



Solstice MAS

Multi-Aperture Side-Scan Sonar

Wavefront apply engineering excellence to the problems of underwater detection, imaging and navigation. Our operationally proven market-leading sonar systems are reliable, easy to use and designed to provide real-world solutions.

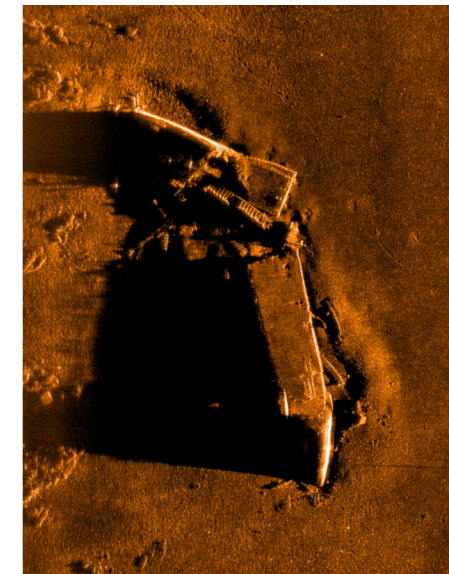
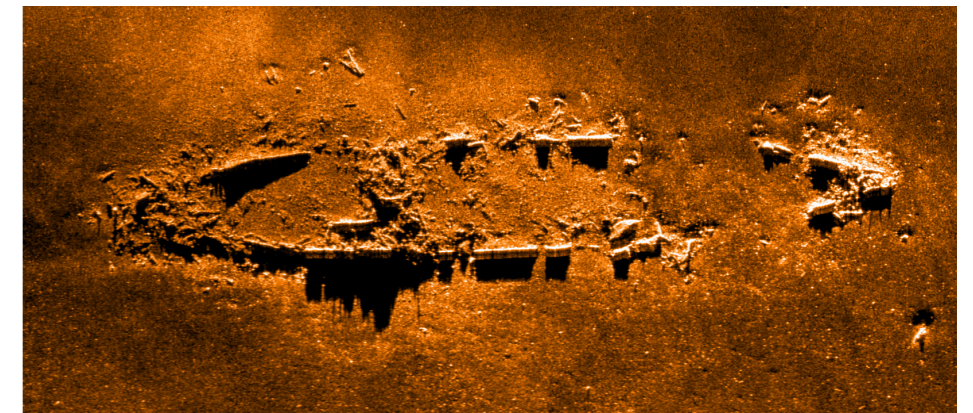
Our sonar technology allows us to make the underwater world visible.

Solstice MAS

Dependable high quality imagery.

