SATLAB® GEOSOLUTIONS

Case Study

Driving a New Era of Hydrographic Surveys in Indonesia with **HydroBoat 1200 USV**

Background

As the world's largest archipelagic nation, Indonesia grapples with the intricate challenges of managing its vast and varied water resources. Traditional hydrographic survey techniques, while effective in the past, have proven to be slow, laborious, and often prone to inaccuracies, particularly in demanding aquatic environments. The evolution of unmanned surface vehicle (USV) technology has introduced a groundbreaking solution, transforming how water surveys are conducted.

Traditional Survey Methods

For decades, hydrographic surveys were dependent on manual efforts. Surveyors frequently faced perilous water conditions and inclement weather, leading to both inefficiencies and safety hazards. In addition, the cumbersome nature of traditional survey equipment made it difficult to deploy in complex or remote areas, often resulting in suboptimal data quality.

Innovation with USV Technology

SatLab leads the way in hydrographic surveying with its cutting-edge products, the **HydroBoat 1200 USV**, when paired with the **HydroFlow 1200 ADCP**, ushers in a new era of precision and efficiency for hydrographic surveying. This intelligent USV solution boasts several key advantages:

- *Fully Automated Operations*

The HydroBoat 1200 autonomously navigates pre-set routes, utilizing its high-precision ADCP sensor to gather real-time water depth and flow velocity data, significantly reducing human intervention.

- *User-Friendly Interface*

Through a simple Android remote controller, operators can monitor and control the USV in real time, eliminating the need for bulky shore-based equipment or extensive technical training.

- *Unmatched Data Accuracy*

Equipped with cutting-edge sensors and advanced data processing algorithms, the HydroBoat 1200 guarantees reliable, high-quality survey data.

- *Unrivaled Versatility*

The system features a 240mm moon pool that accommodates a variety of ADCPs, allowing for easy customization to meet specific environmental needs. Its compact design further enhances its versatility, making it highly adaptable to a broad spectrum of aquatic conditions.

A Streamlined Solution

During a hydrographic survey project in Indonesia, the HydroBoat 1200, alongside the HydroFlow 1200 ADCP, showcased its remarkable efficiency. The solution provides:

• *Seamless Operation*

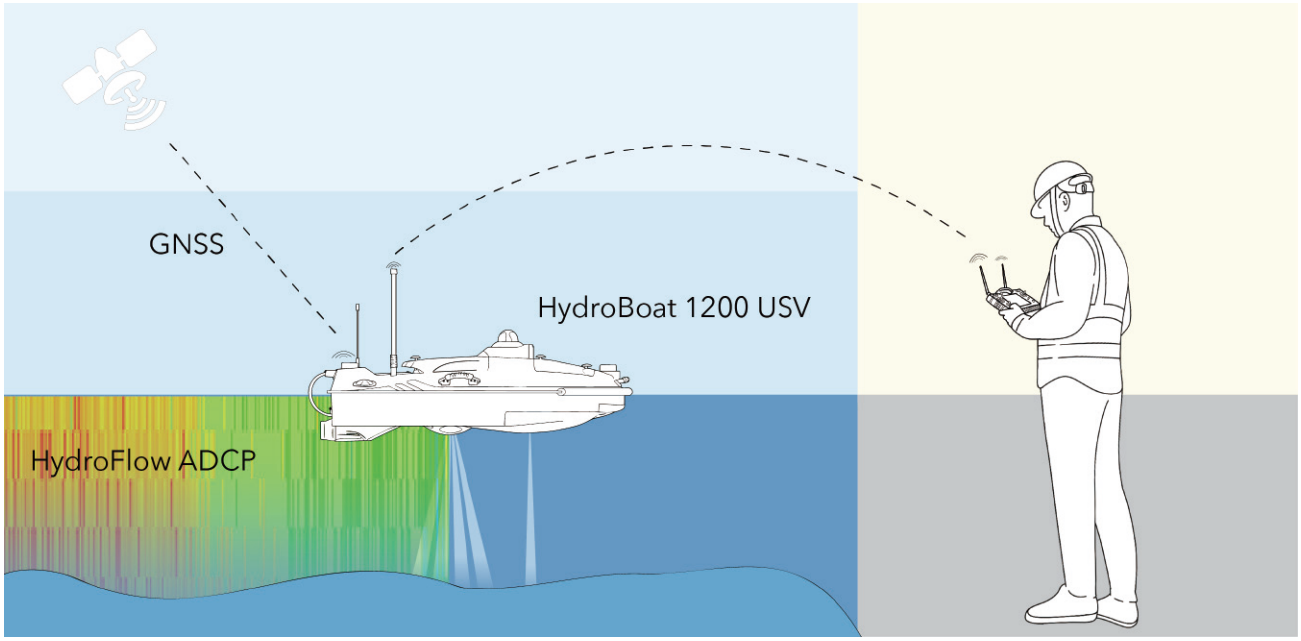
Its intuitive Android interface requires no specialized training, allowing for ease of deployment.

