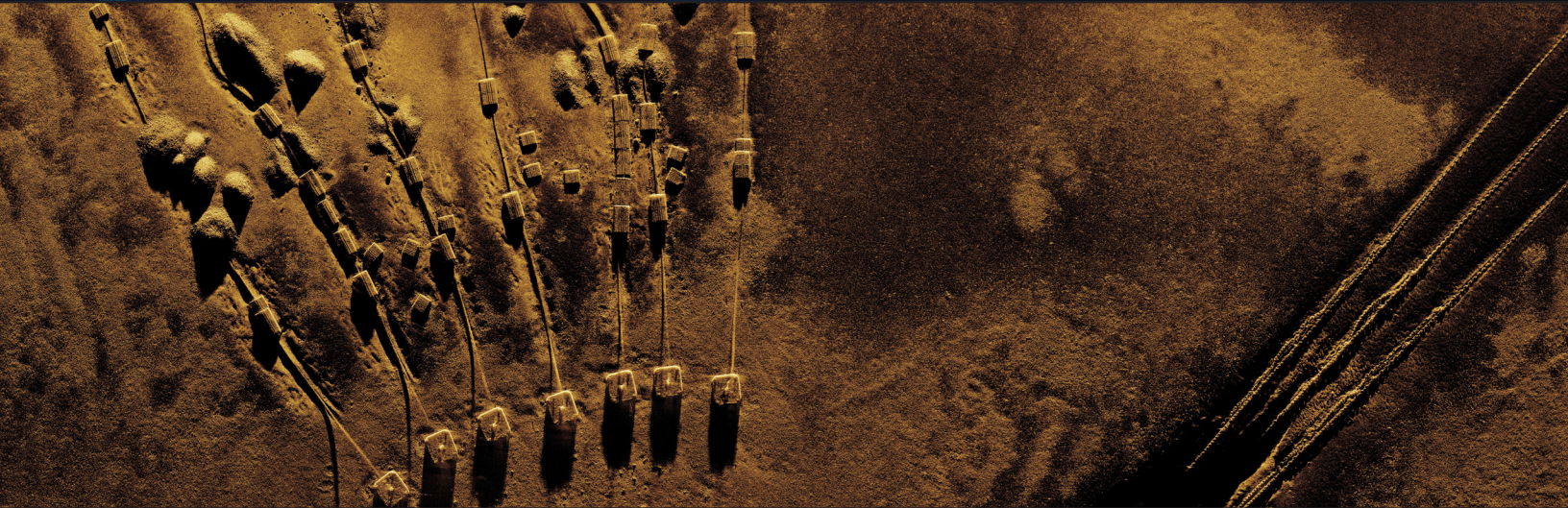
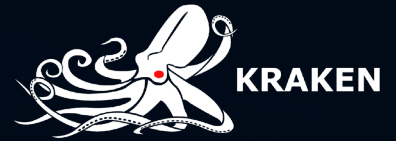


