

Working together to understand the depths of Alaska's vast seascape

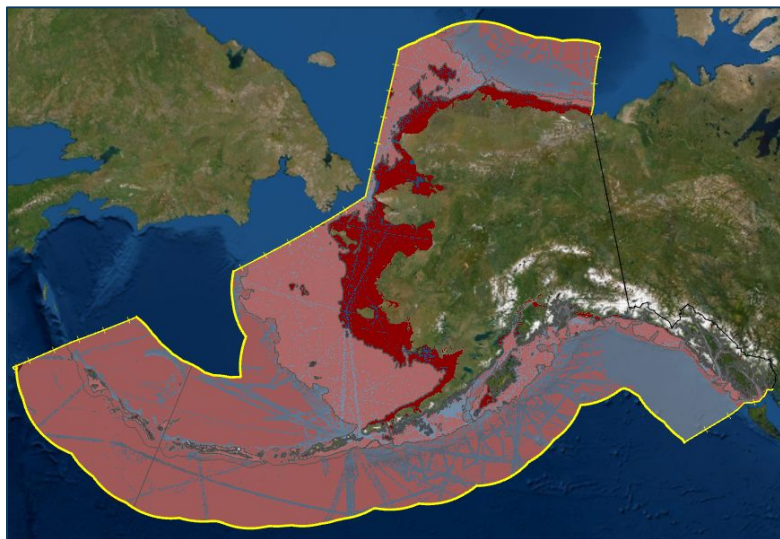
# Introducing Panel 2: How could we fill the data gaps?

- ★ Seasats Capabilities - Mike Flanigan
- ★ Coastal and Ocean Mapping: The value of innovation and collaboration - Rada Khadjinova, Fugro
- ★ eTrac Capabilities and Autonomy - Dave Neff
- ★ USVs – a safe, reliable and low carbon solution to fill the data gaps - Matt Holland, XOcean
- ★ SAILDRONE Capabilities - Brian Connon
- ★ 20 minute panel Q&A

Moderator: Rob Downs, NOAA Coast Survey Development Lab

## 4. Alaska

Total Area = 1,080,200 snm



Actual rate of progress:  
~1% per year

Needed rate of progress:  
~7% per year

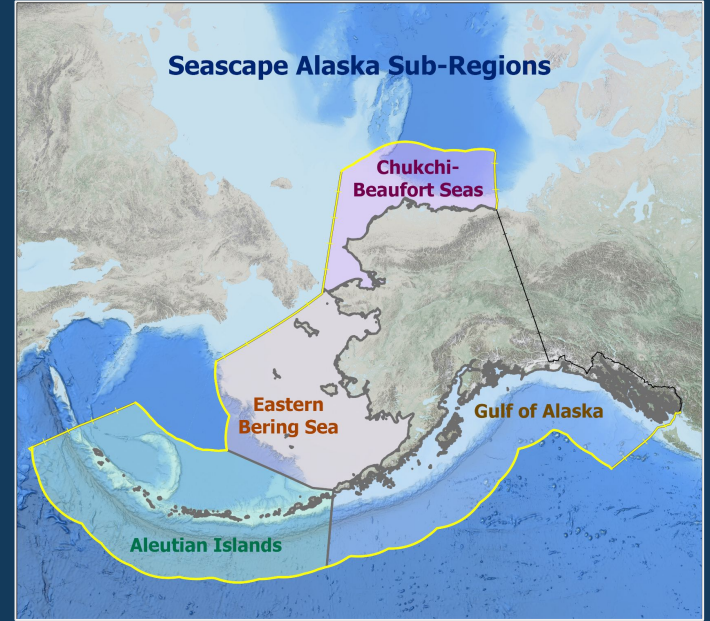
**Alaska portion of Goal 2 performance indicator:** Acquire

approximately **70,000** square nautical miles (snm) of new bathymetric data coverage annually

YEAR	All of Alaska (sq nautical miles)	
	Goal	Actual: UnMapped
2017		796,800
2018		790,100
2019		778,538
2020		772,360
2021	695,124	
2022	617,888	
2023	540,652	
2024	463,416	
2025	386,180	
2026	308,944	
2027	231,708	
2028	154,472	
2029	77,236	
2030	0	

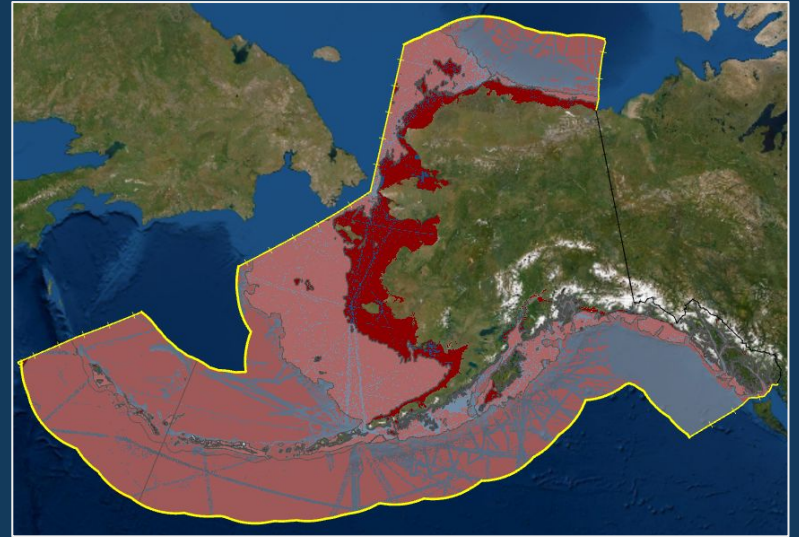
# Poll Question

What geographic region are you most interested in?



# Poll Question

What coastal and ocean depths are you most interested in?

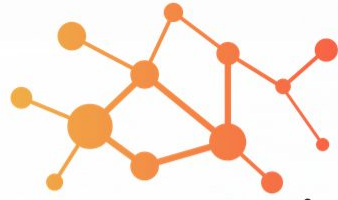




# SeaSats Capabilities

Mike Flanigan

December 2, 2021 | Virtual



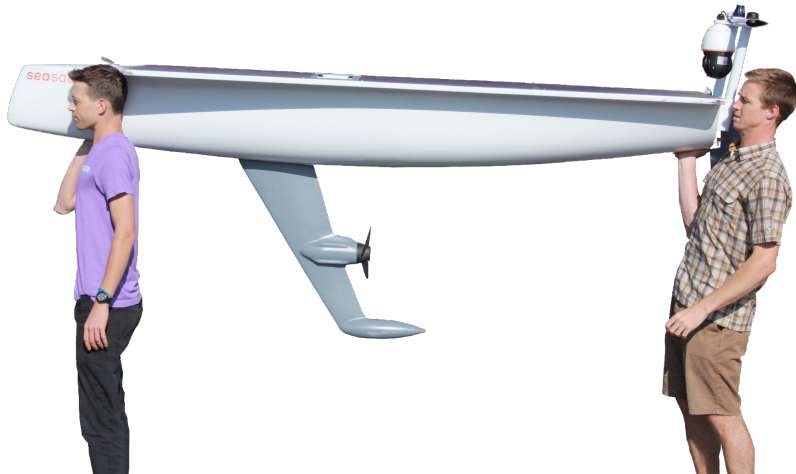
**seasats**



# Company Overview

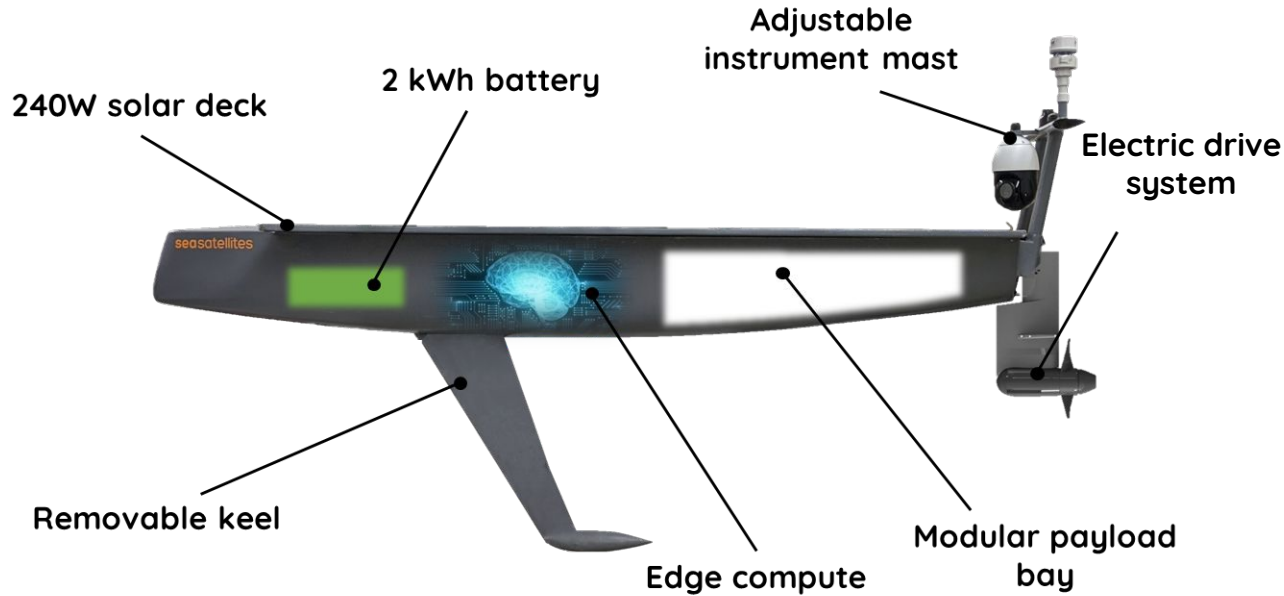


- **Mission:** make ocean operations easier, cheaper, and faster
- **Founded:** 2020 by marine and autonomy experts



# seasats X3

Launch in minutes - perform for months



## Specifications

Length	3.0 m
Beam	0.75 m
Weight	72 kg
Top Speed	4 knots
Endurance	6 months
Payload Capacity	40 L/20 kg
Payload Voltage	5-28 V
Payload Peak Pwr	200 W



