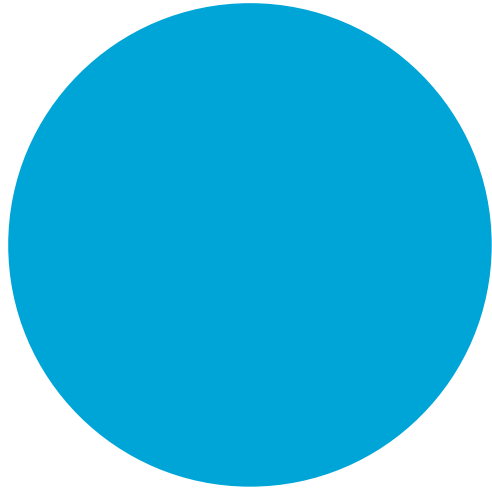




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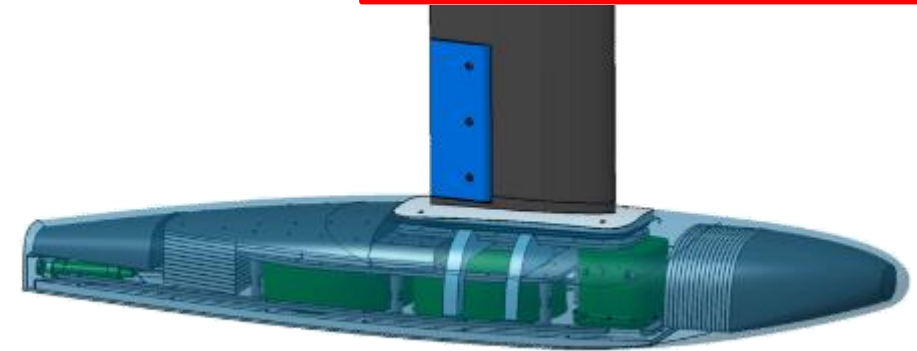
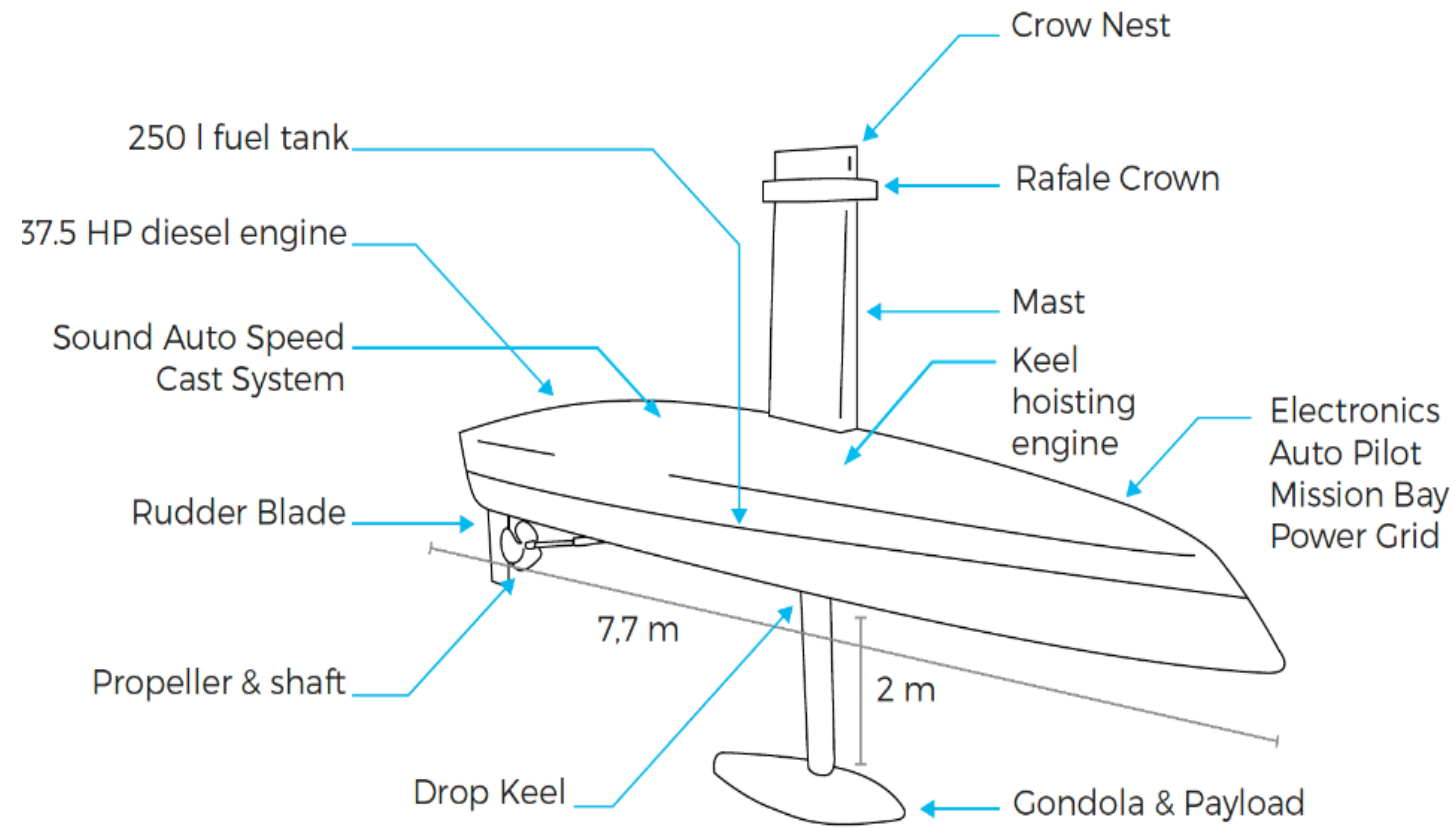
MBSHC

REMOTE HYDROGRAPHY CONCEPT

Ljubljana, 31st March 2022

DriX USV in a Nutshell

PROPERTY OF IXBLUE



Autonomy allows innovations in the design of the platform: Example of DriX

Main Dimensions

Length Overall (LOA)	7,7 m
Beam:	0,82 m
Draft :	2,0 m
Light Weight :	1,4 Tons

Construction materials

Hull & Deck & superstructure	composite material
------------------------------	--------------------

Performance

Maximum Speed :	14 kt
Survey Speed :	8+ kt
Fuel capacity :	250 liters
Fuel Consumption (Survey):	2-3 L/h
Range :	650 nm@ 8kt

Machinery

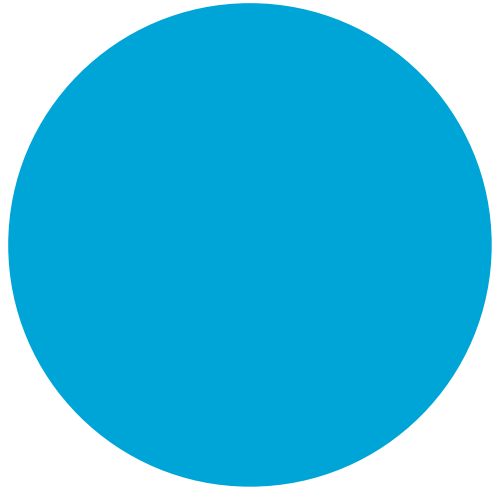
STD propulsion:	1 x 38HP diesel engine
Power Generation:	Up to 3 kW

DriX



MISSION EQUIPMENT :	Mission software, LIDAR, Video Camera, IR camera
MISSION PAYLOAD:	Sensors antennas Inside the gondola
MISSION PAYLOAD:	
COMMUNICATION:	WiFi, Maritime Broadband Radio (MBR) , SATCOM, IRRIDIUM
AUTONOMY:	Up to 1500 Nm

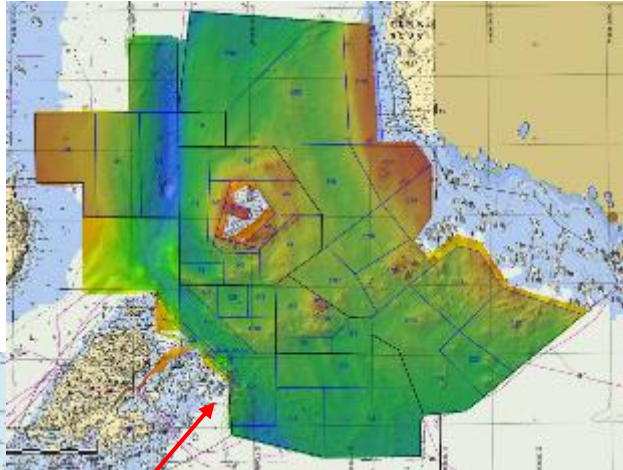




**DriX : Efficient, low carbon
impact survey platform**

DriX 4200km Archeological bathymetric survey

North Atlantic France / Canada



Scope and constraints for wreck detection

- Limited speed and swath to enhance data density
- 6 weeks operation half time 12/24, half time on 24/24 operation for administrative reasons