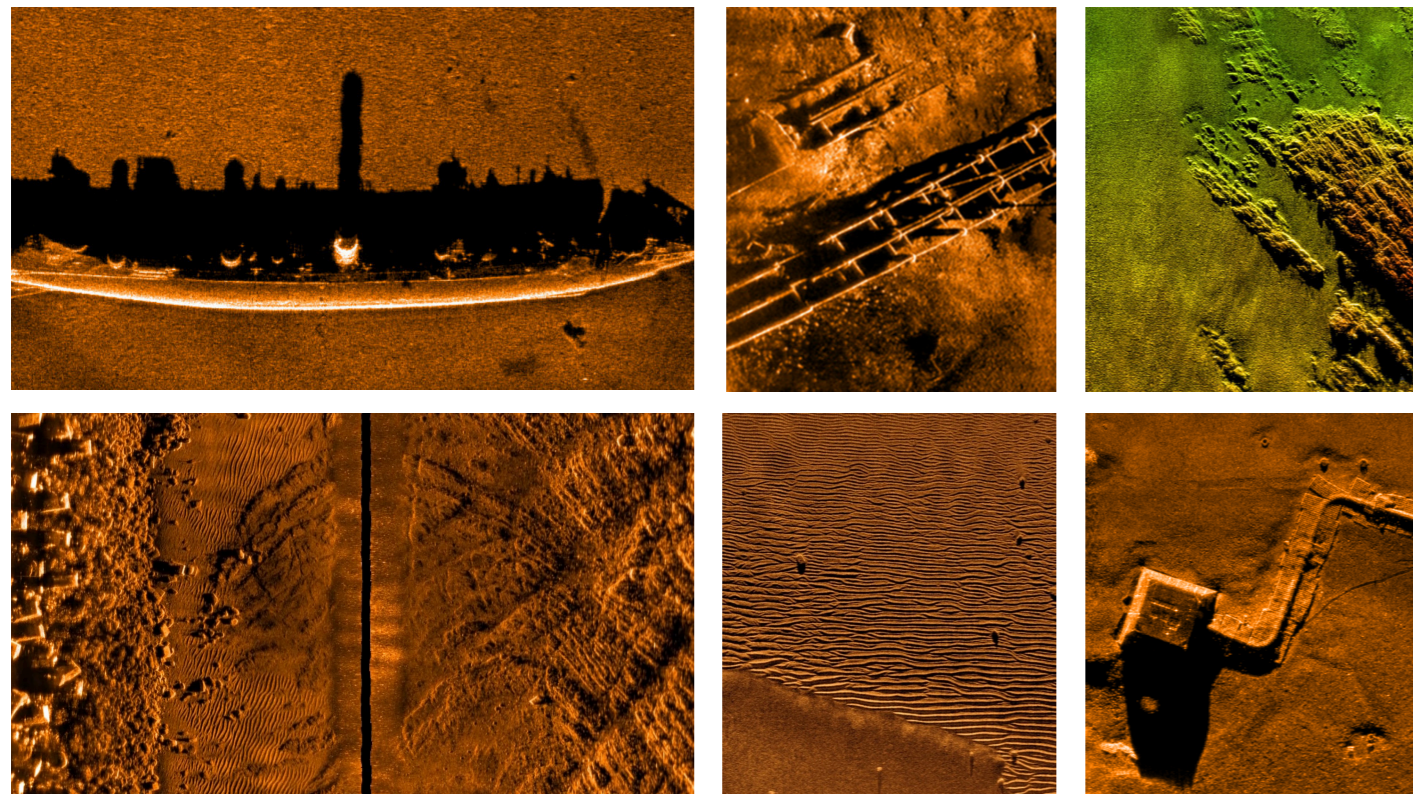
Solstice MAS is a unique family of Multi-Aperture Sonars (MAS) designed to provide world-class imagery by blending the high performance of Synthetic Aperture Sonar (SAS) with the reliability and robustness of conventional Side-Scan Sonar (SSS).

Capture every feature and every detail in ultra-high resolution. Solstice MAS significantly increases the operational envelope of your underwater vehicle by providing wide swath coverage, at high resolution – all while consuming very low power.



Solstice MAS High Tempo

Large swaths of 100m on each side at speeds of up to 6 kts ensure high area coverage rates, increasing your site characterisation efficiency without compromising on the detail.



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Solstice can combine information from multiple transmission apertures or 'pings' over multiple 'look' directions using our proprietary **Multi-Ping Multi-Look (MPML)** processing technology to dramatically improve signal-to-noise ratios, creating stunning imagery at longer ranges than other sonars operating at similar frequencies. It has interferometric processing too, meaning you also get 3D bathymetric data co-located with the side-scan imagery. It's the ideal choice for hydrographic, archaeological, search, salvage, unexploded ordnance, and mine countermeasure missions.

Unlike most conventional side-scan sonars which have a fixed range focus, Solstice uses a unique back-projection beam-forming technique to focus on every single (3cm x 3 cm) pixel in the image. This means Solstice MAS provides **Pixel Perfect Imaging (P2I)** throughout the range scale and not just within a narrow 'sweet-spot' around a fixed focal range.

Imagery from conventional side-scans is also distorted due to non-linear platform motion and may have gaps in coverage due to uncompensated platform attitude changes or accelerations.

Solstice on the other hand uses knowledge of the platform motion to eliminate these effects, producing undistorted imagery with 100% ground coverage. This **Motion Compensation (MOCOMP)** is particularly valuable when Solstice is integrated onto smaller, low-logistic AUVs operating in

littoral environments.