# Flexible launch and recovery options



# Intuitive browser-based control

Home dylan

### VEHICLE STATUS

Hull #7

N/A 0.0W 99%

SOG	HDG	COG	Hull temp
4.7	261.1	256.6	---
ADR	ETR	Bat V	Sip status
1.04nm	0.22hr	12.56	0

### MANUAL CONTROL

On

Motor speed  10C

Rudder angle

Heading

Shortcuts Log message Station keep

### COMMUNICATIONS

WiFi ping: -ms

Cellular ping: 60 ms

Satellite next int: -s

Last data: -0000:01

### MISSIONS

	RADIUS	SPEED	LAT	LOX	HOLD POS	PAYLOAD	ACTION
Running Mission	3	8	40	32.867260	-117.258104	0	(Select Payload) <- Select payload
Create new mission	4	8	40	32.867090	-117.271470	0	(Select Payload) <- Select payload
Delete Mission Stop Mission	5	8	40	32.865616	-117.272157	0	(Select Payload) <- Select payload
Start mission	6	8	40	32.867438	-117.272771	0	(Select Payload) <- Select payload
	7	8	40	32.866472	-117.274007	0	(Select Payload) <- Select payload

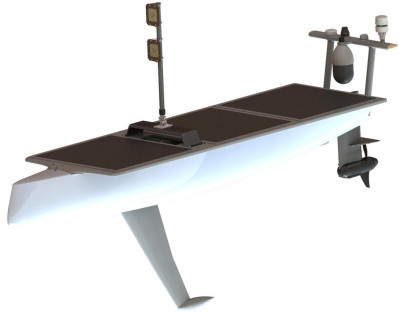
### Select Mission

- MB light 2021-03-21 08:24:51
- Sim\_SD 2021-01-28 13:22:12
- speed\_tester 2021-03-21 07:55:34
- D3 2021-04-01 18:14:05
- rm 2021-01-08 17:54:36
- D5 2021-04-01 18:27:13
- MBnew 2021-03-06 08:20:08
- tester 2021-02-18 15:38:12
- jeff\_bowman 2020-12-29 10:31:11
- point 2020-12-08 15:49:14
- sip\_test\_3 2021-01-15 15:29:58
- pklot4 2021-03-18 18:38:53
- D1 2021-03-08 15:57:08
- Scapps simulation
- pklot\_wat\_colle 2021-04-01 21:58:12
- long line 2021-04-01 08:09:38
- MB-11-24 2020-11-24 11:13:54
- singlesip 2021-03-01 14:35:04
- return\_to\_dock
- 13 2021-03-05 08:35:48
- MB\_close 2021-01-18 08:10:09
- line\_pw\_test 2021-03-21 07:58:48
- MBnewD1 2021-03-19 16:11:29
- return\_MB 2021-01-15 13:08:38
- Pklot 12-1-20 2021-04-01 15:42:28

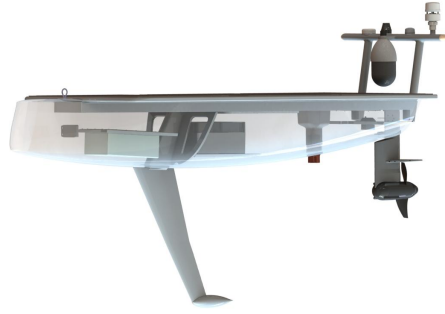
bow stern port stbd



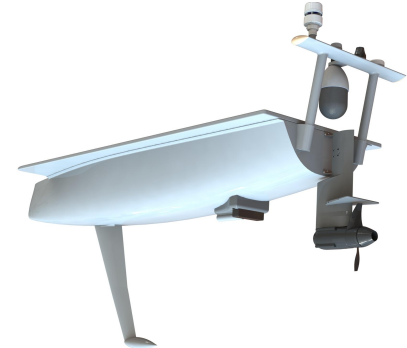
# One platform - swappable payloads



Radios



Water sondes



Sonar



Electronic warfare



Water samples



Towed arrays

# Alaska: shallow mapping challenges

- Shallow
  - Difficult for crewed vessels to navigate
- Inaccessible
  - High equipment and personnel transportation costs
- High turbidity
  - Limited effectiveness for airborne/satellite surveys



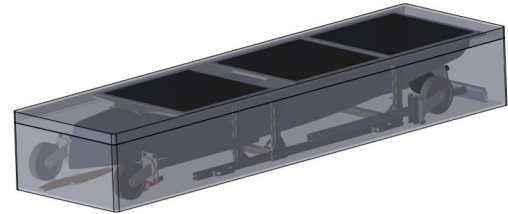
Map courtesy of Alaska DGGS

# The Seasats solution

- Sample mission plan:
  - Load Seasats into bush planes
  - Fly to remote area
  - Launch ASVs
  - Survey autonomously for 3 months
  - Transit to launch site for recovery



- By the numbers:
  - 50 square nautical miles/ASV/month
  - 3 month/yr operating season
  - 35 ASV survey fleet**5,000 snm coverage / year**
  - \$1,000/day/vehicle**Fleet cost: \$3.15M / year**

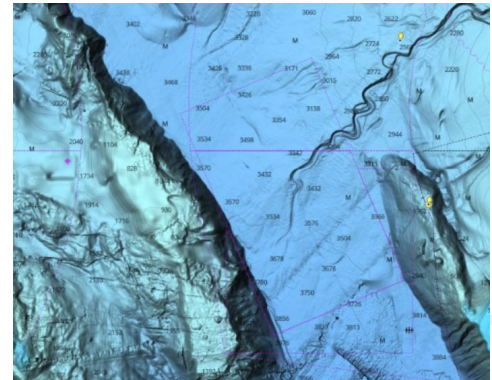
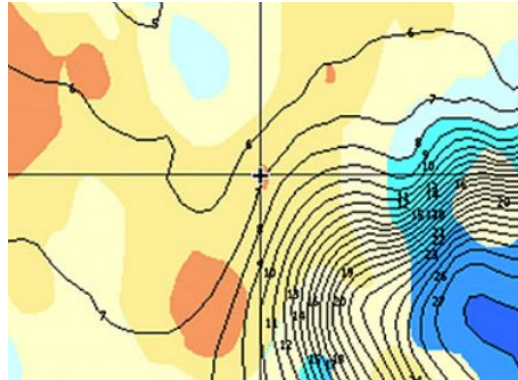
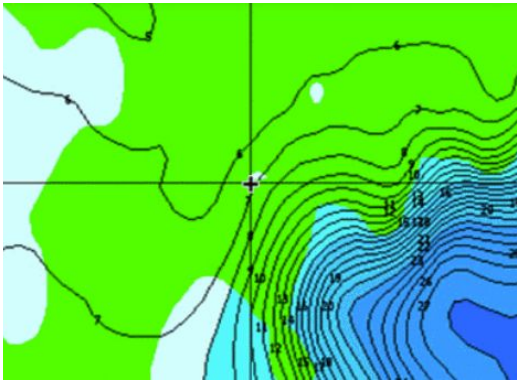


# Comprehensive surveys

- Bathymetry
- Bottom hardness
- Vegetation

navico

C-MAP®



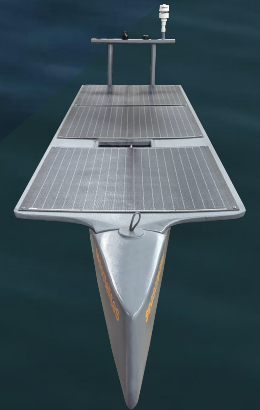


AUTONOMOUS OCEAN  
INFRASTRUCTURE

**Mike Flanigan || CEO**

[mike@seasats.com](mailto:mike@seasats.com)

SeaSatellites, Inc.  
2775 Kurtz Street # 10  
San Diego, CA 92110





# End of Presentation

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Thank you!







Recorded  
Presentation

**Coastal and Ocean Mapping: The value of innovation and collaboration**

Rada Khadjinova

December 2, 2021 | Virtual



# eTrac Capabilities and Autonomy

Dave Neff

December 2, 2021 | Virtual

# AK Coastal and Ocean Mapping Summit

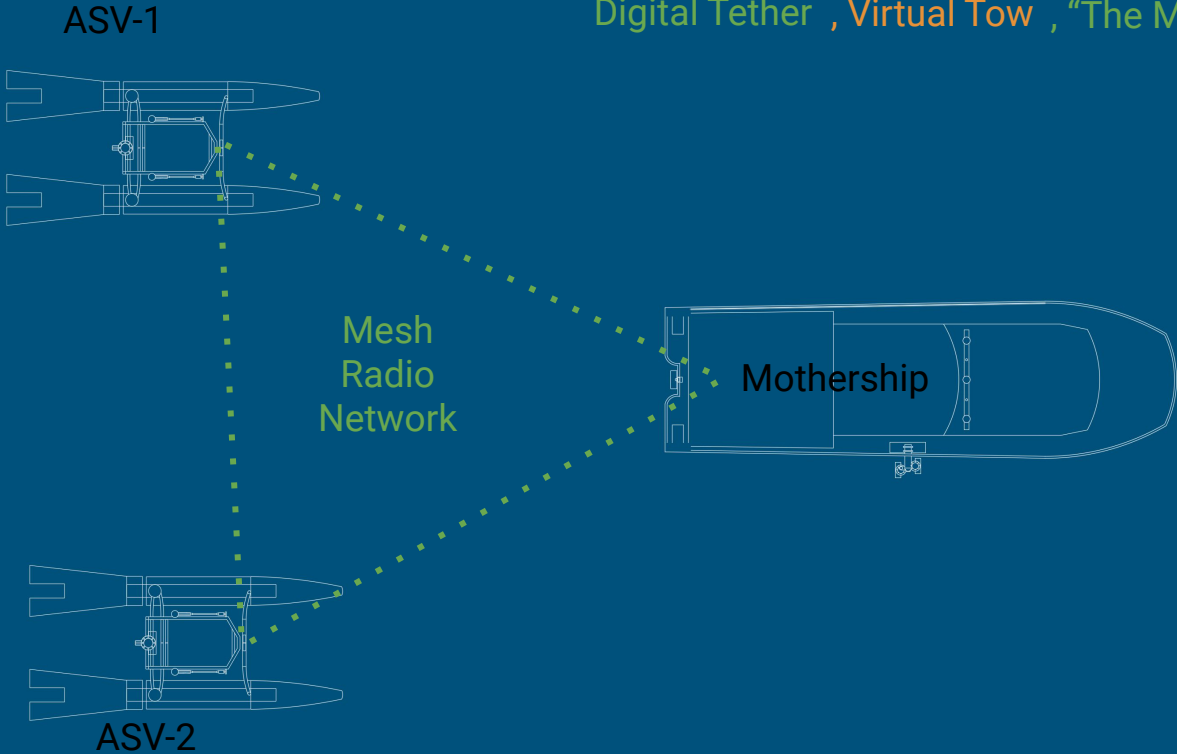
The logo for eTrac, featuring the text "eTrac" in a white, sans-serif font. The letter "e" is lowercase, while "Trac" is uppercase. A small green dot is positioned above the letter "a". The logo is centered within a dark blue square background.

