CHCNAV

# APACHE 4

## AUTONOMOUS HYDROGRAPHIC SURVEY USV

MARINE SURVEY
& CONSTRUCTION

CHCNAV

# AUTONOMOUS HYDROGRAPHIC SURVEY USV

The Apache 4 is an advanced Unmanned Surface Vessel (USV) specifically designed for hydrological s survey and Bathymetric survey, combining the best of high accuracy positioning and automated navigation n control technology. APACHE 4 USV builds around the operator's habits when conducting ADCP (Acoustic Doppler Current Profiler) hydrographic cross section flow measurements, compatible with mainstream underway ADCP systems on the market.

The lightweight design of the double-layered hull, with real-time video and data feedback in Android remote control, makes survey easy, safe and accurate. It is equipped with automatic navigation, adaptive straight-line water flow technology, and hover technology, significantly improving the accuracy of flow rate estimation.

Even when GNSS positioning might be degraded by obstructed environments, the internal GNSS+IMU module continues to provide reliable position and heading for the ADCP and autopilot controller.

The Apache 4 USV also supports CHC integrated compact multi beam echo sounder and other instruments, providing various perfect integrated solutions. It can be applied in the fields of hydrological flow measurement, underwater topographic survey, emergency disaster monitoring, port and waterway construction and other areas.

## ADVANCED NAVIGATION CONTROLLER

**Integrated adaptive water flow straight-line and hovering technology.**

The automatic control system allows the APACHE 4 to navigate in a straight line along the cross section safely according to the profile view as the flow, turbulence, etc. changes by stable position and heading provided by GNSS+IMU. The hovering technology ensures that the APACHE 4 hovers stably in the turbulent flow at the start and end points of the ADCP observation, improving the accuracy of the flow estimation.

## ANDROID INTELLIGENT CONTROL

**Android remote control makes work more efficient**

Ensure reliable data transmission with the combination of 4G and 2.4GHz Android remote control communication. Easysail app is developed independently by CHCNAV for hydrographic and bathymetric Surveys. It supports route planning, Real-time feedback on data and video, data collection and date post-processing and other functions, which makes operations more efficient and convenient.

## BUILT-IN SINGLE-BEAM ECHO SOUNDER

**Expand your unmanned survey capability.**

Single beam sounding data can be used to verify the accuracy of ADCP bottom tracking data, and even fed directly into the ADCP flow measurement software to compensate for the unavailability of ADCP data, extending the depth range of ADCP measurements. And at the same time provide water depth profile data associated with the flow velocity profile measurement.

## COMPATIBLE WITH MOST COMMON ADCPS

**Versatile. Carries up to 35kg of payload**

The APACHE 4 central access shaft design provides unmanned cross-sectional flow measurement solutions for the leading ADCPs on the market. The Apache4 is particularly suited for hydrologists using ADCP sensors such as the CHC Riverstar, M9, RTDP 1200, RiverPro, and RiverRay who are looking for an integrated, portable, and affordable unmanned solution. It does not only carry the ADCP, but also provides its positioning, orientation, power, waterproofing, network and 4G transmission solutions. CHC HQ-400 compact multi beam echo sounder, side scan sonar, water quality monitor and other various integrated solutions.

# EFFICIENT HYDROGRAPHIC SURVEY USV


Android remote control

Transducer

ADCP access shaft

Semi-embedded motor

# SPECIFICATIONS

| Physical | |
|---|---|
| Hull Dimension (L x W x H) | 1.2 m x 0.75 m x 0.4 m |
| Material | Macromolecule polyester carbon fibre |
| Weight (w/o instrument and battery) | 13 kg |
| Maximum Payload | 35 kg |
| Anti-Wave & Wind | 3rd wind level and 2nd wave level |
| Hull Design | Triple-hull vessel |
| GNSS | Internal GNSS dual antenna |
| Waterproof | IP67 |
| Draft | 12 cm ( unladen ) |
| Indicator Light | Two-colour light (Display satellite and positioning status) |
| Camera | 360° omnidirectional video |
| ADCP Mounting Hole | 240 mm |
| ADCP Compatibility | Compatible with M9, RiverPro, RiverRay, RioGrande, RCP and other navigable ADCP |
| Available Instrumentation | ADCP, Integrated compact multi beam echosounder, side scan sonar, water quality monitor, Sampling bucket |
| Safety | Millimeter wave automatic obstacle avoidance, equipped with bumper and double hull design, auto-return while low battery or signal loss, |
| Obstacle Avoidance Distance & Range | 0.2~40m (horizontally & vertical angle:112°x 14°) |