MINSAS

Seeing with Sound



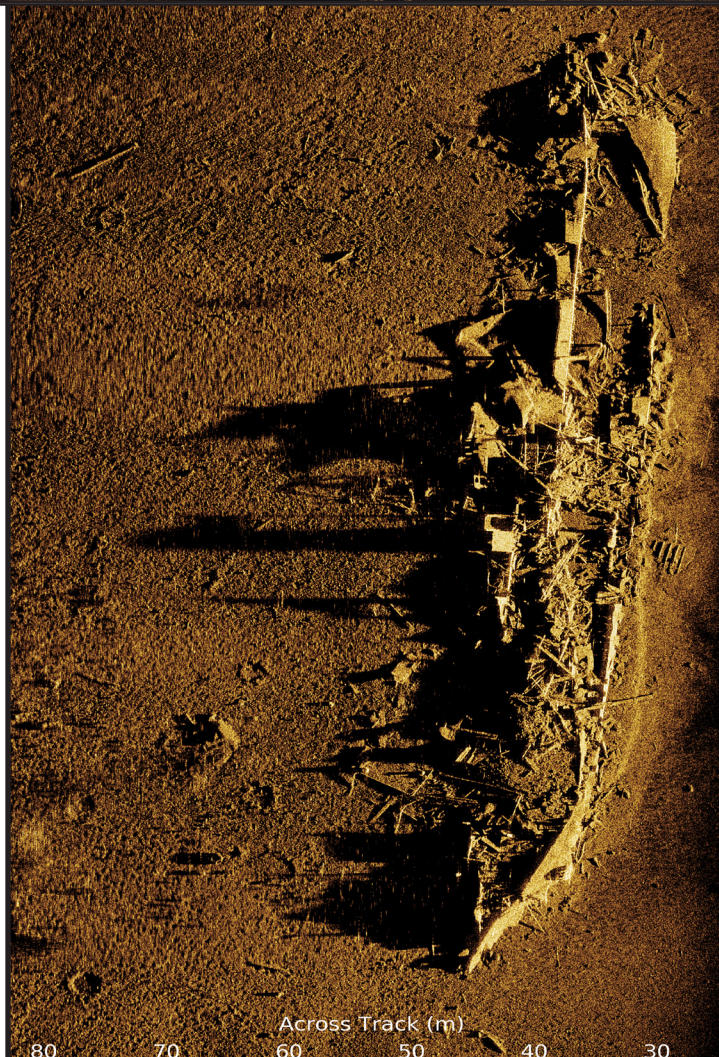
Kraken's MINSAS Miniature Interferometric Synthetic Aperture Sonar is an off the shelf, customizable SAS Payload that provides a cost-effective capability upgrade from conventional side scan sonar systems. MINSAS provides significantly enhanced resolution, extended range, 3D Bathymetry, and best in class Area Coverage Rates (ACR).

MINSAS provides 3.3 cm x 3.0 cm or 2.1 cm x 1.9 cm (post-processed) Ultra High Definition (UHD) constant resolution to ranges of 200 meters per side, along with simultaneous coregistered bathymetry.

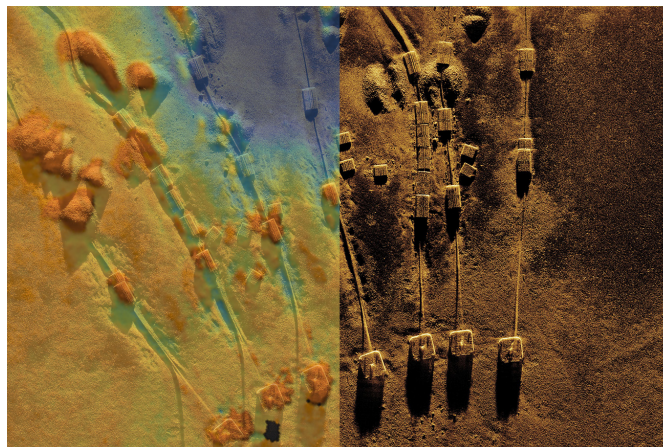
What sets MINSAS apart is its versatility. MINSAS is engineered to integrate seamlessly with various underwater platforms and vehicles. The MINSAS modular array system is adaptable to your vehicle size and unique mission requirements. With array lengths available from 60 cm to 180 cm, MINSAS is suitable for any vehicle size.

Another unique feature of Kraken's sonars is our Real-Time SAS (RTSAS) Processing Module. This capability processes raw sonar data into high-resolution, fully beamformed SAS tiles in real-time, during the mission, to the internal storage hard drive or optional removable data pod, while retaining all raw data for reprocessing. RTSAS sets the framework for embedded Automatic Target Recognition (ATR) and data exfiltration capabilities of processed SAS data, along with reduced post-mission analysis.

Kraken's MINSAS Technology is a multi-use capability for both military and civilian applications. Ranging from Mine Countermeasures and port & harbour security to Infrastructure Integrity surveys and broad area habitat mapping campaigns - MINSAS provides higher-grade information than conventional technology and reduces the cost and time required to make critical decisions.