Capabilities and Autonomy

Dave Neff, C.H.

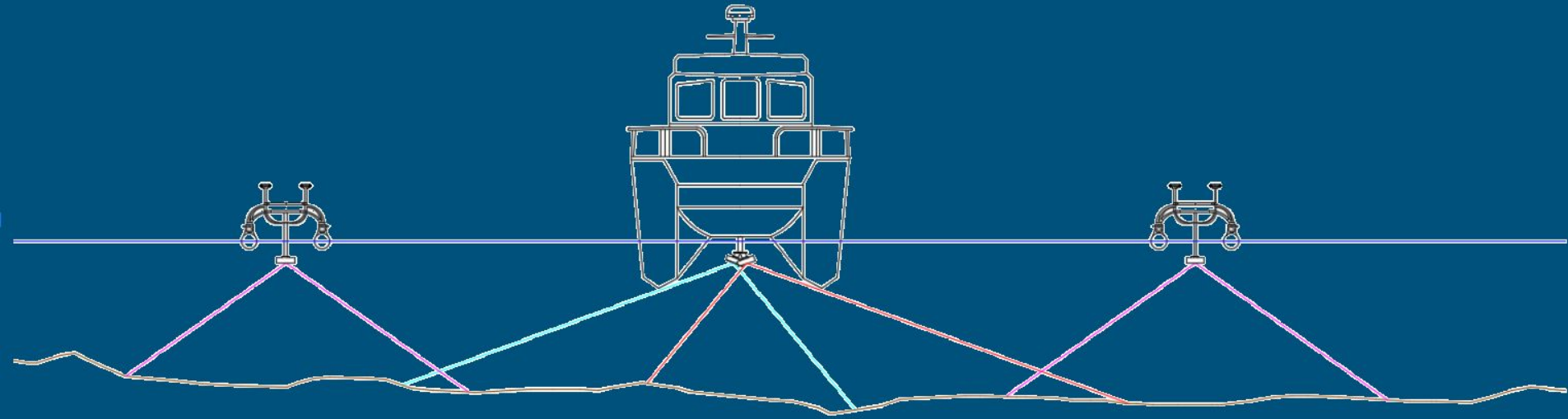
# Force Multiplication Model

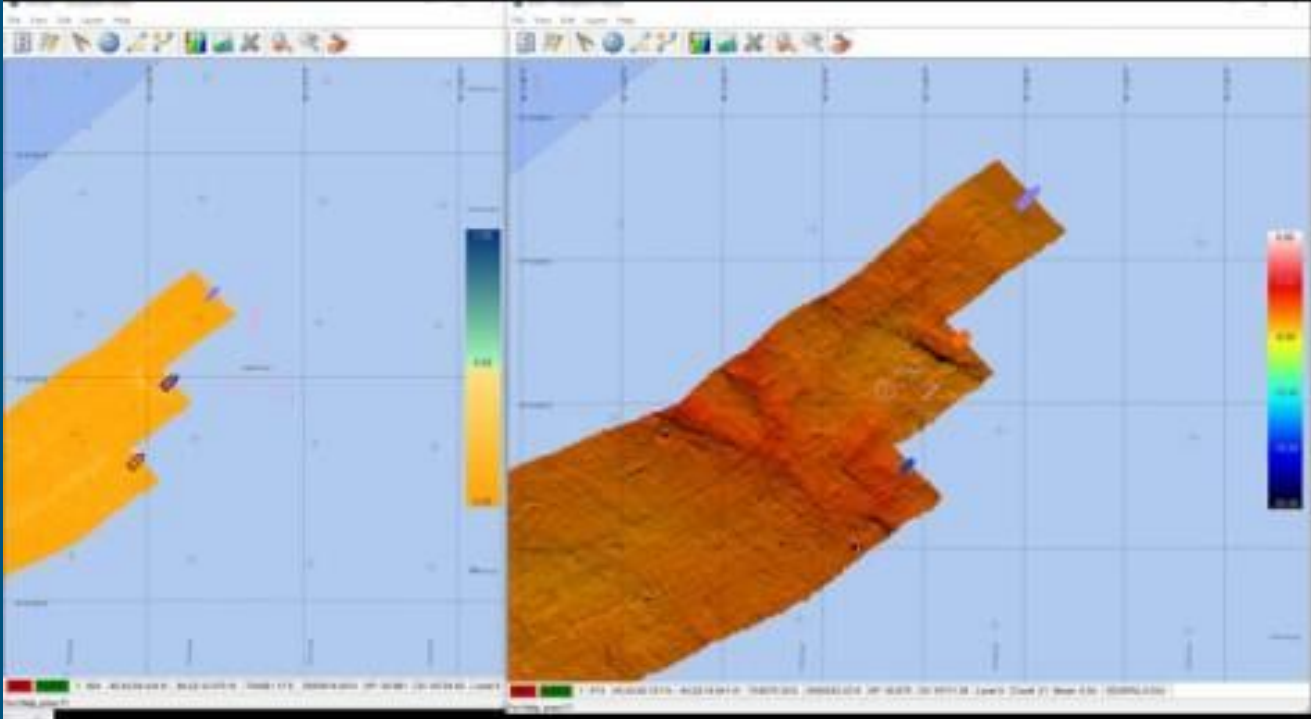
Digital Tether , Virtual Tow , “The Mothership Connection”



Intelligent **SwathSync** Technology  
Autonomously Positions Vessels/ASV's  
to obtain desired overlap.

eTrac





# Let's do the numbers..

	Ship	Ship + 1 ASV	Ship + 2 ASV	Ship + 3 ASV	Ship + 4 ASV	Ship + 5 ASV	Ship + 6 ASV	Ship + 7 ASV
<b>Vessel</b>	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
<b>ASV</b>	\$ -	\$3,000	\$6,000	\$9,000	\$12,000	\$15,000	\$21,000	\$24,000
<b>Sensors</b>	\$3,000	\$6,000	\$9,000	\$12,000	\$15,000	\$18,000	\$21,000	\$24,000
<b>Labor</b>	\$6,000	\$8,000	\$9,000	\$9,000	\$10,000	\$10,000	\$10,000	\$10,000
<b>Total Cost / Day</b>	<b>\$24,000</b>	<b>\$32,000</b>	<b>\$39,000</b>	<b>\$45,000</b>	<b>\$52,000</b>	<b>\$58,000</b>	<b>\$67,000</b>	<b>\$73,000</b>

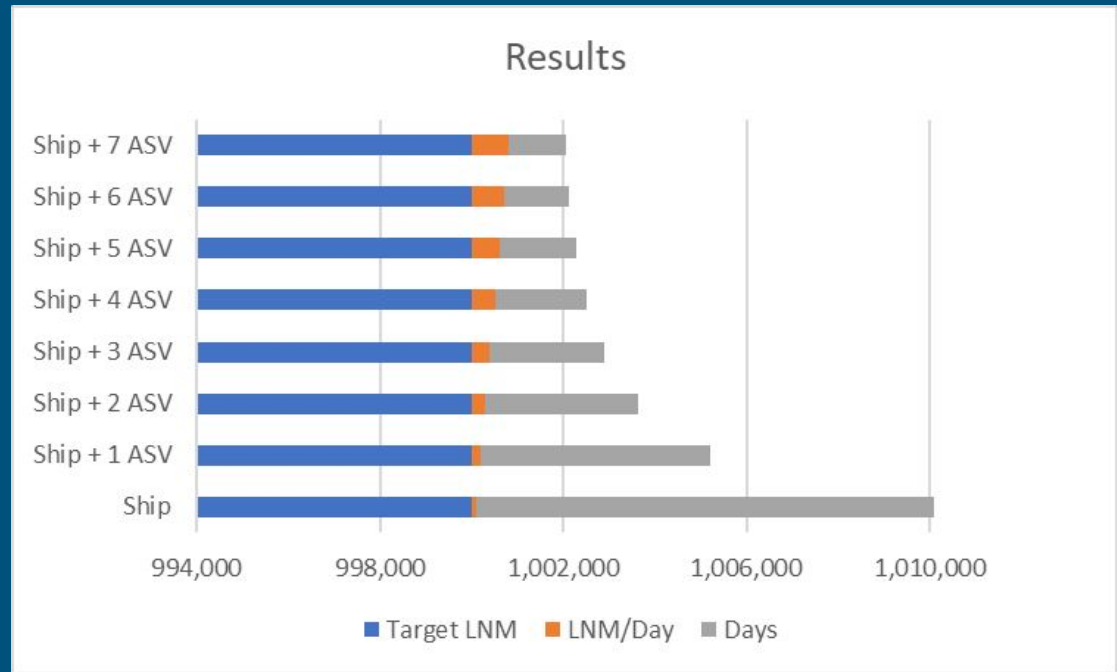
Cost +                                    33%            62%            87%            116%            141%            179%            204%

Production +                            200%            300%            400%            500%            600%            700%            800%

	Ship	Ship + 1 ASV	Ship + 2 ASV	Ship + 3 ASV	Ship + 4 ASV	Ship + 5 ASV	Ship + 6 ASV	Ship + 7 ASV
<b>Target LNM</b>	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
<b>LNM/Day</b>	100	200	300	400	500	600	700	800
<b>Days</b>	10,000	5,000	3,333	2,500	2,000	1,667	1,429	1,250

	Ship	Ship + 1 ASV	Ship + 2 ASV	Ship + 3 ASV	Ship + 4 ASV	Ship + 5 ASV	Ship + 6 ASV	Ship + 7 ASV
Target LNM	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
LNM/Day	100	200	300	400	500	600	700	800
Days	10,000	5,000	3,333	2,500	2,000	1,667	1,429	1,250

## Where's the limit?





Questions?