Total Line Km to cover

4200 km survey
5500 km including transit

**Average overall survey speed
(excluding transit)**

6 kts

Exposed survey area

Average seastate 4

Countries Territorial Waters

France and Canada

Command & Control office

Ship mounted
(3 different vessels used)

Mode: Wifi, radio, Satellite (OTH)

Field office (Hotel)
Main office (La Ciotat, Fr)

Survey grid specs

0.2m down to 50m WD
0.5m down to 100m WD
1m down to 200m WD
2m below 200m WD

USV for wreck detection

34 days at sea in supervised autonomy

3 days weather standby (Seastate >5)

Manning: 1 engineer, 2 surveyors

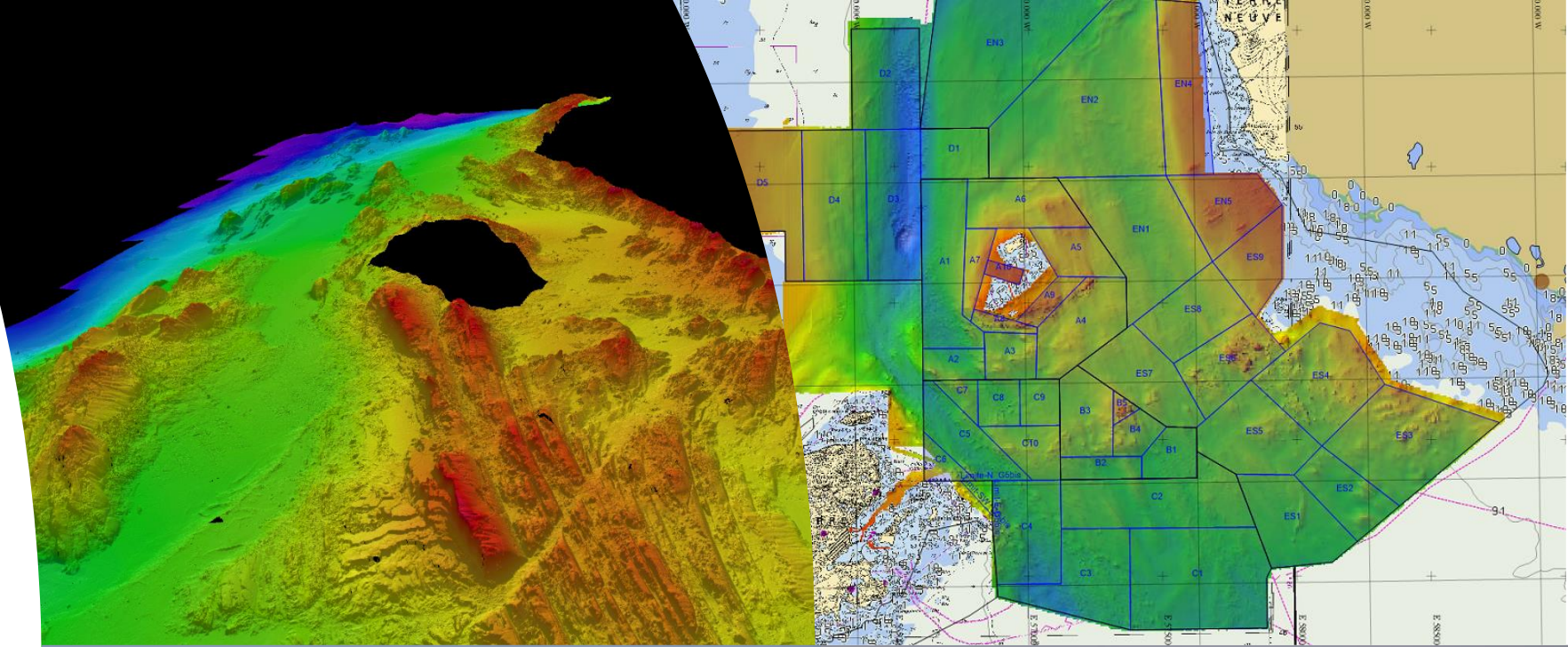
Operational observations:

- **Wind up to 45kts**
- **Current up to 2.5 kts**
- Bad visibility
- **1.5m waves on average**
- 8 to 270m water depth surveyed

Data: **3.6 To**

Improvements:

- 200m swath @WD 270m with the 400kHz – KM EM2040
- **Est. 1.2T of fuel in 34 days**
- **Results 5 times better than previous seabed mappings of the area**
- **0 manual cleaning**
- Minimal post processing



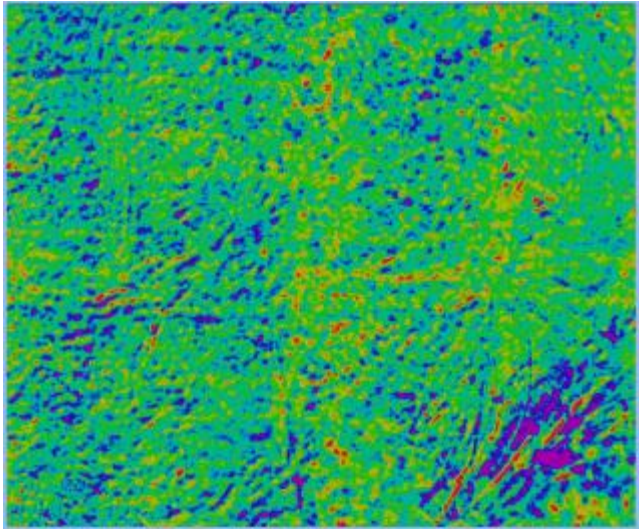
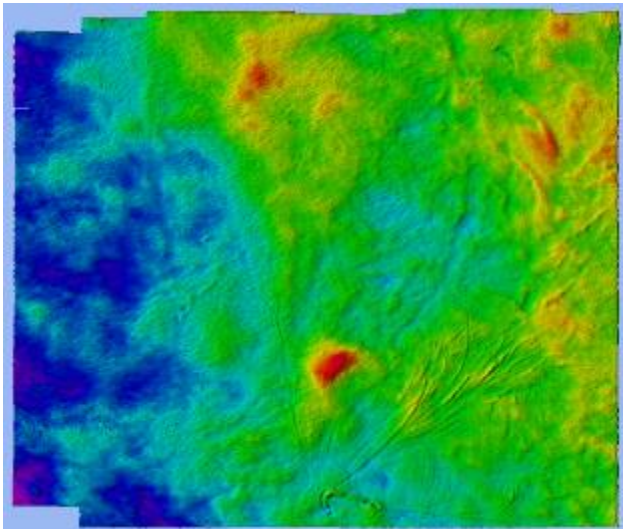
Outstanding Data Quality

Reference area survey

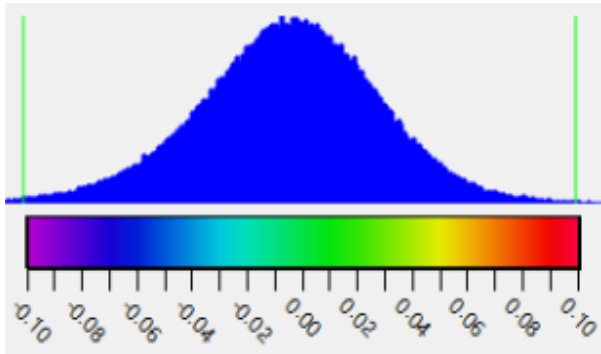


Outstanding achievements on meeting IHO exclusive order requirements in Uncertainty and data density @20m

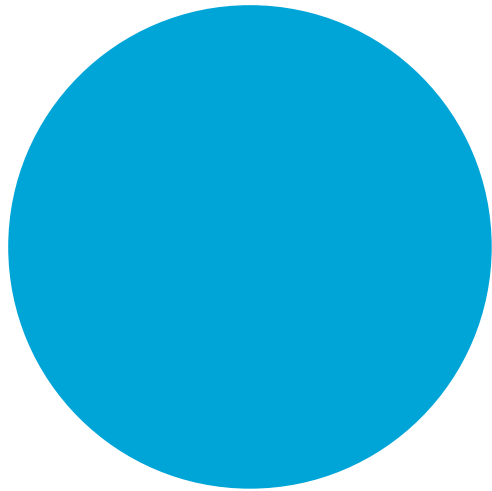
Mean difference respect to reference	1cm
Mean standard deviation	3cm
Result repeated and valid at speed	4, 6, 8, 10 & 14kts