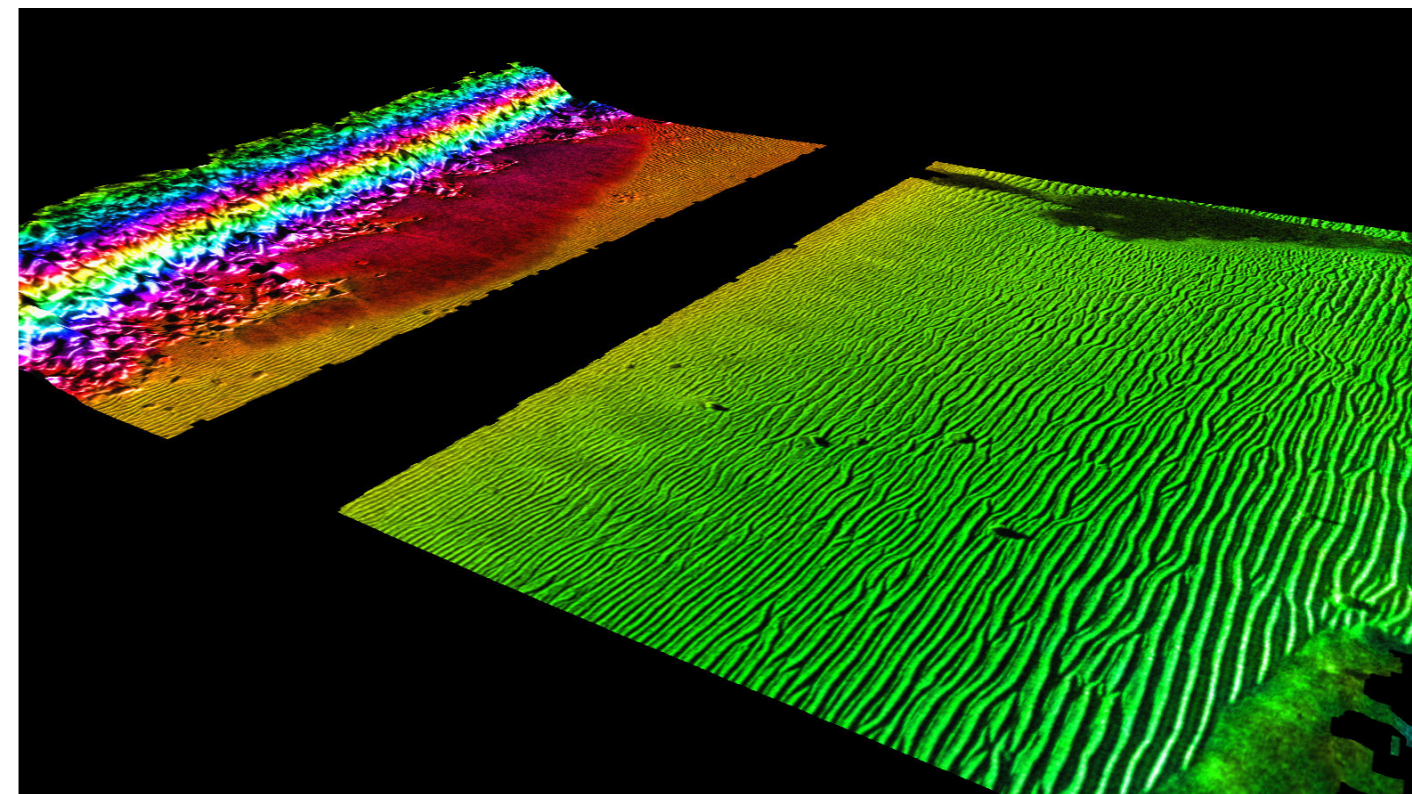
Such accurate imaging demands highly linear receiver element alignment, which cannot easily be achieved mechanically.

Real-time Array Calibration (RTAC) is therefore used to dynamically re-calibrate each hydrophone element several times a second to compensate for any dynamical strains causing array non-linearity.

Solstice has been designed to produce high-contrast imagery, even in shallow, littoral waters, eliminating noise from multi-path reverberation, enhancing the contrast of the imagery. It employs a unique **Multi-path Suppression Array Technology (MSAT)** generating the wide elevation coverage normally associated with wide vertical beamwidths, with the impressive shadow contrast associated with very narrow vertical beams.

Solstice MAS Pixel Perfect Imaging

Class-leading imagery is provided to enable operators to make classification decisions with greater levels of confidence in less time.










The overall result is improved detection probability and decreased probability of false alarms improving the efficiency of your Mine Counter-Measures (MCM), archaeological, search and salvage missions.