Ask me at  
the end

Dave Neff

[david@etracinc.com](mailto:david@etracinc.com)





# End of Presentation

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Thank you!





# **USVs – a safe, reliable and low carbon solution to fill the data gaps**

Matt Holland

December 2, 2021 | Virtual

# XOCEAN

Ocean data, delivered.

USVs – a safe, reliable and low carbon  
solution to fill the data gaps.

Alaska Coastal and Ocean Mapping Summit

02 December 2021



# Agenda

XOCEAN

## Agenda

1. About XOCEAN
2. Technology
3. Filling the Data Gaps

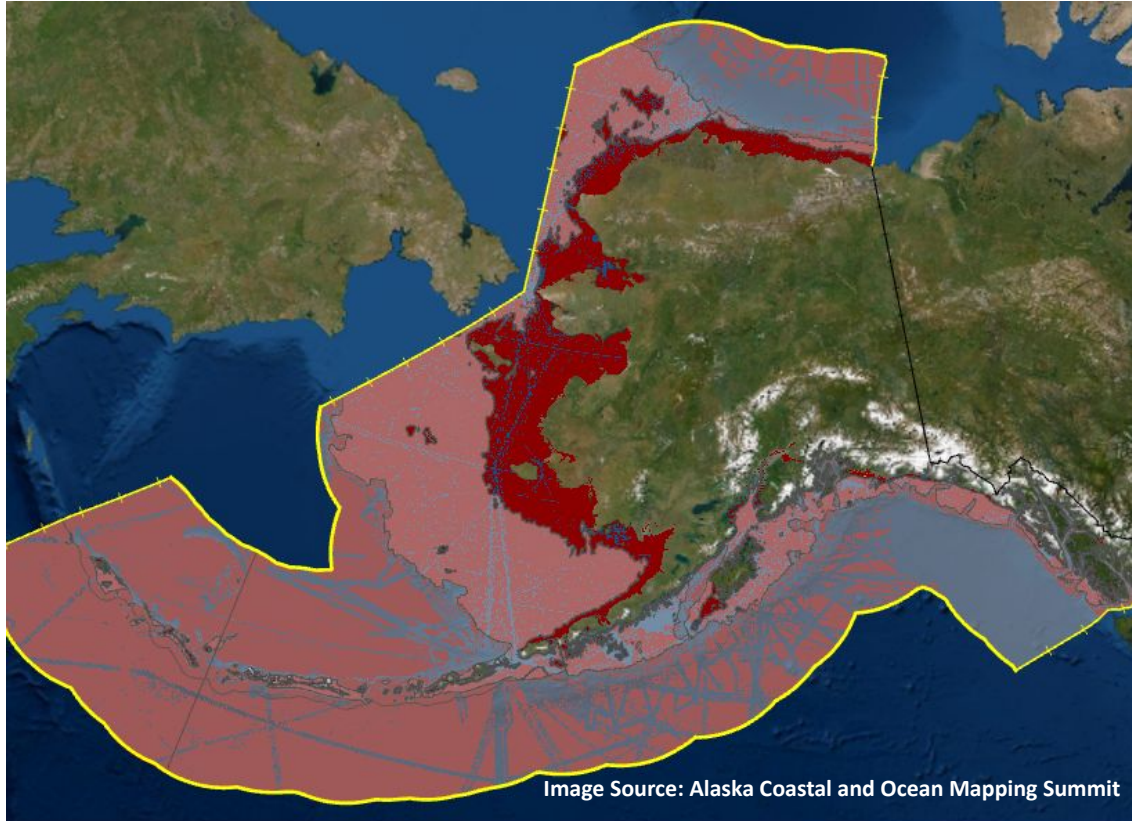


Image Source: Alaska Coastal and Ocean Mapping Summit

## Data as a Service

- Using Uncrewed Surface Vessels (USVs), XOCEAN offers data collection services to Surveyors, Companies and Agencies.
  - Fixed Price, Turnkey Service
  - Data Delivery & Quality Guarantees

## USV Benefits:

- **Safety:** No Offshore Personnel
- **Environment:** Carbon Neutral  
Data
- **Economic:** Significant Savings



# About XOCEAN

# XOCEAN

## Track Record:

- Over **35,000 operational hours**.
- Over **100 projects** across **16 jurisdictions** internationally.
- On target to displace **one million tons** of carbon in next 5 years.



Orsted



PERENCO



MPI Offshore



DEEPOCEAN

bp



REACH  
SUBSEA



MMT



Seadrill



Canada Fisheries and Oceans Pêches et Océans Canada

sulmara  
SUBSEA



Foras na Mara  
Marine Institute



VATTENFALL

# Agenda

XOCEAN

## Agenda

1. About XOCEAN
2. Technology
3. Filling the Data Gaps

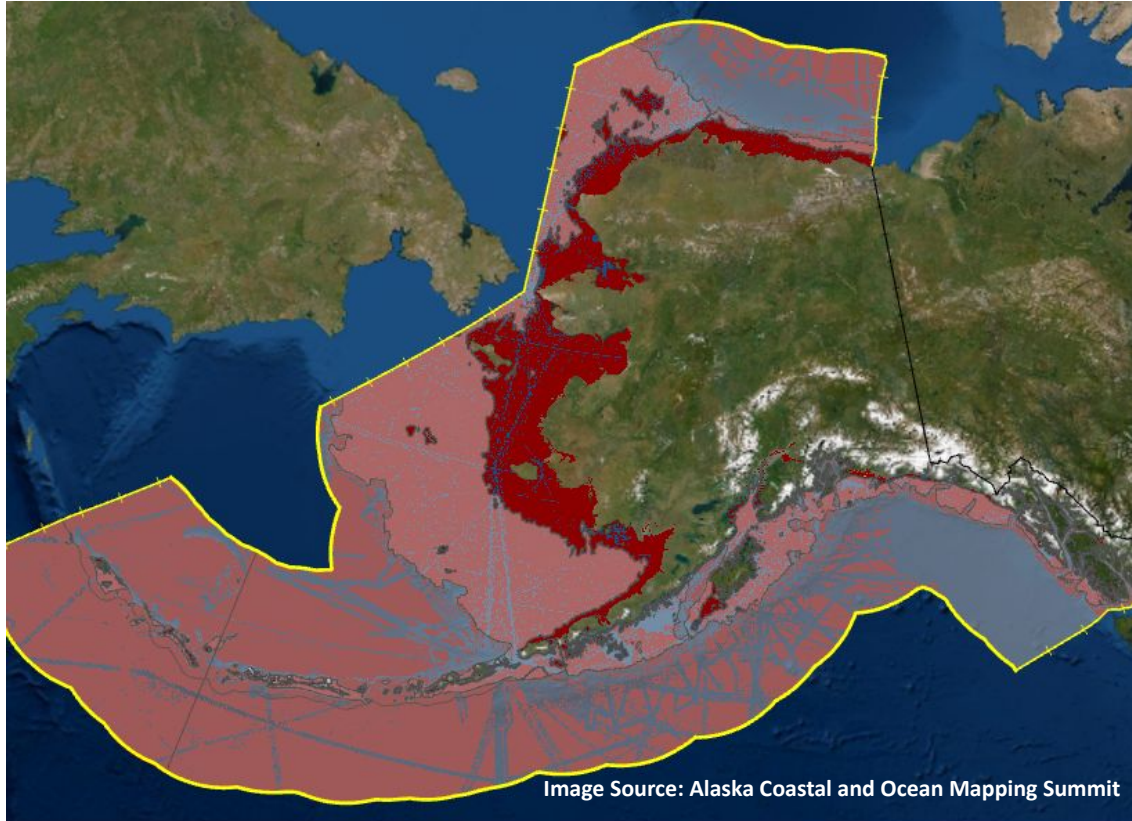


Image Source: Alaska Coastal and Ocean Mapping Summit



## USV Fleet

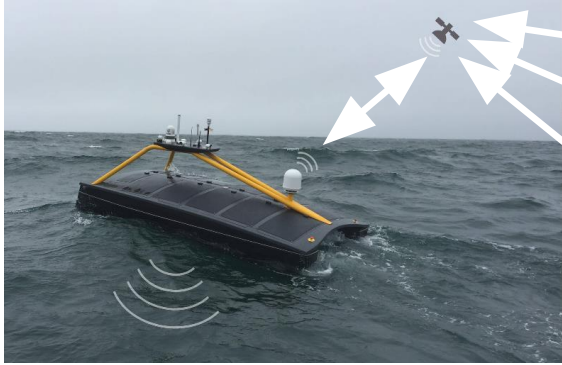
- XOCEAN operates a fleet of 12 x Uncrewed Surface Vessels (USVs) with an additional 6 vessels in production.