| Propulsion | |
|---|---|
| Type | Electric |
| Propeller Type | Brushless DC |
| Direction Control | Veering without steering engine |
| Maximum Motor Power | 1000W |
| Maximum Motor Speed | 7200 rpm |
| Motor Installation | Pluggable |
| Li-ion Battery Capacity | 32.4V 23.1Ah*4 rechargeable lithium battery |
| Power Supply | Support single battery independent power supply or dual battery balanced power supply |
| Battery Endurance | 8 hours @ 1.5 m/s(running on 2 battery sets, support hot-swap) |
| Maximum Speed | 6 m/s |

| Remote control | |
|---|---|
| Display Screen | 1000nit luminance |
| Resolution Ratio | 1920*1200 |
| Internal Storage | RAM 4GB, Storage 64GB |
| Endurance | 5h |
| Communication Frequency | 2.4 GHz |
| Peripheral Interface | USB port, Nano SIM card slot, TF card maximum support 128GB, Type-C |

| Communications | |
|---|---|
| Data Communication | Standard 4G and Remote control |
| Remote Control Communication | 4G and 2.4 GHz Remote control |
| Remote Control Range | Remote control: 1 km and 4G: unlimited |
| SIM Card Slot | Nano SIM |
| Interface | 2x RJ45 port; 3x RS232 serial port<br>1x RS485 serial port |
| Navigation Mode | Manual or Auto-Pilot |
| Waterproof of Master Control | IP67 |
| Data Storage | Local storage (multi-channel storage) & Remote storage |

| Software | |
|---|---|
| Easysail | Route planning and autonomous navigation.Total mileage statistics, remaining mileage reminder, multi-angle video and online map display.<br>hull parameter control, physical & virtual joysticks, hover control, system self-check at power-on.<br>Data collection and post-processing.<br>post-processing support waveform overlay and attitude correction.<br>support coordinate conversion, trajectory, water depth, waveform and hull parameter real-time display.<br>software and firmware push upgrades online.<br>export results by USB flash drive and Type-C cable.Support hydrological mode for hydrological flow testing.<br>Support flow test results report output. |

| Positioning | |
|---|---|
| Satellite System | BDS B1I/B2I /B3I、GPS L1C/A/L2P(Y)/ L2C/L5、Galileo E1/E5a/E5b、GLONASS L1/L2、QZSS L1/L2/L5 |
| Channel | 1408 |
| Single Point Position (RMS) | Horizontal: 1.5 m Vertical: 2.5 m |
| DGNSS Positioning Accuracy | Horizontal: 0.4 m + 1 ppm<br>Vertical: 0.85 m + 1 ppm |
| RTK Positioning Accuracy | Horizontal: ±8 mm + 1 ppm<br>Vertical: ±15 mm + 1 ppm |
| Radio Protocols | Satel 3AS protocol, CHC protocol (1) , TT450 protocol, Transparent Transport Protocol |
| Heading Accuracy | 0.1 °@1 m baseline |
| Inertial Navigation Stability | 6 °/ h (Accuracy attenuation 1 m after 20 s) |
| IMU Update Rate | 200 Hz |

| Single beam Echo Sounder | |
|---|---|
| Data Type | CHCGD (1) , NMEA SDDPT/SDDBT, original waveform |
| Operating system | Linux |
| Weight | 0.84 kg |
| Sounding Range | 0.15 m to 200 m |
| Sounding Accuracy | ±0.01 m + 0.1% x D (D is the depth of water) |
| Resolution | 0.01 m |
| Maximum Sampling Rate | 30Hz |
| Frequency | 200 kHz |
| Beam Angle | 6.5° ± 1° |
| Sound Velocity Adjustment Range | 1400m/s~1700m/s |
| Supply Voltage | 10-36V DC |
| Waterproof | IP67 |
| Integrated Water Temperature Sensor | -55°C~+100°C, real-time correction of the sound speed |
| Maximum Transmit Power | 300W |
| Power Consumption | 10W |

*Specifications are subject to change without notice.
(1) CHCGD & CHC protocol is CHCNAV format.