• *Instant Insights*

Real-time ADCP data recording enables immediate data analysis and on-the-spot decision-making.

• *Fully Integrated System*

The streamlined connection between device control, data display, acquisition, processing, and export minimizes the need for manual intervention, boosting overall operational efficiency.



Implementation: A Step-by-Step Overview

Equipment

HydroBoat 1200 USV

HydroFlow 1200 ADCP

Software

SLHydroUSV

SLHydroFlow

Specification

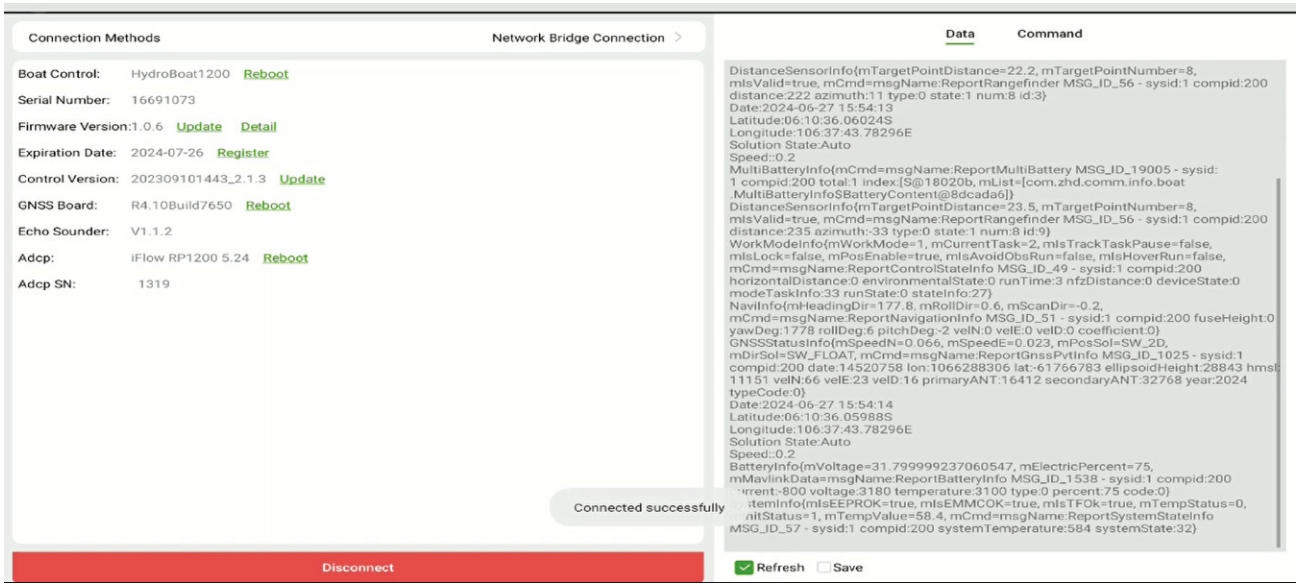
HydroBoat 1200 USV Specification	
Vehicle Specifications	
Hull dimension (L × W × H)	1185 mm*593 mm*397 mm
Weight	25kg(No Battery)
Max Load	25kg
Anti-wave & Wind	3rd Wind Level & 2nd Wave Level
Waterproof	IP67
Anticollision sensor	Detection distance 10-30 meters
Propeller	2*Brushless Propeller
Maximum speed	6m/s
Battery endurance	One battery 4.5h with 1.5m/s, total 2 batteries
Controller	
System	Android System
Software	SLHydro USV
Control range	1.3km on 2.4GHz; Unlimited on 4G
GNSS Performance	
Satellite system	GPS, BDS, GLONASS, Galieo
RTK Positioning accuracy	H: ±8mm + 1 ppm RMS V: ±15mm + 1 ppm RMS
Heading accuracy	0.2° @1 m baseline
INS accuracy	2.1°/h, <1m/20s
Refresh Rate	200Hz
Built-in Single Beam Echo Sounder	
Depth range	0.15m - 200m
Accuracy	±0.01 m + 0.1% x D (D is the Depth of Water)
Frequency	200 kHz
Beam angle	5±0.5°