## Key Features

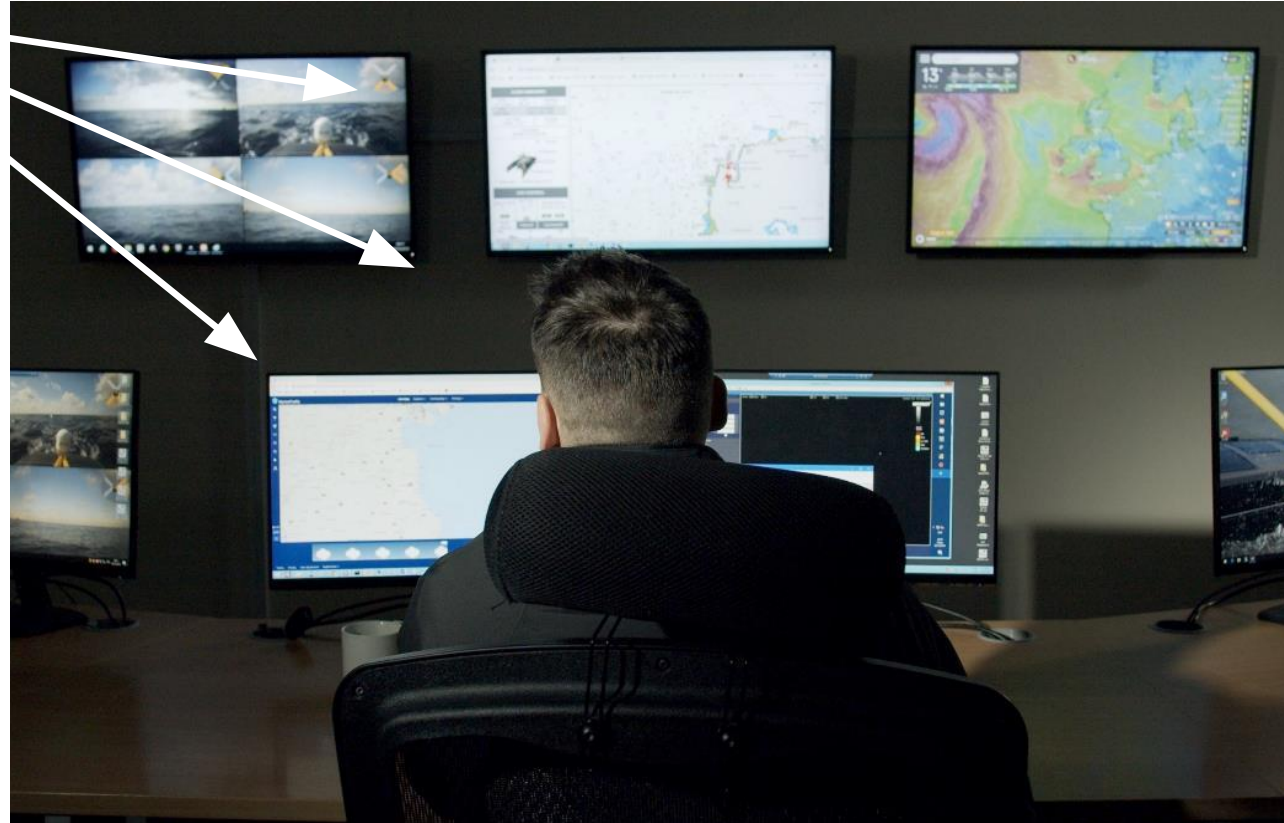
- **Sensors:** Power (up to 6.4kW) and payload capacity (up to 500 kg) for commercial grade sensors.
- **Control:** Full 'Over Horizon' satellite operations; real-time monitoring and control.
- **Efficient:** Slipway, crane or vessel launch (LARS); continuous 24/7 operations up to 22 days.





## XOCEAN CyberDeck

- USV Pilots and Online Surveyors monitor and control the vessels and survey system remotely in real-time 24/7.



## Transport Options

- Road Trailer
- 20ft Shipping Container

## Launch Options

- Slipway
- Crane
- Vessel based LARS



# Agenda

XOCEAN

## Agenda

1. About XOCEAN
2. Technology
3. **Filling the Data Gaps**

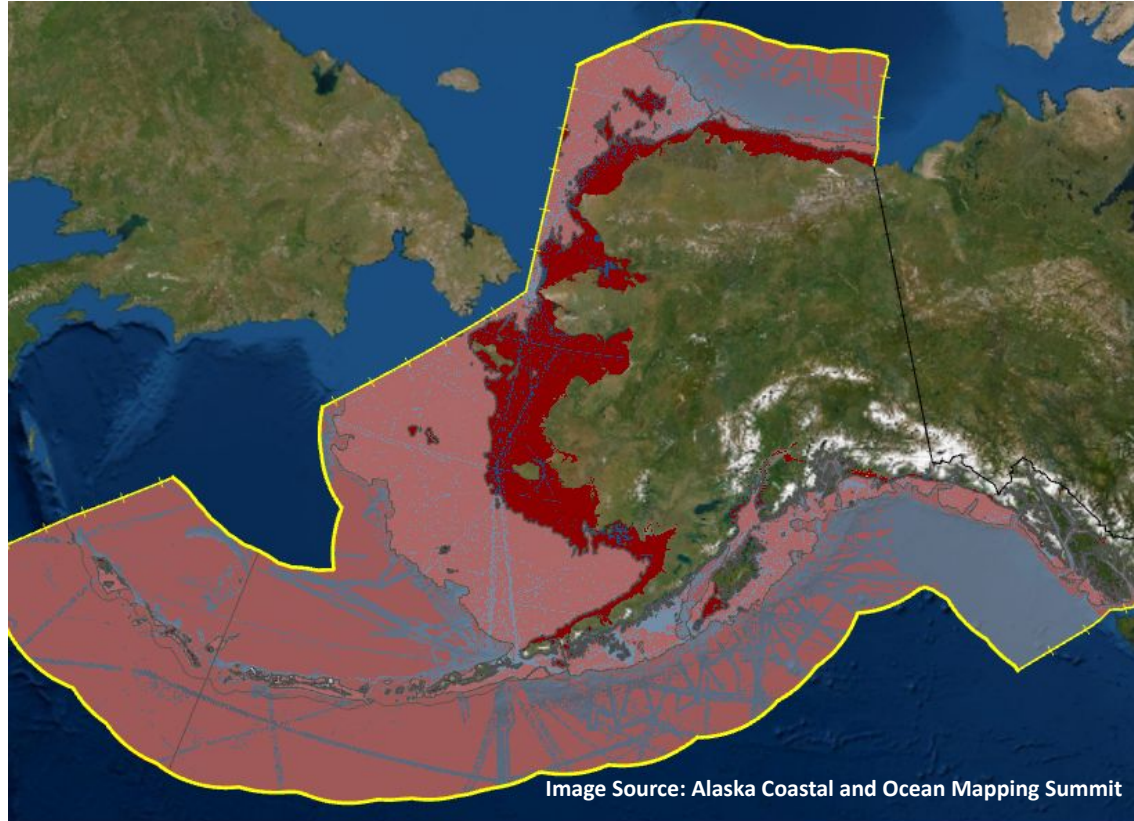
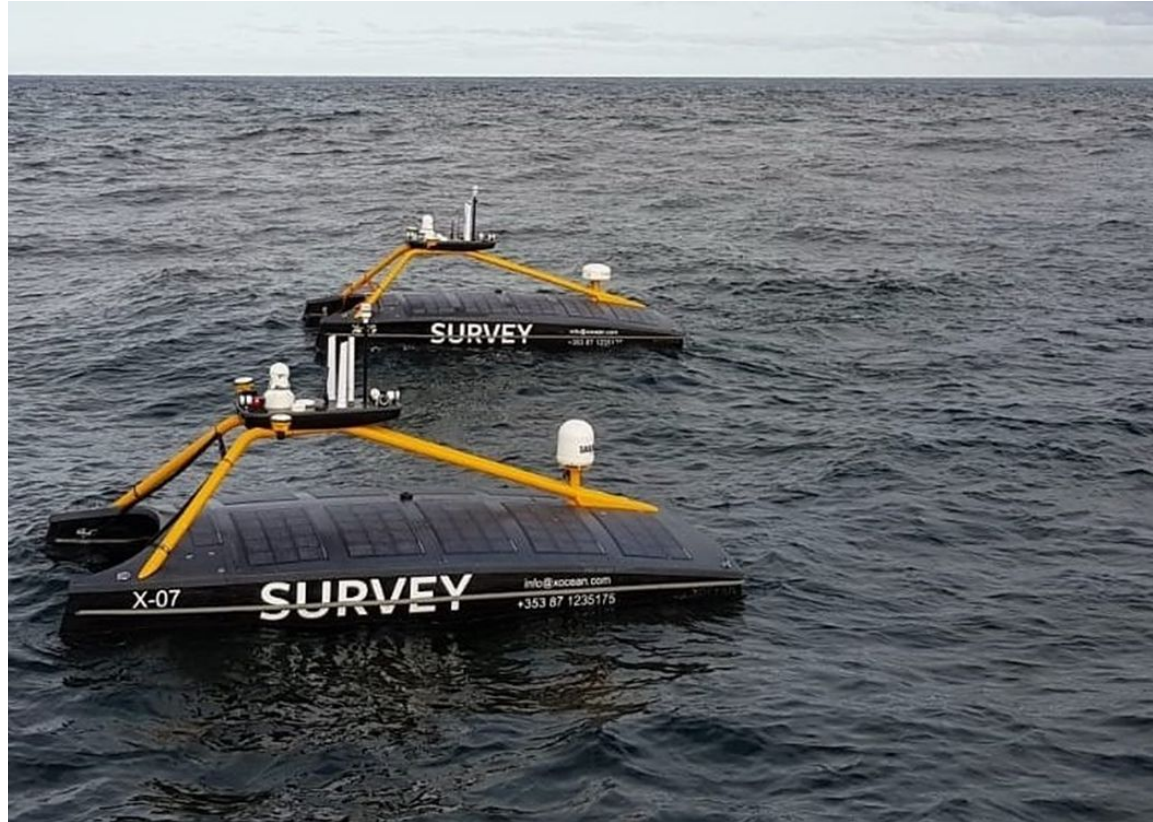


Image Source: Alaska Coastal and Ocean Mapping Summit

# Filling the Data Gaps

## Force Multiplication

- Multi-USV approach (two or more).
- Data collection 24/7 and in Sea State 5.
- Efficiencies gained:
  - **Limit exposure to weather events**
  - **1 x Pilot per USV**
  - **1 x Online surveyor for multiple USVs**
  - **2 x Field operatives for many USVs**



# Filling the Data Gaps

## Local Engagement and Capacity Building

- Personnel for logistical support.
  - **Transfer knowledge and build skills**
- Builders and suppliers of vessels.