Differential map
DriX vs SHOM ref data set

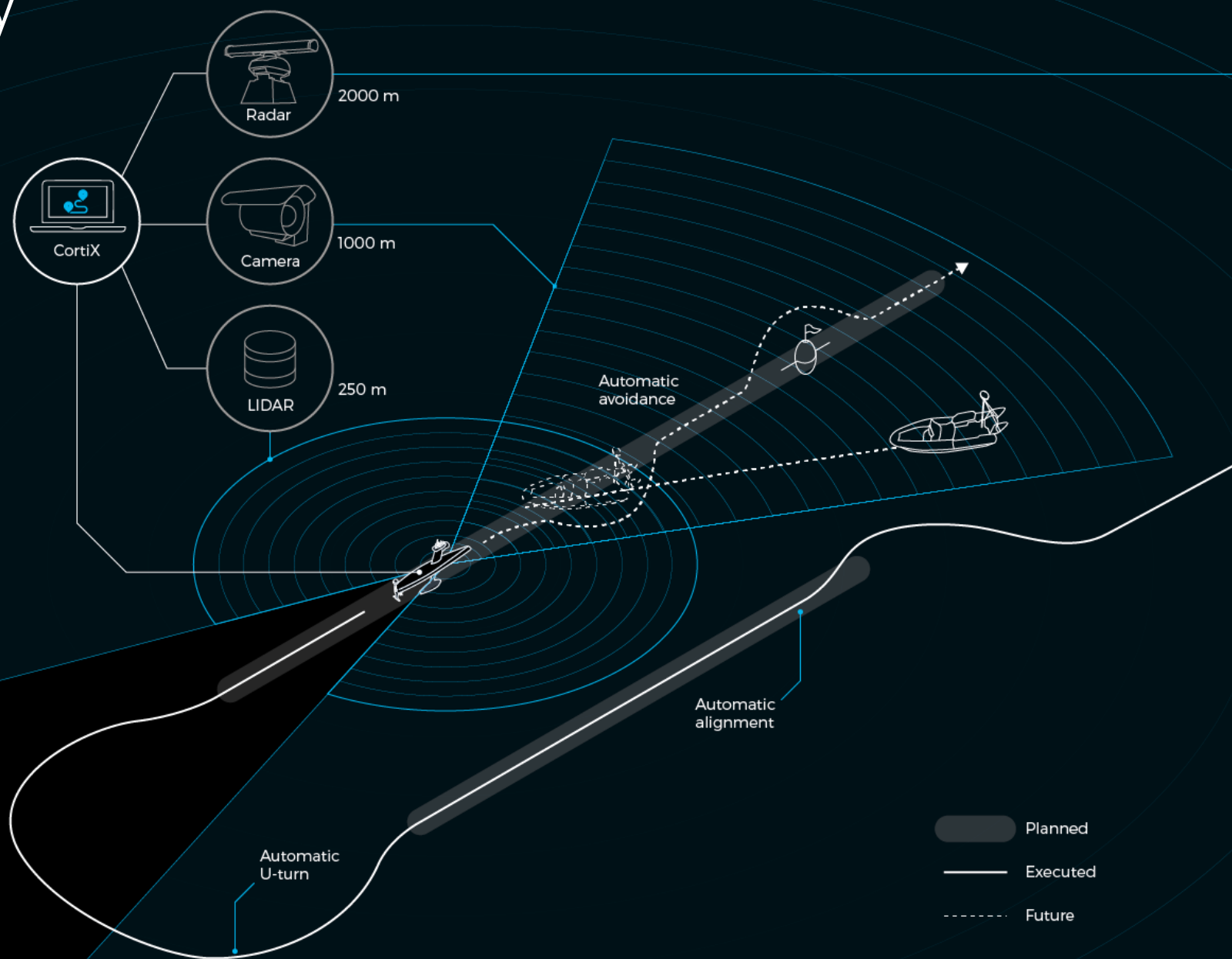


Differential statistic
distribution



**Navigation safety and supervision
is paramount**

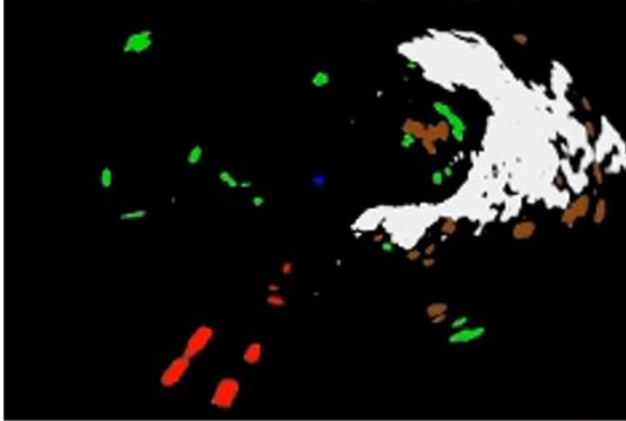
Navigation safety



CortiX OAS – Safety for watercraft

Multi-sensor perception for safe navigation

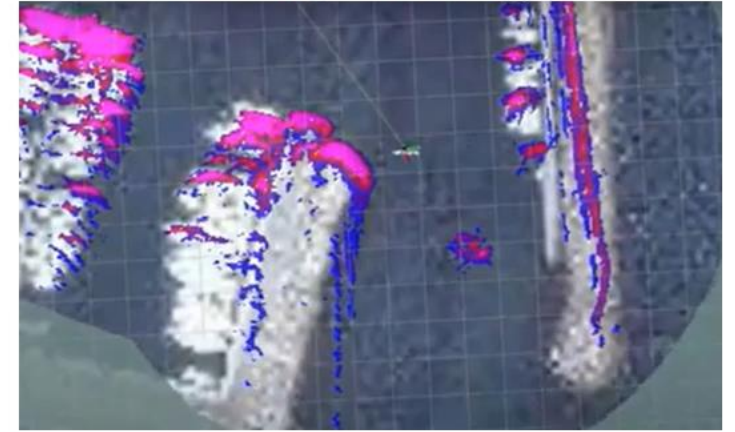
RADAR (Long range)



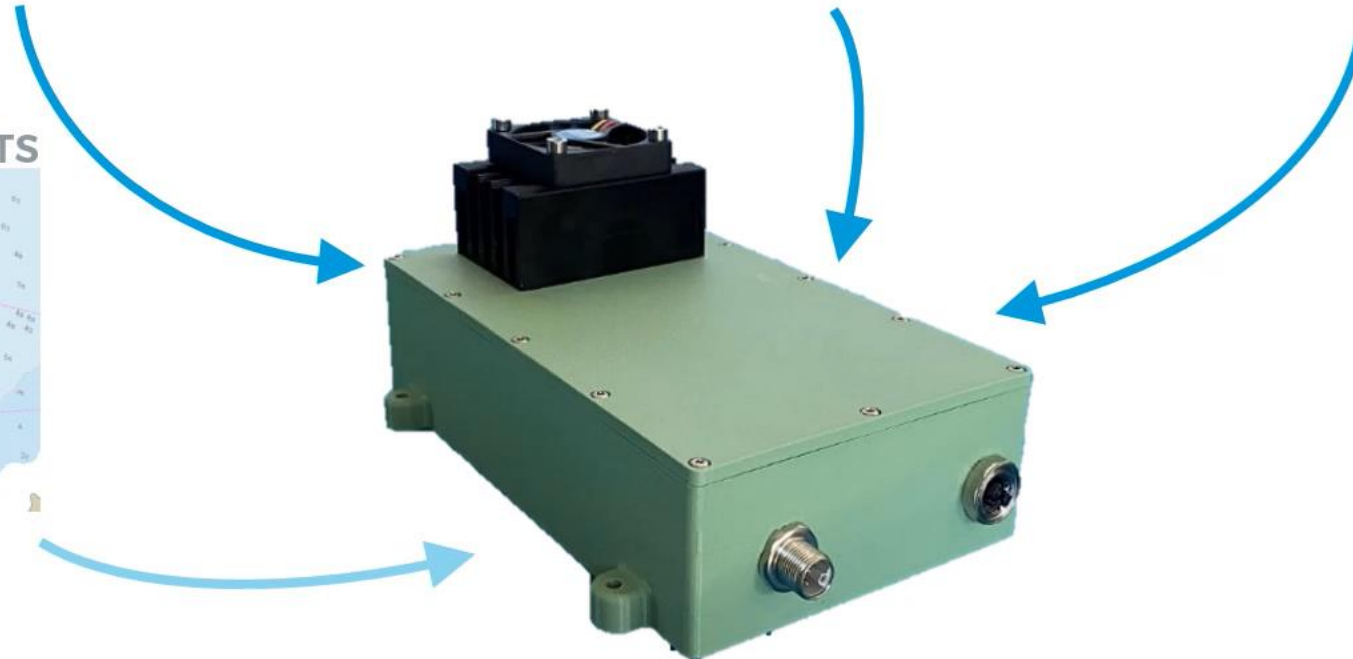
INFRARED (Medium range)