Solstice Models

- Solstice S4000-300 is a unique Multi-Aperture Sonar (MAS) designed to provide world-class imagery by blending the high performance of Synthetic Aperture Sonar (SAS) with the reliability and robustness of conventional side-scan
- Solstice S3000L-300 provides near SAS quality imagery and is used with a towed body or autonomous vehicles with an operating envelope down to 300m depth
- Solstice S3000L-600 provides near SAS quality imagery and is designed for use on autonomous vehicles with a depth rating down to 600m

"Excellent results to say the least out to 100-m range, especially compared to SAS systems producing similar results burning about 175W as opposed to Solstice at about 30W w/ real-time processing. For our size UUVs, considering the energy capacity, this is a significant advantage particularly for customers performing wide area surveys (deep or shallow) coupled with optical object-identification surveys/ATR."

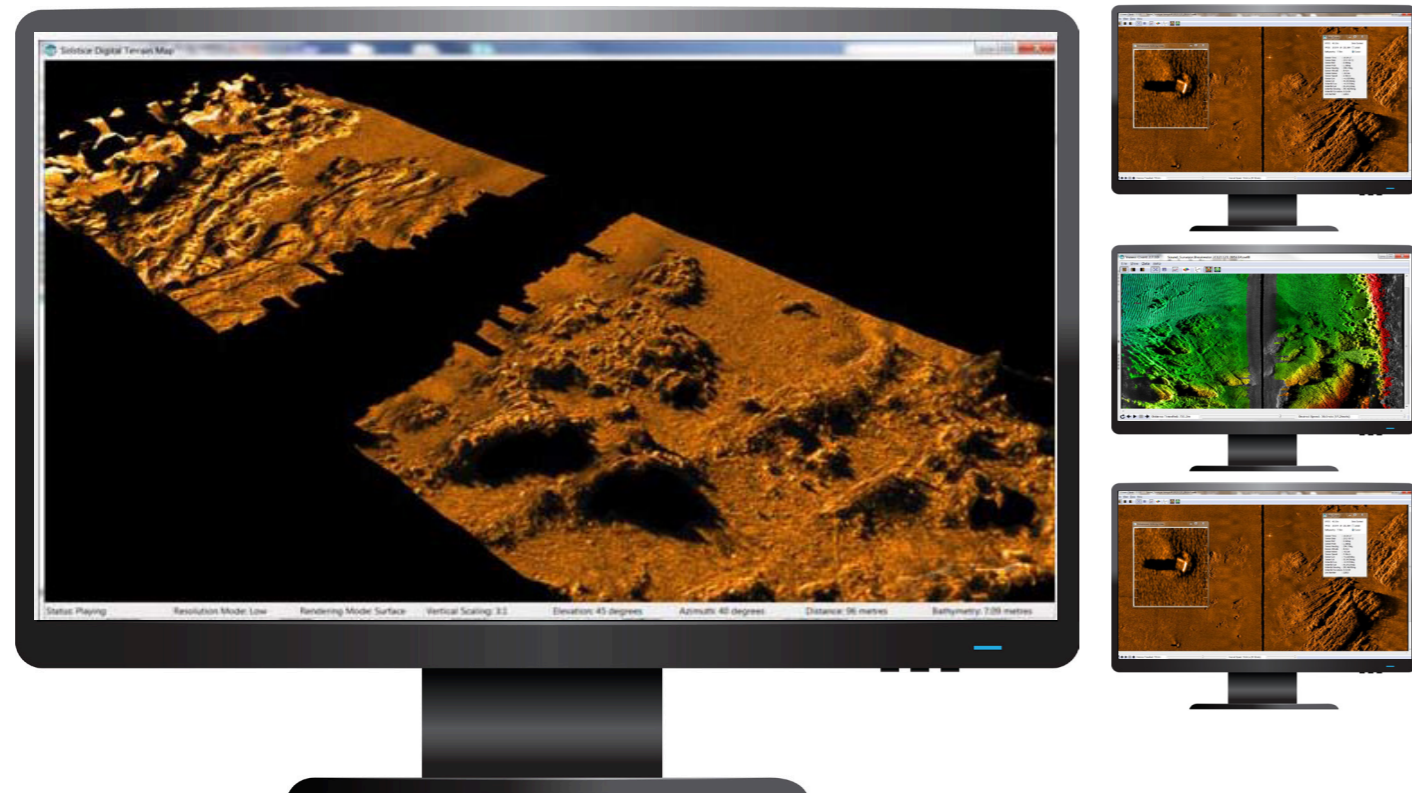
John Sloat, Applications Engineering Lead, Principal Investigator at L3Harris AUV Systems