## Minimize Environmental Impact

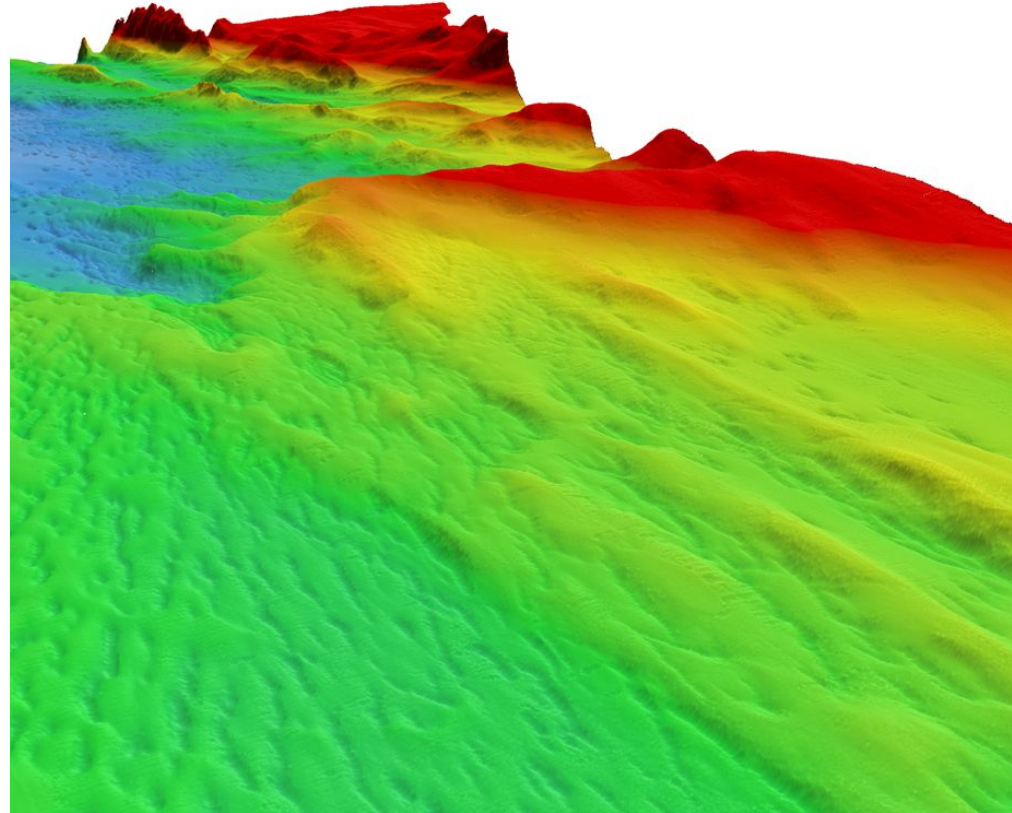
- Minimal carbon footprint (< 5gal diesel per day).
- Quiet platform with low speeds (<= 4kts).
- Cameras support species identification with real-time and 24/7 360° video recording.



# Filling the Data Gaps

## Data Processing

- **Today:** Establish field offices.
  - Weekly data downloads and USV services
  - Data processed while mapping operations are ongoing
- **Tomorrow:** Stream data to the cloud.
  - Low orbit, broadband satellite internet
  - Scalable infrastructure to increase productivity
  - Near real-time processing





# Filling the Data Gaps

## Example of Force Multiplication to Expedite Mapping\*

- 0m to 40m water depths: 108,000 nmi<sup>2</sup>
  - Up to 2030: 49 x USVs and ~12,000 nmi<sup>2</sup> per year
  - Up to 2040: 23 x USVs and ~5,700 nmi<sup>2</sup> per year
  
- 40m to 200m water depths: 228,000 nmi<sup>2</sup>
  - Up to 2030: 22 x USVs and ~25,300 nmi<sup>2</sup> per year
  
- Combine multiple USVs with survey vessels to further increase capacity.

\*Based on 100 survey days per year

		USVs for 0m to 40m					
		2418	20.0	35.0	50.0	65.0	80.0
Survey Days	60.0	2055	2041	2035	2032	2030	
	80.0	2047	2036	2032	2030	2028	
	100.0	2042	2033	2030	2028	2027	
	120.0	2038	2031	2029	2027	2026	
	140.0	2036	2030	2028	2026	2026	
	160.0	2034	2029	2027	2026	2025	

		USVs for 40m to 200m					
		2202	5.0	15.0	25.0	35.0	45.0
Survey Days	60.0	2082	2042	2034	2031	2029	
	80.0	2067	2037	2031	2028	2027	
	100.0	2058	2034	2029	2027	2026	
	120.0	2052	2032	2028	2026	2025	
	140.0	2048	2031	2027	2026	2025	
	160.0	2044	2029	2026	2025	2024	

# Questions?

XOCEAN

Thank You!

Matt Holland

Sales Manager Americas

XOCEAN

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W: [www.xocean.com](http://www.xocean.com)





# End of Presentation

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Thank you!





# Saildrone Capabilities

Brian Connon

December 2, 2021 | Virtual



SAILDRONE

**Alaska Coastal and Ocean Mapping Summit  
December 2, 2021**

# AGENDA

- Introduction to Saildrone
- Arctic Operations
- Platforms
- Survey Approach
- Wrap-up



# SAILDRONE INC

American Made | Owned | Manufactured | Operated



Saildrone is the world's leading collector of in situ ocean and climate data via uncrewed vehicles, above and below the sea surface.

Environmentally friendly | ML enabled | Secure data portal | Based in the USA

# WHY SAILDRONE

Capable | Proven | Trusted



>15,000  
Days at sea

>500,000+  
Miles sailed

>407M  
Samples collected

Global  
Reach

Powered by  
renewable energy



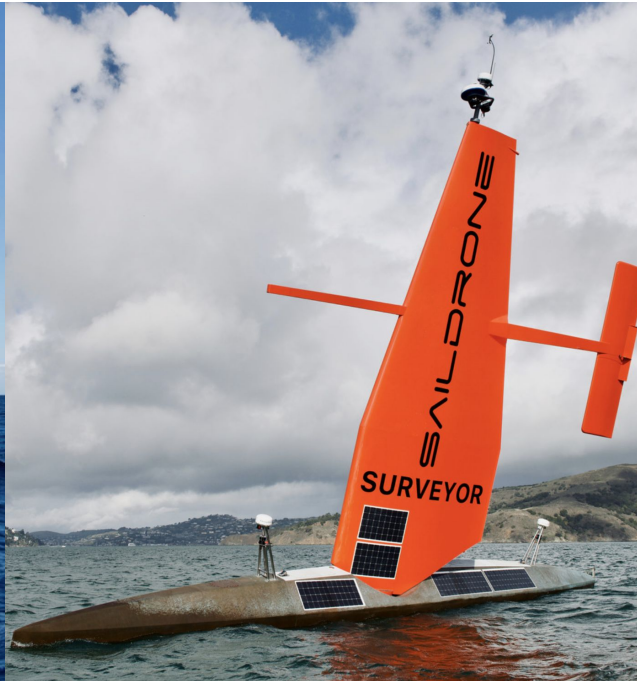
# A GLOBAL FLEET OF OCEAN DRONES

Wind and solar-powered, monitoring the planet in real time, above and below the surface.



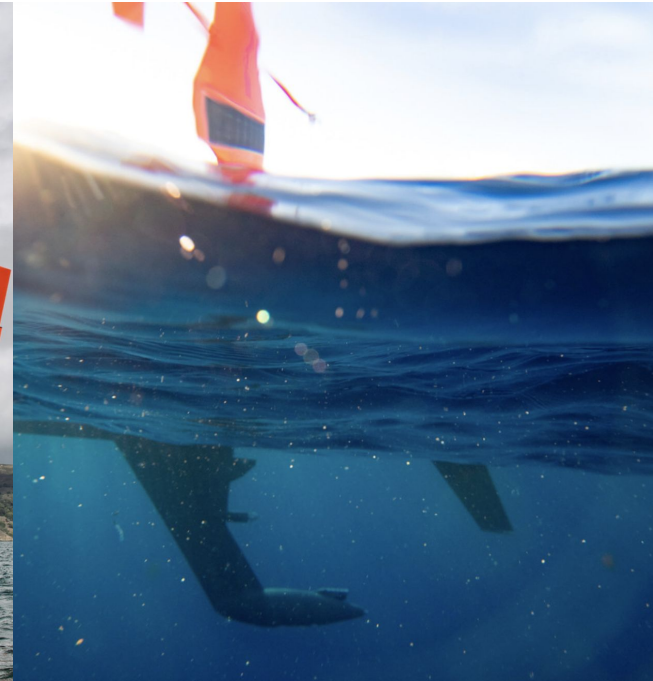
## Maritime Domain Awareness

Intelligence, Surveillance & Reconnaissance (ISR)  
Force Protection | Law Enforcement & Maritime Safety  
Ecosystem Monitoring



## Ocean Mapping

Single-beam and multibeam bathymetric data collection for navigation and charting, telecommunications, offshore energy, and physical oceanography to 23,000 feet (7,000 m) depth.



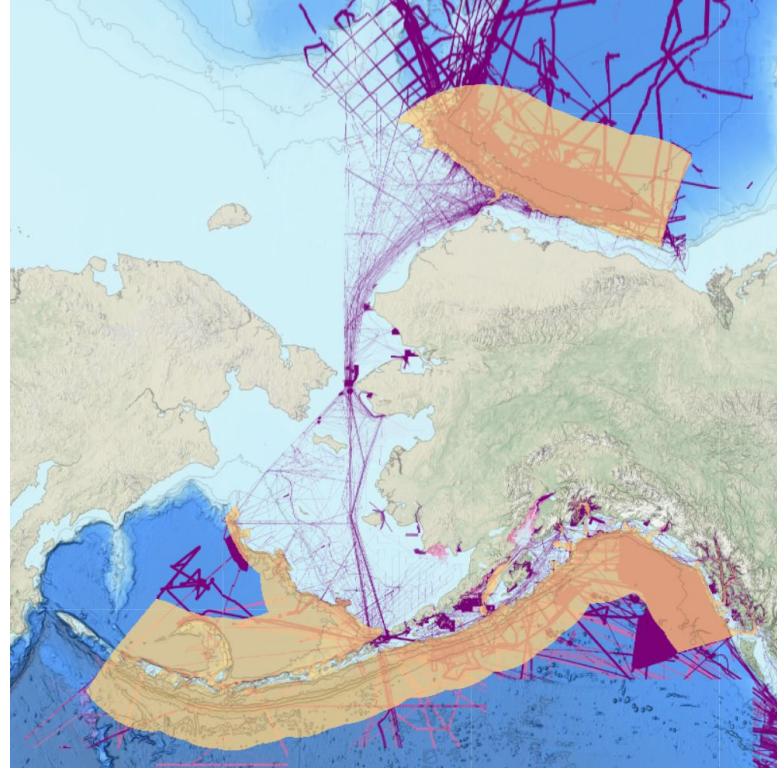
## Ocean Data

Collecting essential ocean and climate variables.  
Fisheries | Metocean Data Collection | Ecosystem monitoring | Satellite Calibration/Validation