LIDAR (Short range)

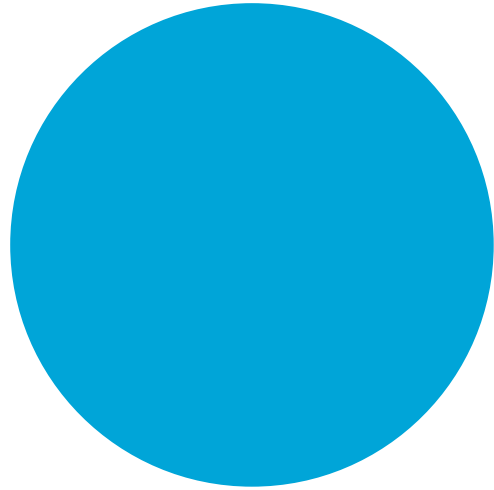


ELECTRONIC NAVAL CHARTS





iXblue



**Enhancing the hydrospatial data
gathering**

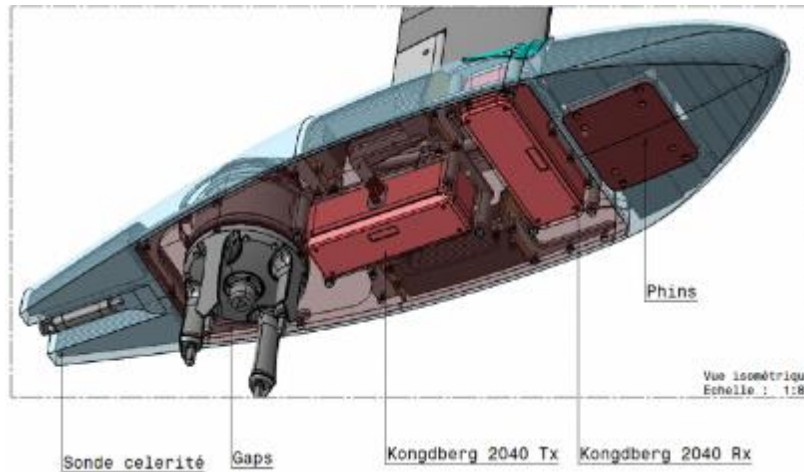
A universal platform

A gondola to house any type of relevant sensor – a serious track record

Example of standard combination



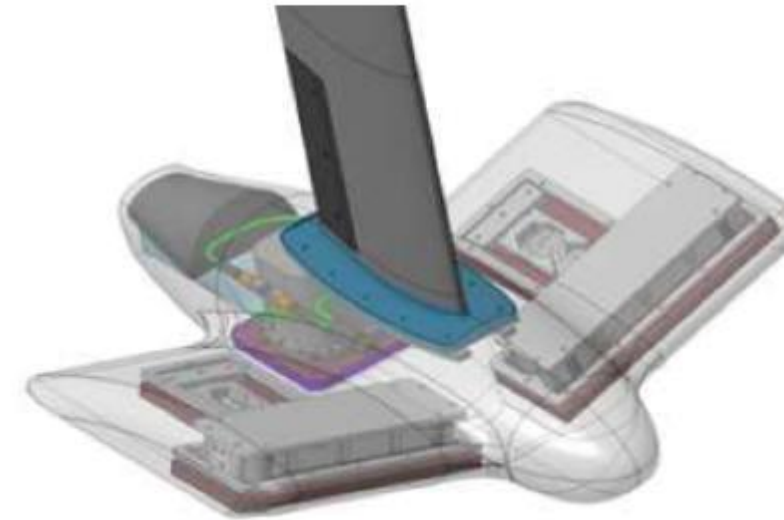
A GAPS USBL and a MBES



Integration track record:

- Multiple brands of MBES
- Side Scan Sonar
- Sub bottom profiler

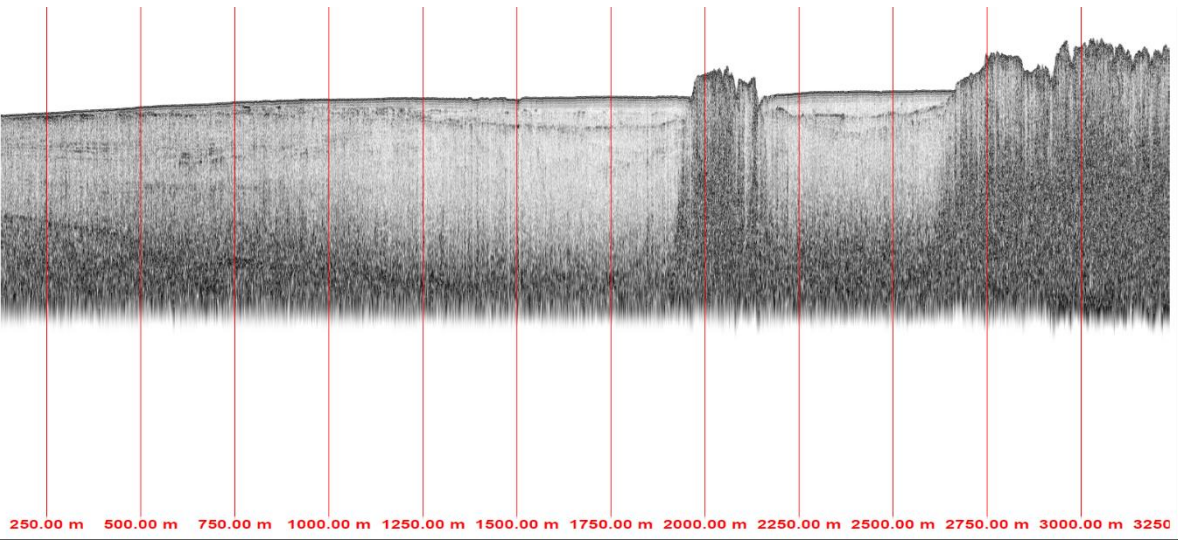
Various sizes and shapes



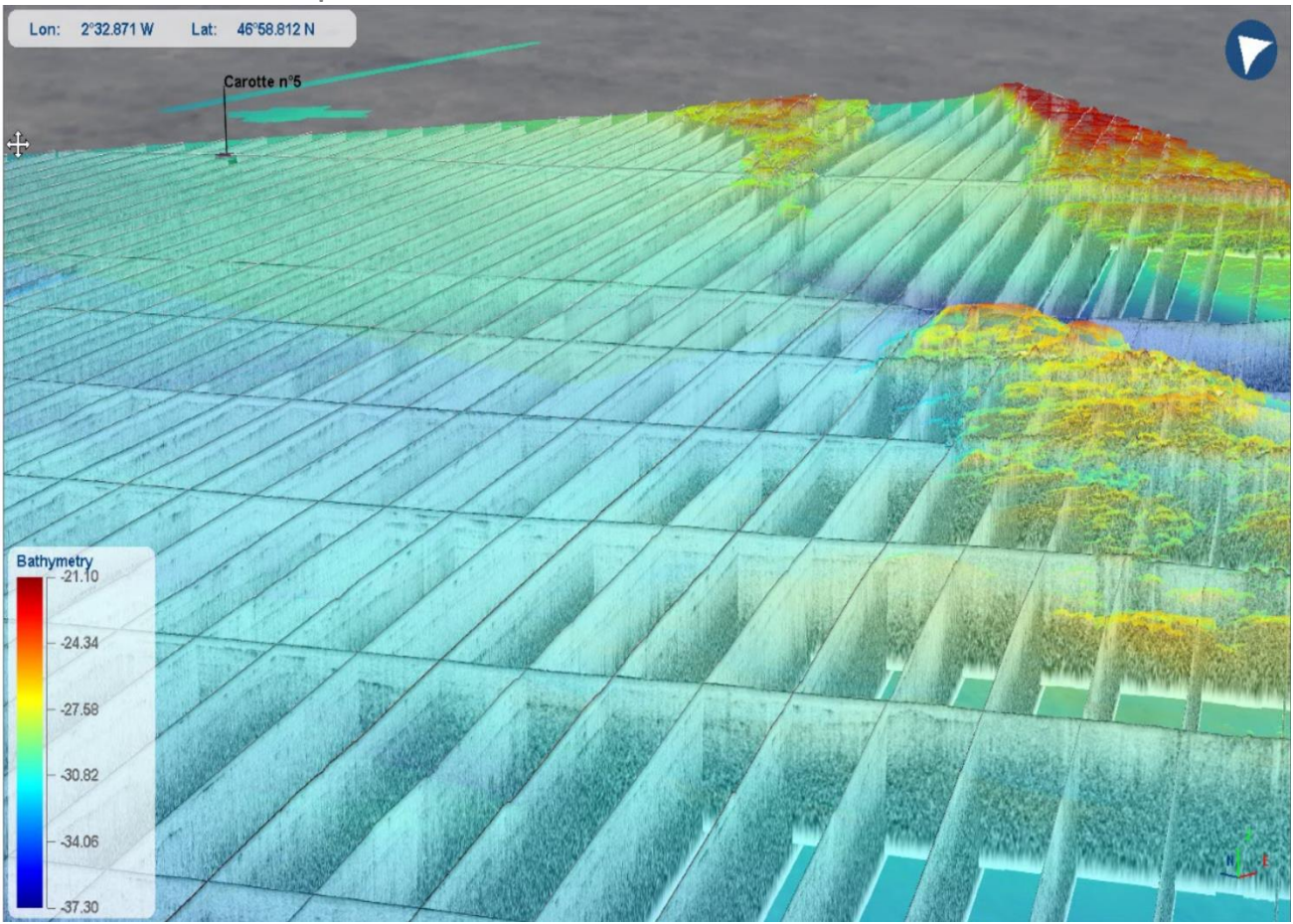
- USBL
 - Acoustic modem
- All customers requirement within