-  **Survey more ground in a single pass; 200 m-wide swath with 6 kts max speed ensures high coverage rates**
-  **Along track resolution from 0.075°; best in class delivering maximum detection rates**
-  **Co-registered side-scan imagery and bathymetry**
-  **Consumes only 18 W; power budget friendly increases your AUV's endurance**
-  **Compared with SAS, mission planning and data analysis is simpler and more efficient**
-  **Mission ready; designed to support search, classify and map (SCM) and hydrographic operations**
-  **Small and compact arrays; optimised for low-logistic AUVs and towed bodies**

Solstice MAS

Solstice Viewer & Real Time (RT) On-board MAS processing

Solstice comes as standard with a comprehensive viewer providing a complete suite of analysis tools and with the option for low power on-board Real Time processing.



Solstice Viewer Software

The Solstice Viewer Client (VC) is a lightweight, easy-to-use data viewing tool which allows operators to rapidly view and interact with their side-scan (SWF) data without the need for expensive third-party software. It is designed to output both Waterfall and georeferenced KML (Keyhole Markup Language) data for Earth browsers such as Google Earth.

The SWF data contains co-registered imagery and bathymetry data, together with other navigation metadata including latitude, longitude, heading, pitch, roll, altitude, heave and speed over ground.

Should end-users choose to display their Solstice data in third party software viewers, Solstice VC can act as a quality assurance tool. Since our VC will display data at the maximum possible image quality, the images obtained from the third-party viewers can be cross-

referenced against VC imagery to confirm successful integration.

Display Modes

- Displays port & starboard imagery together (traditional waterfall). It can be stretched across two monitors to increase screen area
- Single Side Mode. Port/Starboard only to focus on data from a single side
- Fit to screen or scrollable 1:1 resolution options
- 2D graphical plots of navigation data which are displayed alongside the waterfall data
- Colour chooser. Provides additional colour map options
- 3D Digital Terrain Map (DTM) of the acoustic data

Key Tools

- Snippet Window - provides a zoomed window(s) for analysing details at full resolution while continuing to display and navigate the full picture

- Measurement Tool - used to infer the object height by measuring the length of its shadow

Default Viewer Integration

Inbuilt support for the following:

- EIVA NaviSuite
- SeeByte SeeTrack
- Moga SeaView MOSAIC
- Triton Imaging
- HYPACK® SURVEY
- Chesapeake SonarWiz Sidescan
- Teledyne CARIS
- Plus, others which can import XTF

Real Time on-board MAS Processing

- Produces real time motion compensated data (SWF) available to onboard embedded ATR or other onward processing
- Allows data (SWF, SSF and XTF) to stream to removable storage
- Reduces post mission processing time and effort
- Low processing power requirement of 8W (less if running on existing computers)

Solstice MAS

Family



Feature	S3000L-300	S3000L-600	S4000-300
Depth Rating	300 m	600 m	300 m
Frequency Band	725-775 kHz	725-775 kHz	725-775 kHz
Source Level (dB re 1 µPa @ 1 m)	220 dB	220 dB	220 dB
Number of Receiver Channels	2 x (32 +4)	2 x (32 +4)	2 x (64 +4)
Number of Transmitter Channels	2 x 32	2 x 32	2 x 32
Azimuth Beam Width	0.15°	0.15°	0.075°
Swath	200 m	200 m	200 m
Bathymetry	Yes	Yes	Yes
Power (Array & PPV)	18 W	18 W	29 W
Power (Array & PPV) + on-board RT	26 W	26 W	37 W
Operating Temperature	-2 to 40°C	-2 to 40°C	-2 to 40°C
Hydrophone Array Length	682 mm	682 mm	1344 mm
Projector Array Length	416 mm	416 mm	416 mm
Output Formats	.SWF8 and .XTF	.SWF8 and .XTF	.SWF8 and .XTF
Weight in Air/Water per Solstice flank	2.11/0.76 kg	2.11/0.76 kg	8.50/3.5 kg
Payload Pressure Vessel (PPV)			
Depth Rating	300 m	600 m	300 m
Dimensions (Dia. x Length)	133 x 289 mm	133 x 289 mm	133 x 289 mm
Weight in Air/Water	2.88/0.25 kg	2.88/0.25 kg	2.88/0.25 kg



Making the underwater world visible.
We apply engineering excellence
to the problems of underwater
detection, imaging and navigation.
Our operationally proven world-
leading sonar systems are reliable,
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real-world solutions.

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