During the survey, the HydroBoat 1200 navigated autonomously in the designated area, while the HydroFlow 1200 ADCP continuously collected river velocity data. Operators kept a vigilant eye on the USV's navigation status and the ongoing data acquisition using an Android remote control, ensuring that the survey was conducted with precision and efficiency.

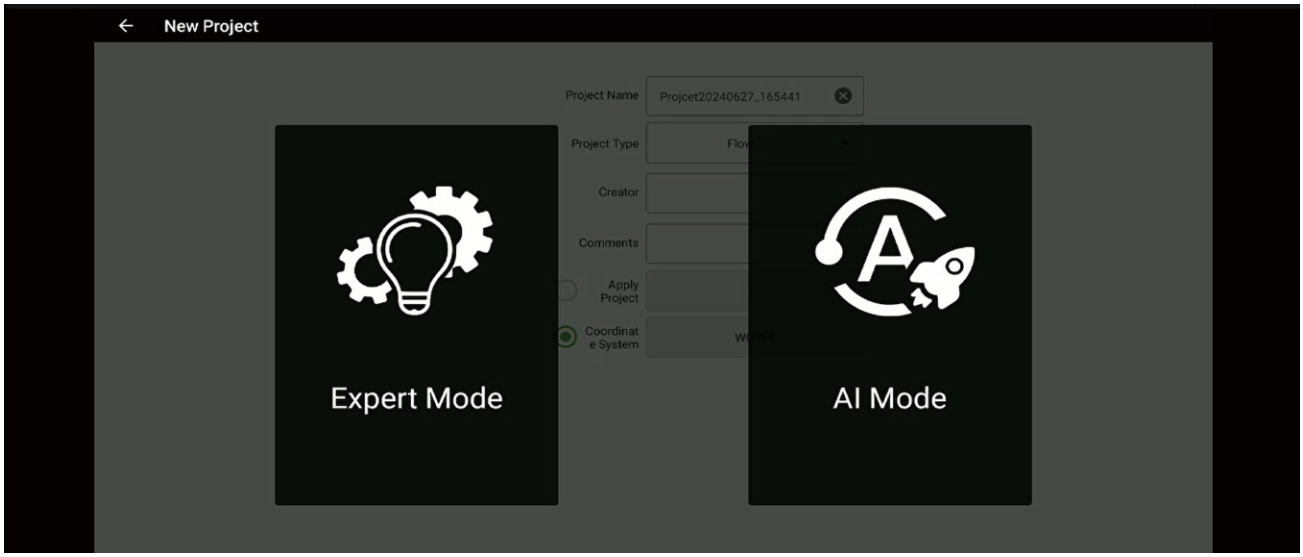
Key Steps:

1. Deployment of the USV

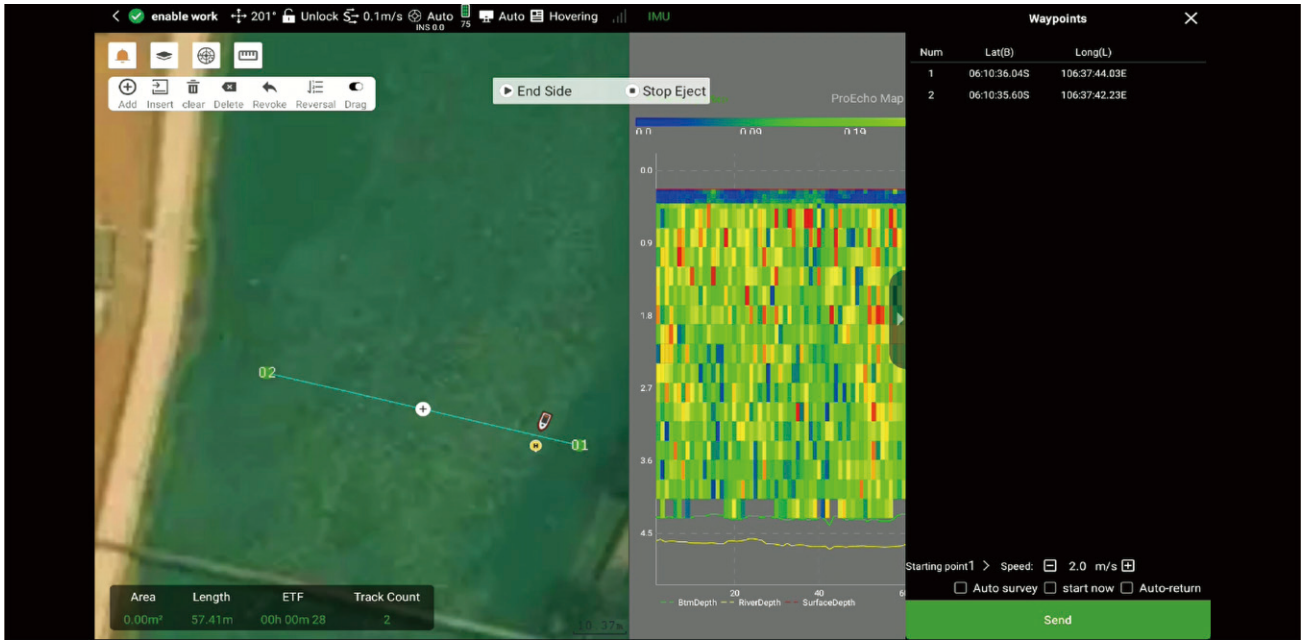
2. Equipment Connection



3. Select Measurement Mode



4. Set up the Automatic Navigation Mission



5. Data Acquisition

Results

In contrast to traditional survey methods, the HydroBoat 1200 USV delivered a dramatic improvement in both speed and accuracy. Tasks that previously took days were completed in mere hours. The ease of operation, combined with real-time data capabilities and broad system compatibility, sets the HydroBoat apart from other solutions on the market. The Android-powered remote control allowed for real-time data recording, making the entire operation more accessible and intuitive.