Geophysical survey MBES & SBP simultaneous acquisition

- Large, high resolution sub-bottom survey to assess aggregate extraction / dredging activities
- Reduce cost and impact of routine survey assessment
- Increase data quality : line keeping, low noise environment, well known motion compensation.



SBP profil



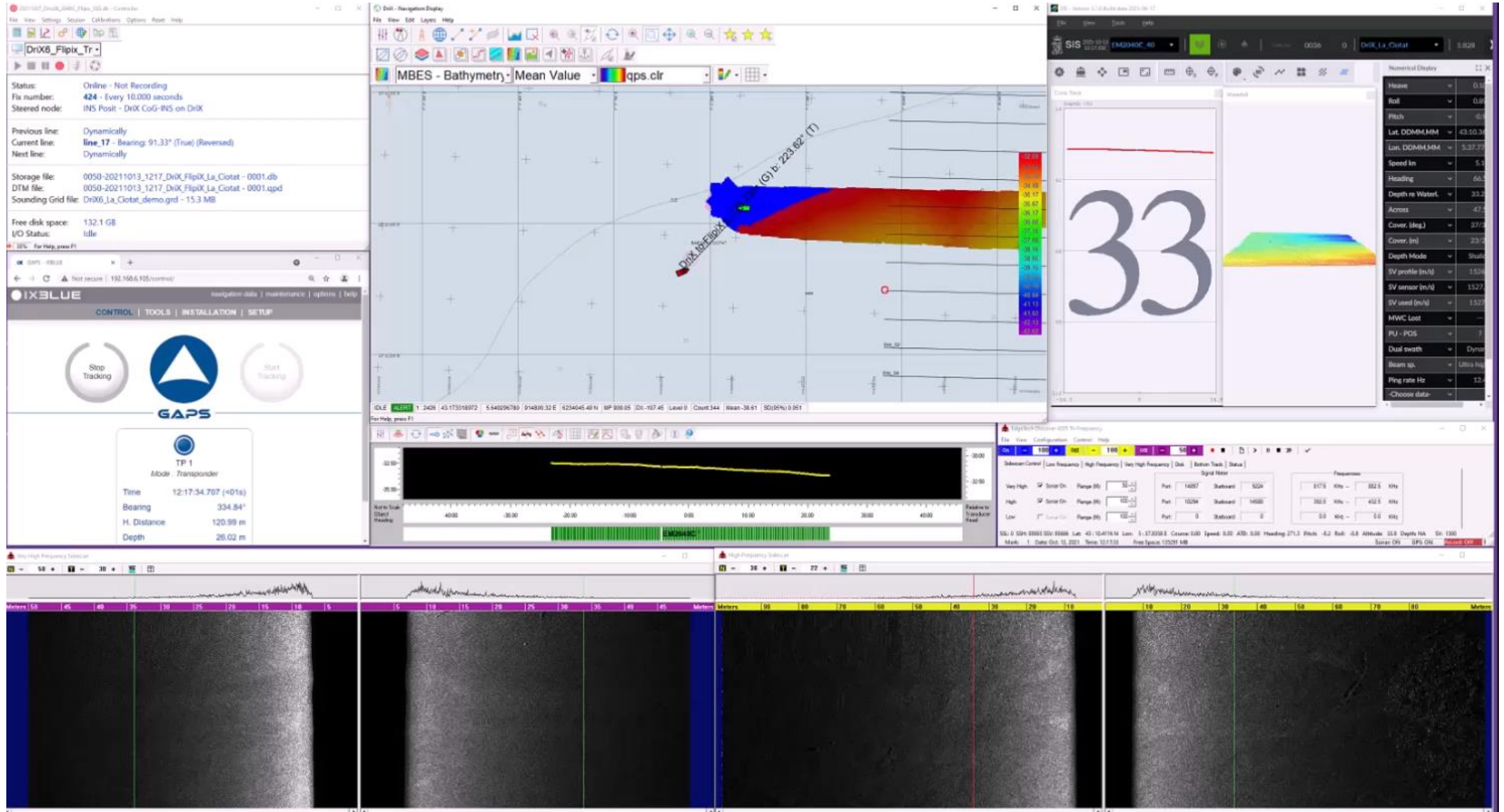
Merged SBP / MBES top of the rocky layer