# ARCTIC OPERATIONS - CHALLENGING



- Water Depths
  - Extremely shallow to very deep
  - Expansive shallow area
- Environmental Conditions
  - Extreme weather events
  - Sea Ice
- Local Factors
  - Fishing fleets
  - Marine mammals
- Sheer Size
  - Huge area to survey
  - Limited ports for logistic support



# ARCTIC OPERATIONS – TIMING IS EVERYTHING



- Survey window is **short** due to ice and weather conditions.
  - Surveying in the shoulder season requires durable system
- Survey time required is **long** due to large area and significant shallow regions
  - Need to limit port calls and transits
- Need systems with long endurance and high survivability to maximize survey time during the available windows.
  - Uncrewed systems

Depth (m)	Time Required (days)
10	2000+
20	1000+
30	805
40	635

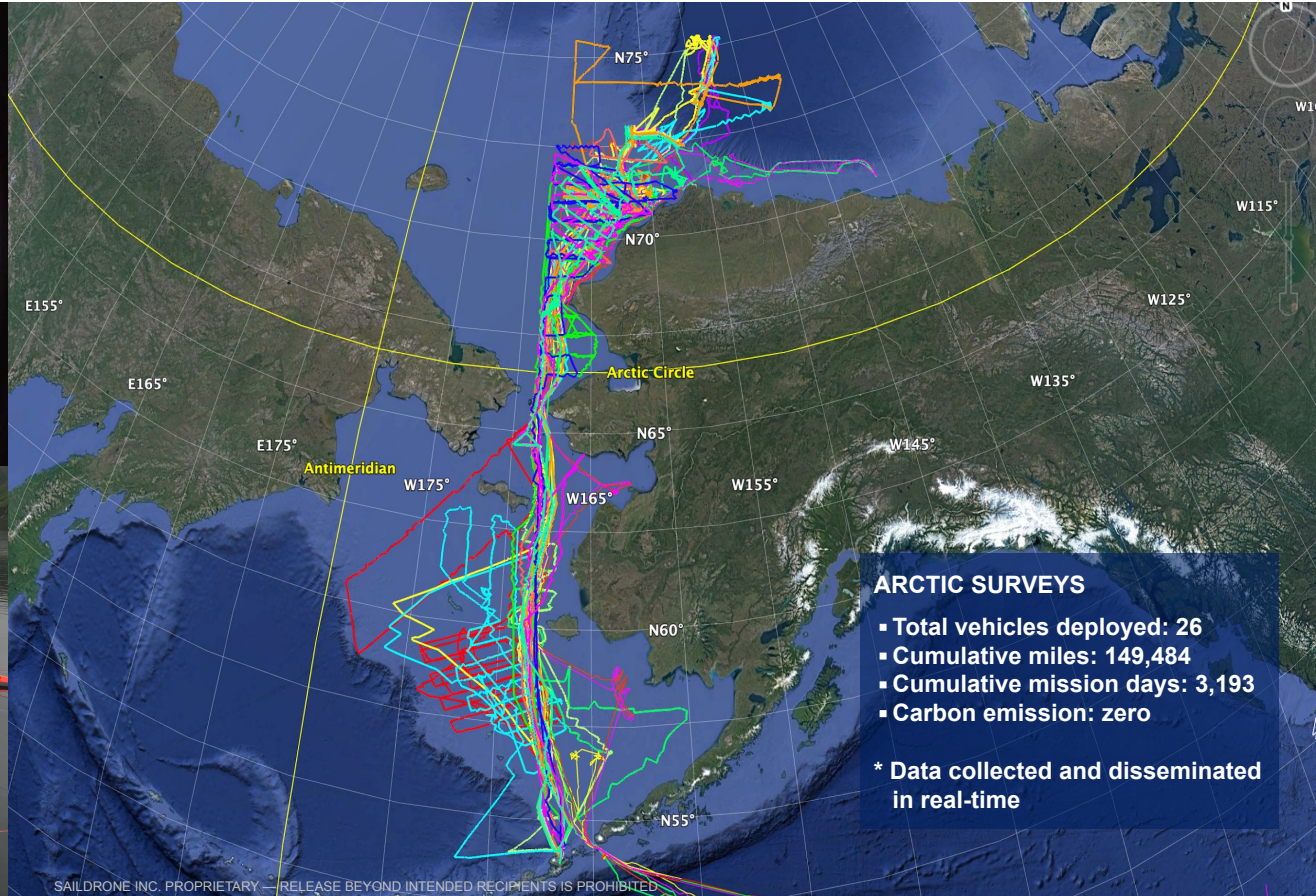
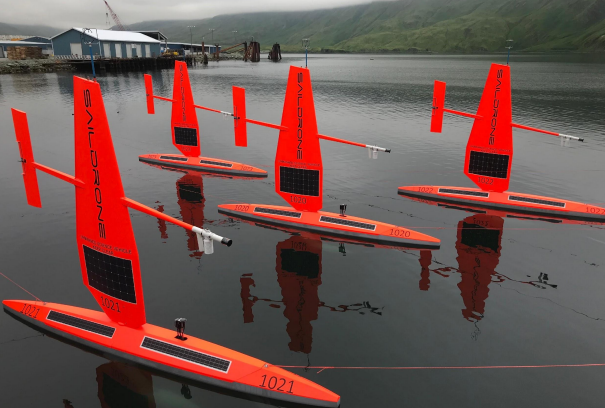
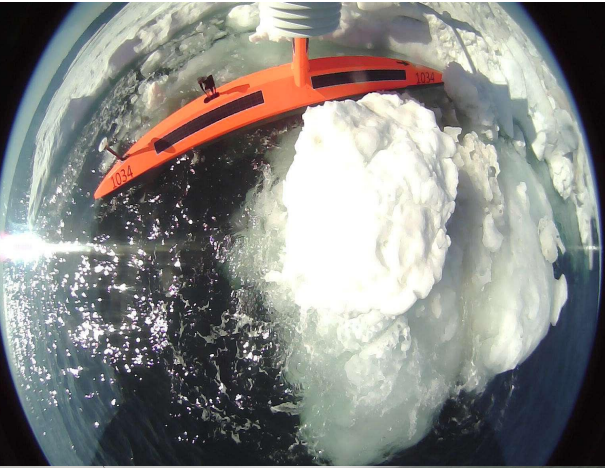
5K nm<sup>2</sup> per year

Depth (m)	Time Required (days)
50	5700+
100	3900+
500	630
1000	261
3000	185
5000	225