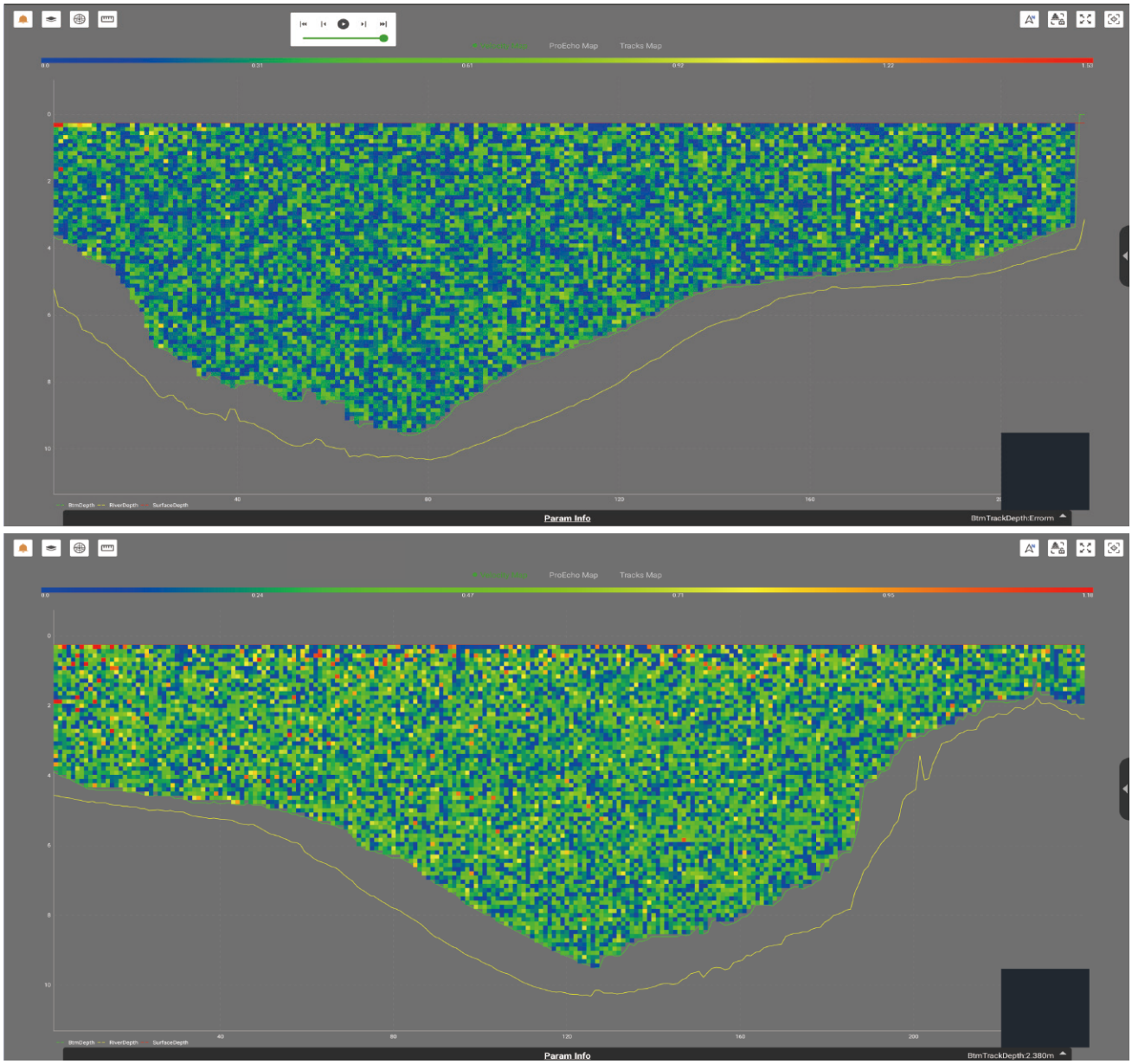


Figure - Velocity contour graph

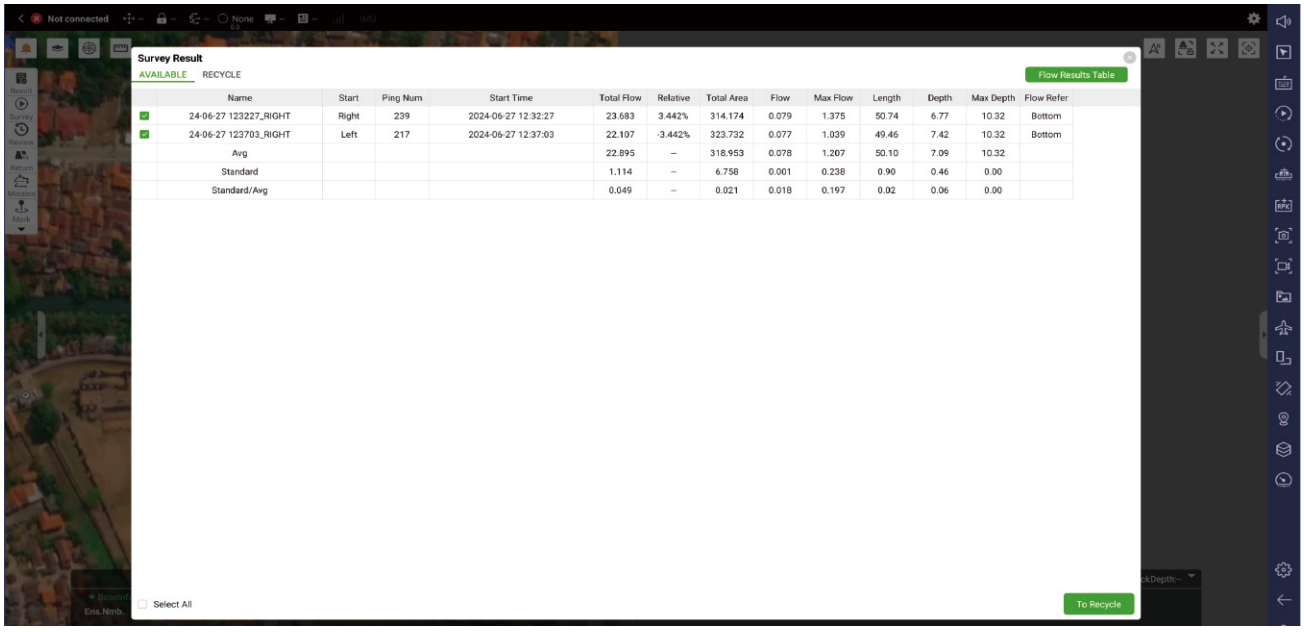


Figure - Data results of round-trip measurement

Date: 2024 y 6-27			Weather: cloudy				Wind power and direct		
Measurement times:			Boat: HydroBoat 1200				Computer:	SM-G998B	
Start time: 2024-06-27 12:32:27			End time: 2024-06-27 12:40:37				Aver time:	2024-06-27 12:36:32	
ADCP model: HydroFlow 1200 1319			Fire version:				Soft version:	V3.0.4-20240521	
Gnss model:			Compass:				Echo Sounder:		
Data file path: /storage/emulated/0/HIBOAT/Project/Projcet20240627					Config file path:		Projcet20240627_122944		
Transducer depth: 0.078 m		Blanking Distanc: 0.12			Depth cell size:	0.12	Number of depth cell:	100	
Salinity: 0		Water tracking ping numbe: 2			Bottom tracking ping numbe:	2	Exponent: $\overline{b}$	0.1667	

Measurement Round	Course	Shore distance (m)		Data file name	Half round Q (m^3/s)	Average Q of one round (m^3/s)	Remarks
		L	R				
1	Right	5.0	5.0	24-06-27 123227_RIGHT	23.7	22.9	
	Left	5.0	5.0	24-06-27 123703_RIGHT	22.1		

Measurment Result

Measure Items	Round 1		Round 2		Round 3		Average of rounds
	Forward	Back	Forward	Back	Forward	Back	
Cross-sectional Q (m^3/s)	23.7	22.1					22.9
Cross-sectioal Area (m^2)	314	324					319
Average current vel (m/s)	0.08	0.08					0.078
Max current vel (m/s)	1.38	1.04					1.38
Average water depth (m)	6.8	7.4					7.1
Max water depth (m)	10.3	10.3					10.3
Water surface width (m)	51	49					50.1

start water level: m	end water level: m	average water le m	corresponding water lev m

Remarks:

Operation record: On-site review: Approved:

Figure - Data report exported from SLHydro USV software

Feedback from users has consistently highlighted the HydroBoat 1200 and HydroFlow 1200 ADCP system as a game-changer in hydrographic surveys. Its ability to deliver precise data with unparalleled speed and safety has simplified complex operations, empowering users to achieve more with less effort.

Conclusion

The pairing of the HydroBoat 1200 and the HydroFlow 1200 ADCP represents a leap forward in hydrographic surveying. This highly efficient, safe, and precise system is redefining how water resource management is approached in Indonesia. As USV technology continues to advance, its role in hydrographic surveys, water resource management, and environmental monitoring will undoubtedly expand, offering new possibilities for the future.