FLIPIX INNOVATIVE TOW WING

Patent Pending –Confidential Industry

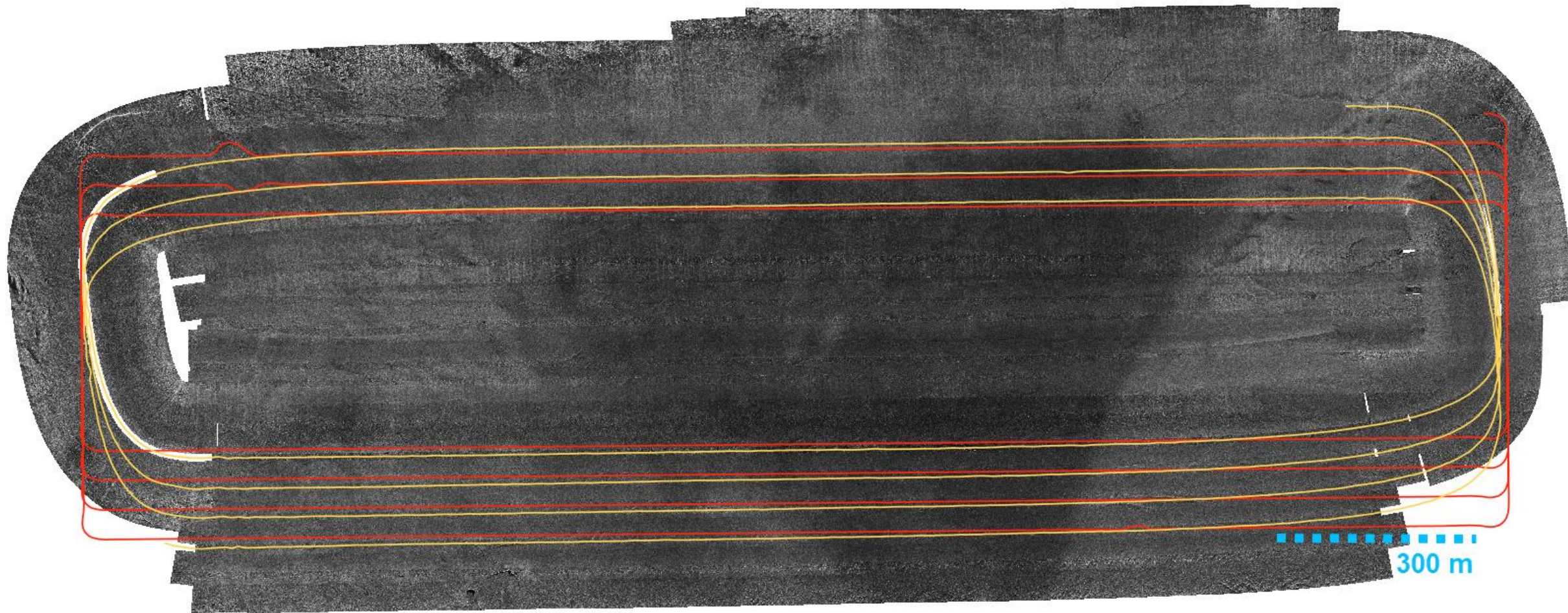
iXblue

Let's Play it Sharper



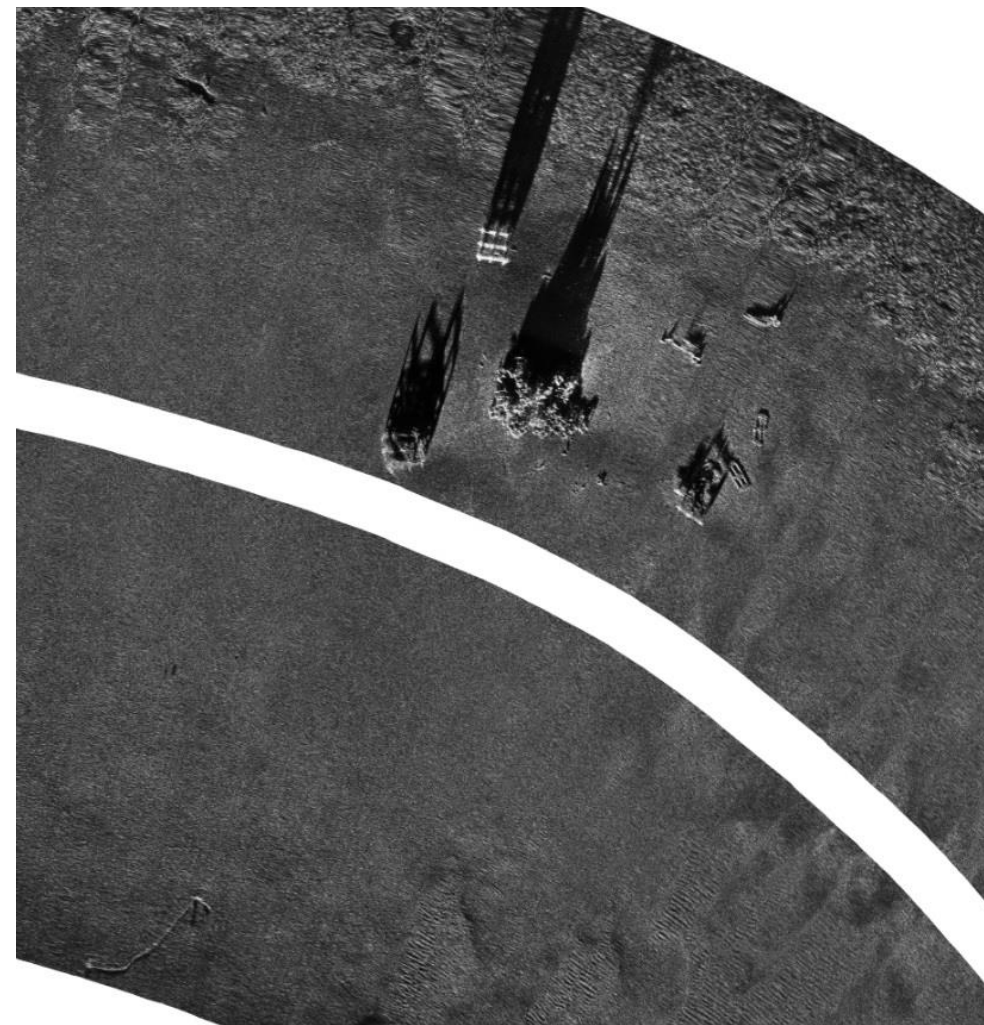
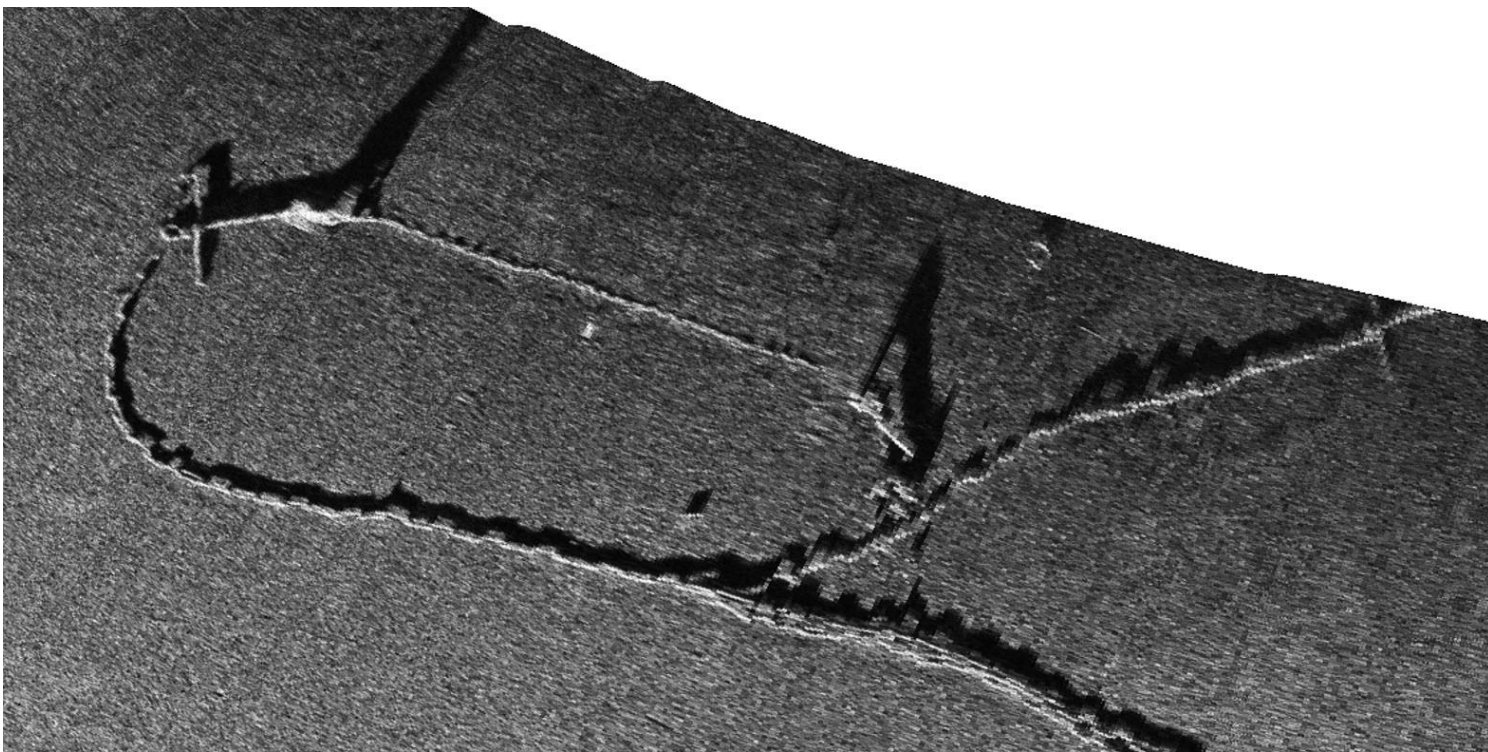
Outsanding Performance