System Specifications	MINASAS 60	MINASAS 120
Platform Speed	2-5 kn	2-6 kn
Receiver Array Dimensions - L/W/H	53.0/6.1/9.5 cm	109.0/6.1/9.5 cm
Receiver Array Weight - Air / Water	6.4 kg/3.2 kg	12.8 kg/6.4 kg
Transmit Array Weight - Air / Water	0.5 kg/0.19 kg	
Electronics Module Dimensions	47 cm x 17 cm dia.	
Electronics Module Weight - Air / Water	12.4 kg/1.4 kg (1000 m)	
Total System Weight - Air / Water	26.9 kg/8.4 kg	39.7 kg/14.6 kg
Depth Rating	1000 m / 6000 m	
System Idle	60 W	75 W
System Real Time Processing	80 W	94 W
Power Supply	24VDC - 60VDC Nominal.	
Real Time Image Processing	3.3 cm Along x 3 cm Across	
UHD Image Processing (Post)	2.1 cm x 1.9 cm	
Real Time SAS Bathymetry Resolution	25 cm x 25 cm	
SAS Bathymetry Vertical Uncertainty	<15 cm at 100 m range at 95% confidence	
Source Level	210 dB re 1μPa @ 1m	
PRF	8 Hz	4 Hz
Center Frequency	337 kHz	
Pulse Length	configurable 1 ms -> 10 ms	
Pulse Bandwidth	40 kHz	
Pulse Type	Linear FM	
SAS Robustness Against Yaw	±4° over 20 m Track Length	
SAS Robustness Against Sway	±10 m	
Max Crab Angle	20°	

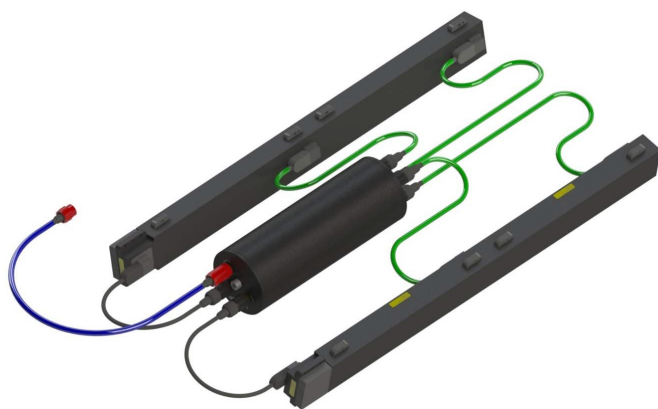


The image above demonstrates MINASAS combined SAS and 3D Bathymetry Imaging.

To achieve the same level of resolution, conventional survey sonars require a lower altitude which limits the area coverage rate in a single survey pass. In contrast, MINASAS can fly at higher altitudes and achieve high resolution SAS and bathymetry data across the entire swath.

Speed		MINASAS 60			MINASAS 120		
Knots	m/s	Range meters (per side)	ACR w/o Gap Filler km ² /hr	ACR w/ Gap Filler km ² /hr	Range meters (per side)	ACR w/o Gap Filler km ² /hr	ACR w/ Gap Filler km ² /hr
3.00	1.54	118	0.90	1.31	200	1.53	2.22
3.50	1.80	100	0.89	1.30	200	1.78	2.59
4.00	2.06	87	0.89	1.29	181	1.88	2.68
4.50	2.32	77	0.89	1.29	160	1.87	2.66
5.00	2.57	69	0.88	1.28	143	1.86	2.65
6.00	3.09	57	0.87	1.27	118	1.84	2.62

Performance specifications represent maximum sensor values and may vary due to environmental conditions, vehicle stability, and operational specifics.



Above: MINASAS 120 1000 m rated system shown with RTSAS processor

Left: Typical ACR of MINASAS based on speed and array length.