65K nm<sup>2</sup> per year

# ARCTIC OPERATIONS – SAILDRONE EXPERIENCE

Tracks from Saildrone missions – 7 Consecutive years in the US Arctic



# EXPLORER

## Recon Single-beam

Simrad WBT Mini, Teledyne  
EchoTrac E20 & Airmar DT800

# VOYAGER

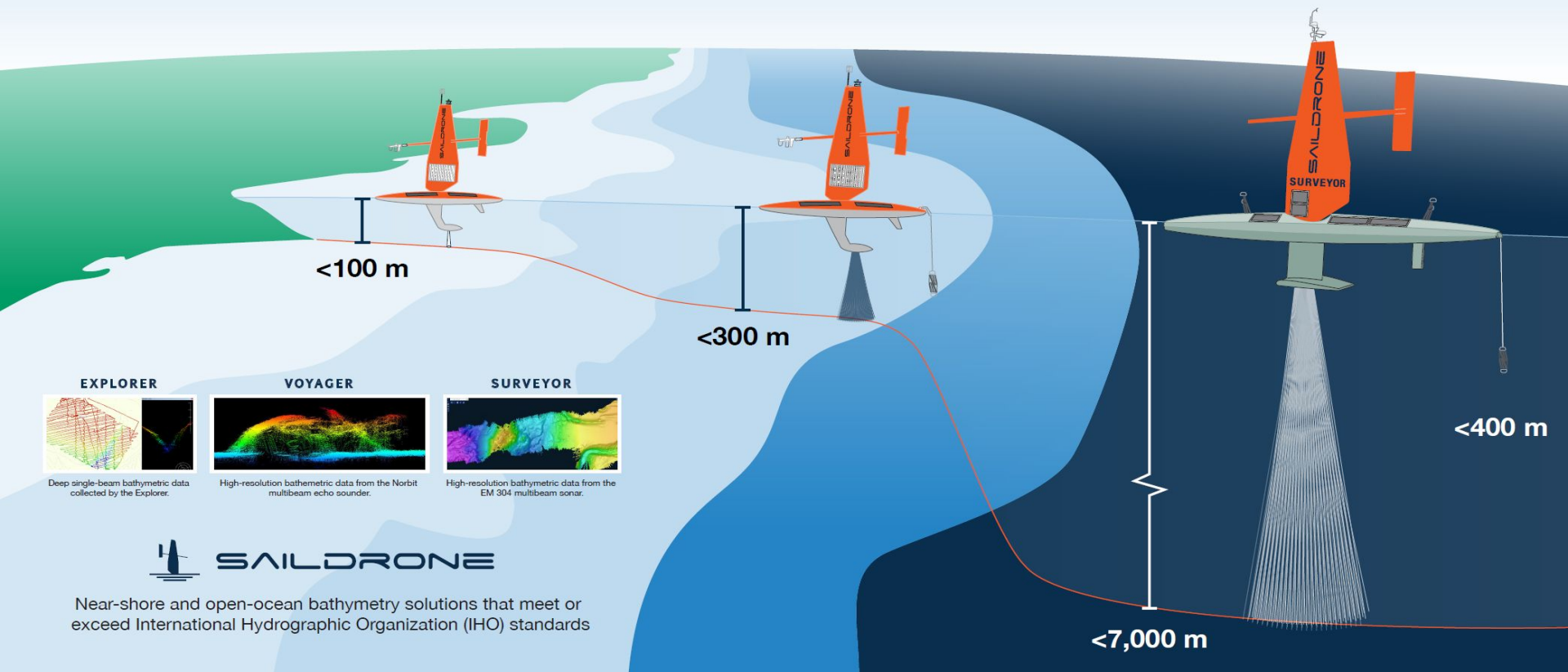
## Medium Multibeam

Norbit Winghead i77h & SVP

# SURVEYOR

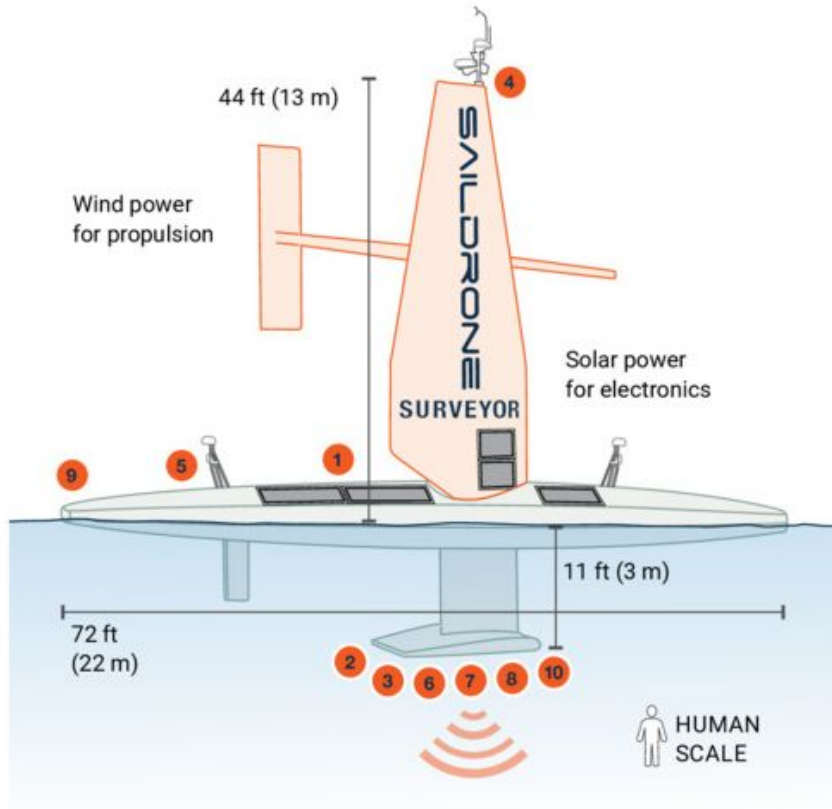
## Full Ocean Multibeam

Kongsberg EM 2040, EM 304 & SVP



# SAILDRONE SURVEYOR

World's largest and most advanced, uncrewed surface vehicle for ocean mapping and exploration



## VEHICLE SPECIFICATIONS

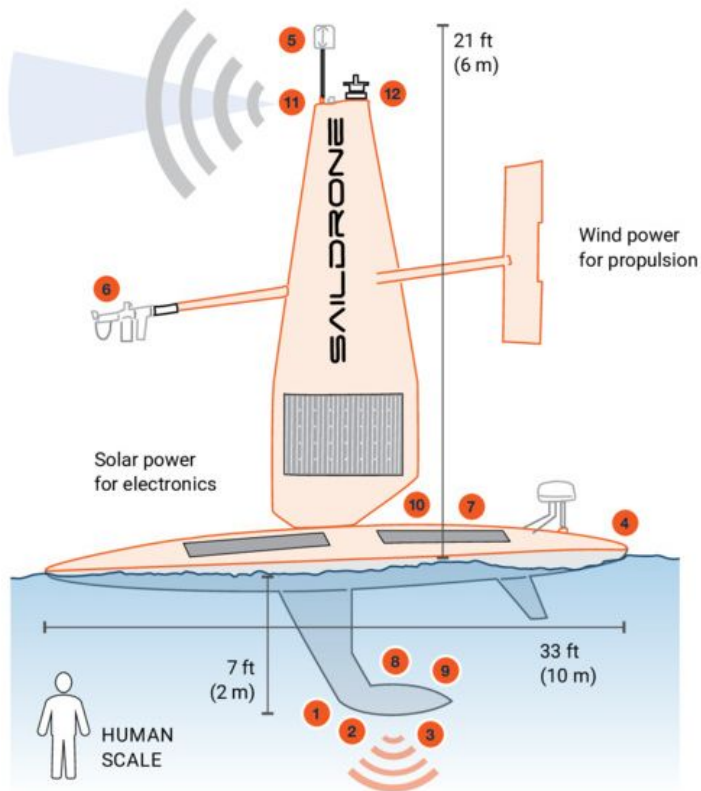
Hull length:	72 ft (22 m)
Wing height:	44 ft (13 m)
Draft:	11 ft (3 m)
Primary propulsion:	Wind (Saildrone wing)
Auxiliary propulsion:	75 hp high-efficiency diesel
Mapping speed:	6 knots
Endurance:	2,500 nm @ 6 knots under power, 9+ months under sail
Payload power:	2,000 W steady state 3,000 W peak

## PAYLOAD OPTIONS

No.	Variable	Sensor
1	Positioning	Seapath 380+ GNSS/INS system
2	Deep-water bathymetry	Kongsberg EM 304 multibeam sonar
3	Shallow-water bathymetry	Kongsberg EM 2040 multibeam sonar
4	Wind speed & direction	B&G WS730S
5	Barometric pressure	Yacht Devices YDBC-05N
6	Ocean currents	Simrad EC150 ADCP
7	Ocean currents	Teledyne Pinnacle 45 ACDP
8	Fish biomass	Simrad EK80 echo sounder
9	Sound velocity profiler	Valeport sound velocity probe (cast depth: 500 m)
10	Surface sound velocity probe	Teledyne SVP 70 (fixed on bottom of gondola)

# SAILDRONE VOYAGER

World's newest and most advanced, uncrewed surface vehicle for coastal mapping



## VEHICLE SPECIFICATIONS

Hull length:	33 ft (10 m)
Wing height:	21 ft (6 m)
Draft:	7 ft (2 m)
Primary propulsion:	Wind (Saildrone wing)
Auxiliary propulsion:	4 kW electric motor
Mapping speed:	5 knots
Endurance:	3+ months
Payload power:	300 W avg.   2 kW peak

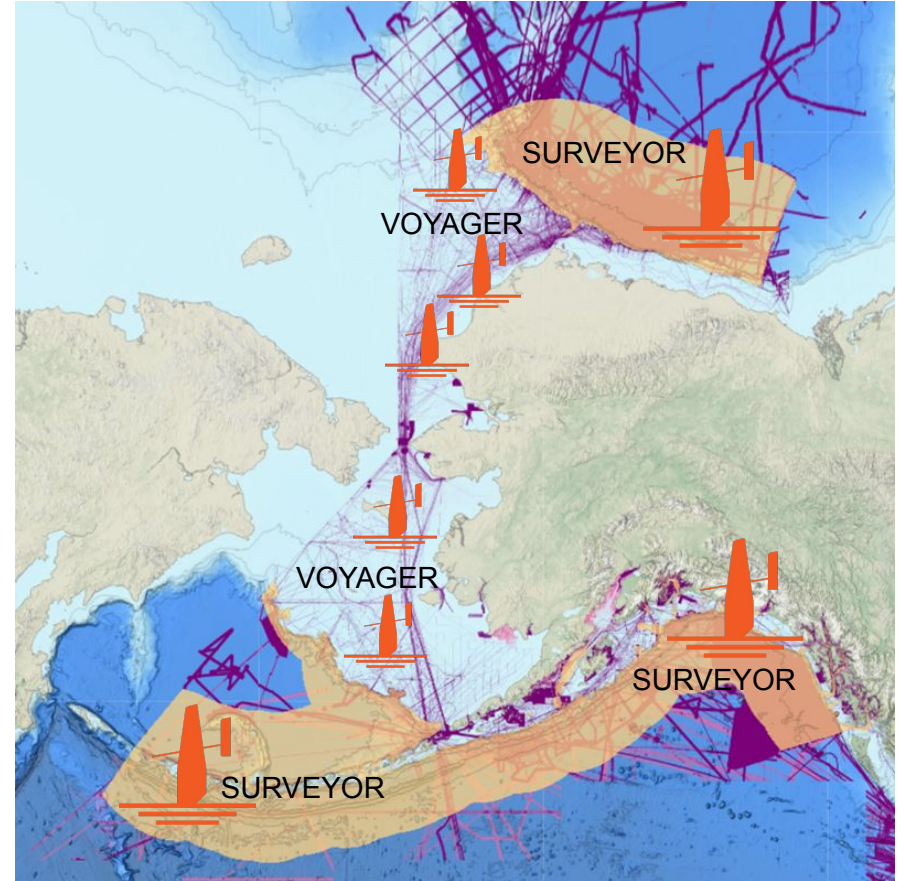
## PAYLOAD OPTIONS

No.	Variable	Sensor
<b>ACOUSTIC</b>		
1	Bathymetry	Norbit Winghead i77h 300 meters
2	Positioning	Integrated POS MV OceanMaster
3	Sound velocity	Integrated sound velocity profiler
4	Sound velocity & winch	Integrated sound velocity profiler down to 150 m depth

# ALASKA SURVEYS – RECOMMENDATIONS



- ALB as much as possible
  - How deep can it see?
- Focus manned operations nearshore
  - Including USV work in dangerous areas
  - Ports and harbors
  - Maximizes onstation time
- Utilize USVs in open waters
  - 10-200m SAILDRONE Voyager
  - 200m+ SAILDRONE Surveyor
- USVs allow operations to quickly scale
  - Aggressive goals require aggressive approach







<https://www.saildrone.com/>

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SAILDRONE



# End of Presentation

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Thank you!



# Panel Questions

Enter your questions or comments in the Questions box in the menu pane.

# Poll Question

Should we organize an industry day to hear more strategies for filling data gaps?

# Opening Remarks

**Senator Dan Sullivan**



# LUNCH BREAK

## Back at 12:30pm AKT



Alaska Coastal and Ocean Mapping Summit  
December 2, 2021