Data Using EdgeTech 4205



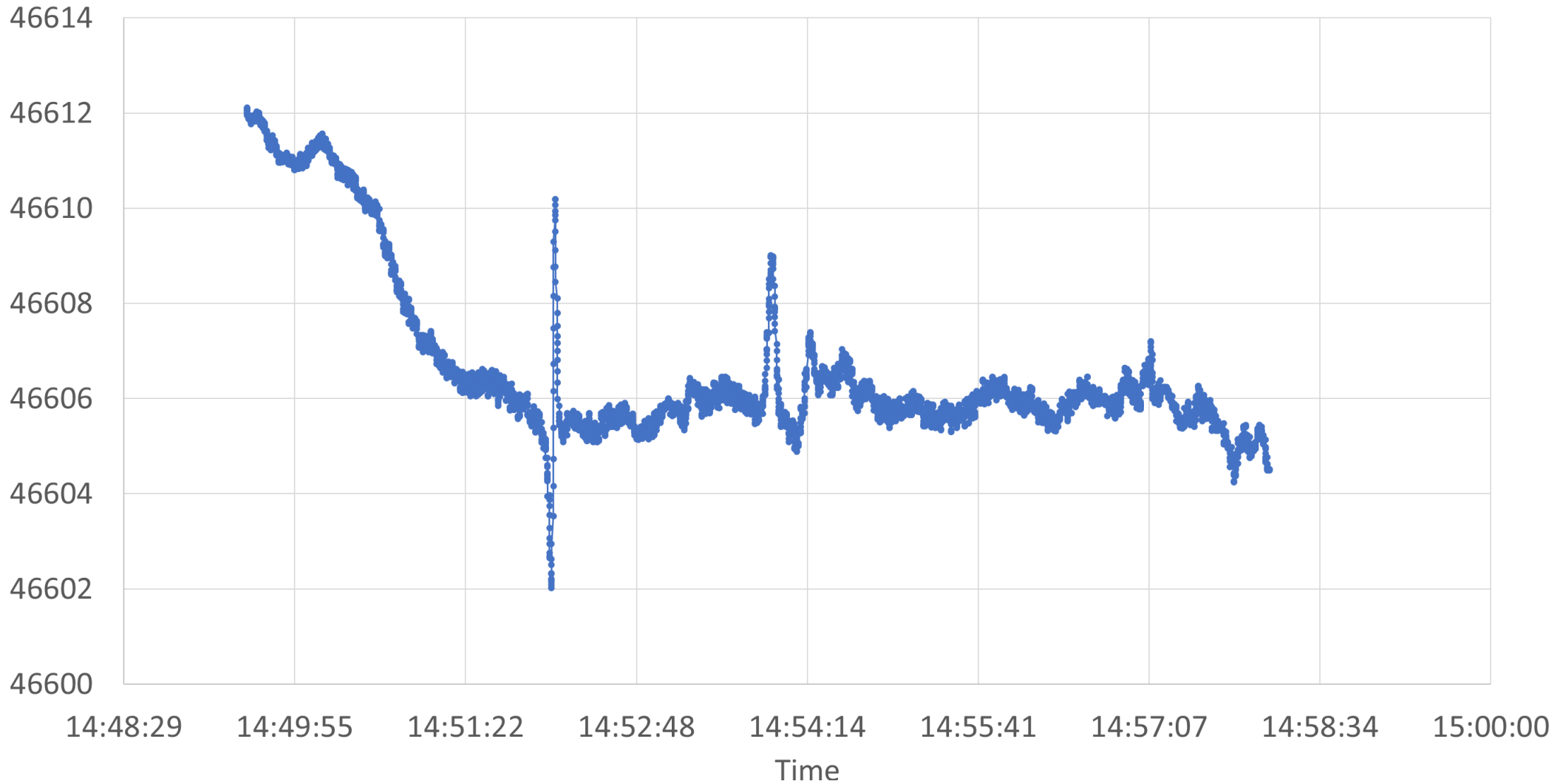
Outstanding Performance

Even during Turns



Outstanding Performance

What about MAG – Low Noise



Outstanding Performance

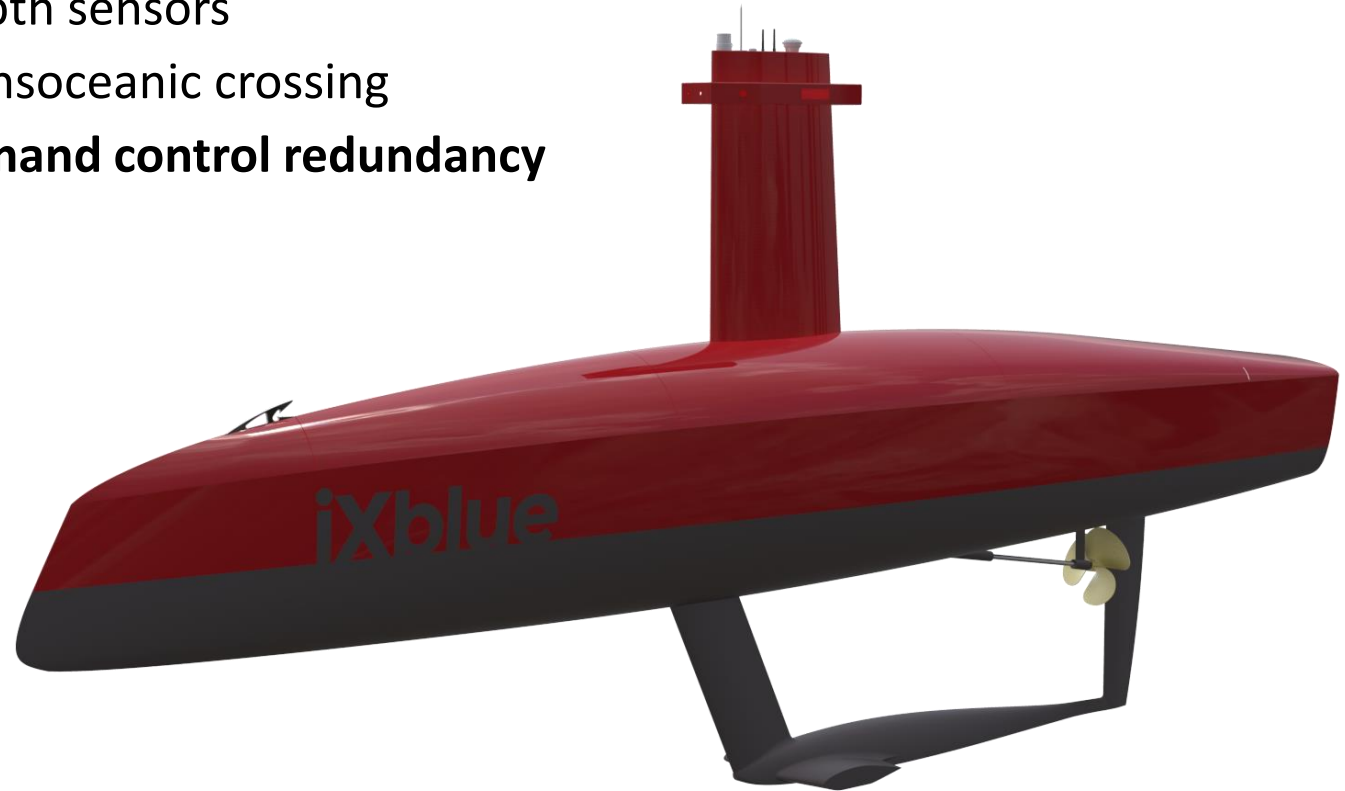
What about MAG – Precise & Accurate Positioning

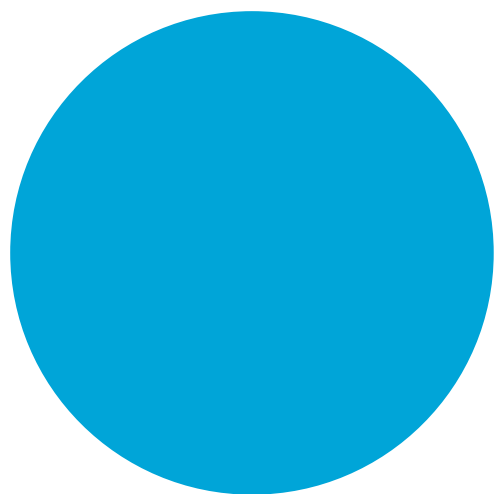


Moving toward transoceanic capabilities

DriX 40

- To keep the dynamic and the key differentiators observed on DriX
- To keep **low manning**
- To enhance the sub-system capabilities (higher power, heavier and larger payload)
- Be capable to carry full ocean depth sensors
- To offer **longer endurance** for transoceanic crossing
- To offer **full propulsion and command control redundancy**





CONCLUSION

Remote Hydrography benefits (I)

