main controller. The main controller communicates directly with the machinery control system and weather station over an RS-422 or RS-232 serial link, and with the interface modules over Fast Ethernet. The interface modules provide the signal conditioning, A/D, and D/A conversion interface to the sensors and valve actuators.



OSM measures environmental data using a dedicated weather station mounted on the ship mast. The sensors record air temperature, humidity, wind speed, solar and background thermal irradiation, ship heading and speed. Ship skin temperature is measured through an array of temperature sensors located on the inside surface of the ship at various points around the platform. Water flow to the SWI and AHC sprinklers is controlled through a set of electrically actuated control valves.



**Davis**

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