Massive reduction of survey costs

- **Drastic reduction of fuel consumption (- 90%)**

fuel consumption: 2.5L/h at 10kts speed

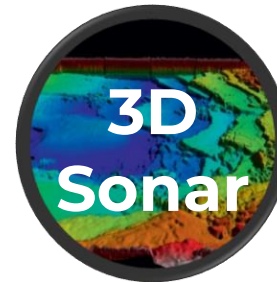
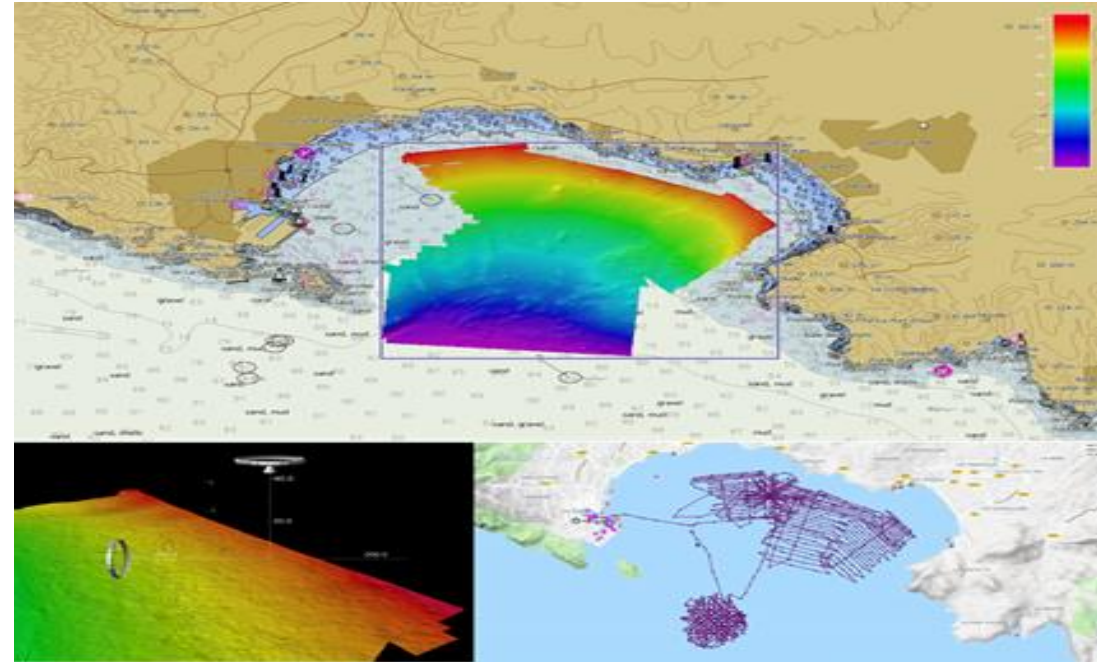
- **Sea proven in Sea state 5**
- **Reduced vessel downtime**

Rapid line Turn, outstanding line keeping

- **High speed surveys up 8 to 12 knots**

4 to 5 knots towing flipiX

- **Line change : less than 1 minute**
- **Endurance 8 days @ 4kts / 3 days @ 8kts**



DriX USV benefits (II)

Better quality data, faster, with improved HSE

- **“Over the Horizon capability”**

Possibility to conduct surveys from ADNOC Control Center, ship, or shore

- **Safety**

Obstacle avoidance to support Collision Regulation (ColReg)

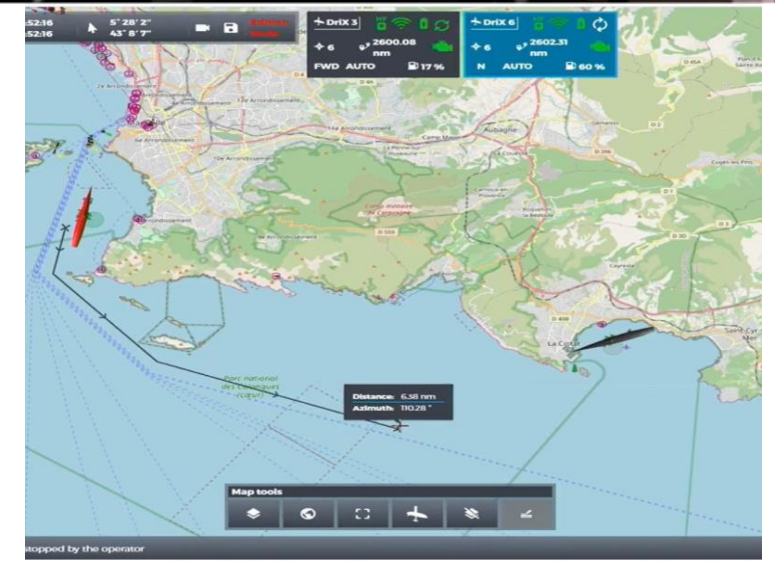
- **Improving further HSE standards**

Personnel exposure, assets, data quality

- **Open architecture**

Caters “all” types of sensors

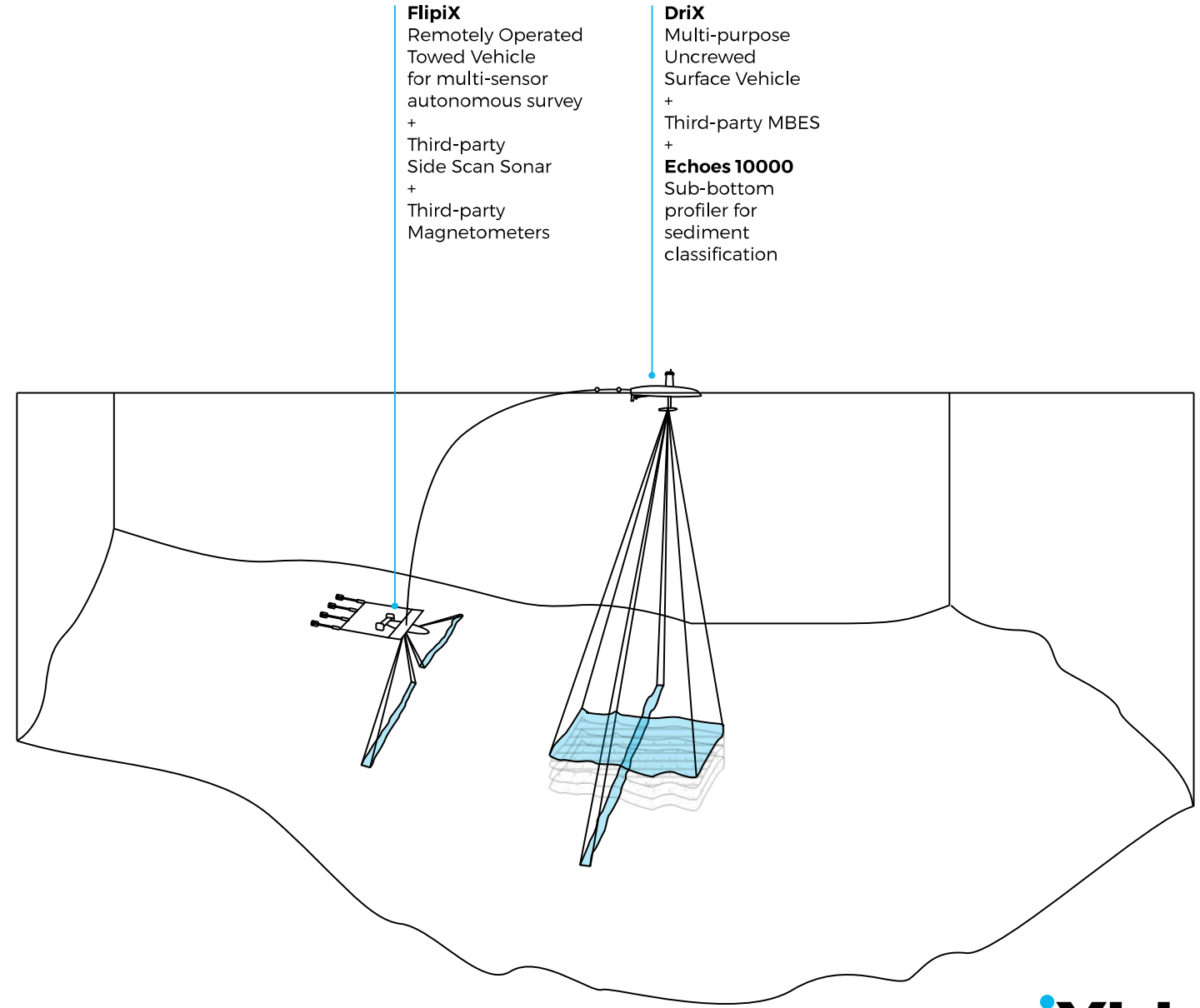
- Underwater
- Above the water



iXBlue Full Integrated Autonomous Survey Solution

FlipiX ROTV with DriX AUSV

- **All in One survey solution**
 - Surface AUSV (MBES/SBP/USBL/SVP)
 - Towed ROTV (SSS/MAG)
 - Deployable from USVs and standard vessel
 - Surface MASS platform already well mature, operational and now ready to welcome towed equipment



Thank you for your attention!

David Vincentelli: david.Vincentelli@ixblue.com

<https://www.ixblue.com/products/drix>