



**UNMANNED
SURFACE
VESSEL
(USV)**

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By using Arma-Tech Tactical Autonomous Control Kit (**ATTACK**), the vessel can operate independently or combined in swarm. Completely autonomously or a combination of both manned and unmanned. Plug / Play integration of numerous payloads or weapon systems. Platform versatility for mellanslag applications. While keeping personnel out of harm's way.

What if your Navy could perform some of its toughest and most dangerous missions using a large number of small and inexpensive unmanned surface craft, instead of with a small number of large and very expensive manned platforms? The concept of teams of inexpensive unmanned surface vehicles (USVs) becomes not only interesting but increasingly relevant. In addition, a team of USVs could be more survivable less detectable and more effective for certain missions than individual larger manned vessels.

Autonomous control greatly reduces the bandwidth required to operate the USV, and the amount of cognitive workload on humans. This will allow USVs to operate much farther away from the control station and allows human supervisors to control multiple USVs. It is also possible to use a swarm of USVs to relay and extend range further. A team of USVs can be programmed to work together and escort a mothership to give that extra awareness protection.

ATTACK is engineered to provide USVs with an ability to handle dynamic operational situations. Fast-moving USVs could lower risk and increase efficiency for a large number of missions, including Intelligence, Surveillance and Reconnaissance (ISR), countermine operations, search and rescue, electronic warfare, supply and weapons transport.

Applications

- Offshore Rigs
- Commercial Ports
- Naval Bases
- Force Protection/Anti-Terror
- Anti-Surface Warfare
- Mine Warfare
- Littoral Anti-Submarine Warfare
- Search And Rescue
- Pollution Detection and Treatment



SYSTEM OVERVIEW

The USV autopilot control system is a configurable control system that was designed with state-of-the-art technology, guaranteeing the reliability and quality of the system all through the procedure. The system is designed to integrate aerospace components that are highly reliable, as well as a radio module, an IMU, and a dissimilar arbiter processor to be used to take charge of Unmanned Surface Vessels. The system is highly enhanced particularly when used on unmanned vehicles. It has an autopilot control system that can work with any unmanned vehicle. You can configure it through software to control any unmanned vehicles if you make use of the same hardware and software.

SUPPORTED OPERATIONS INCLUDE:

Telemetry	Being able to see real-time onboard USV metrics like actuators, sensors, and control states.
Telecommand	Provides support for every synchronized operator command that is capable of being sent to the USV like, mission management, operational mode switch, and payload control to name a few.
Mission design	It can configure missions using payload target, waypoint definition, coverage analysis, and definition.
Mission analysis	It reconstructs all the data obtained from earlier missions and builds plots as well as reports.
Configuration	It edits s settings like servo trim, and interface/port management.
Multiple Users	Enables more than one operator to work at the same time.



Fig: Arma-Tech Tactical Autonomous Control Kit (ATTACK)

ATTACK SYSTEM OVERVIEW

Unit of the control station reroutes stick and PC to the onboard section and regulates bi-directional communications concerning ATTACK and the USV.

Allows one to perform fully automatic operations with manual or assisted manual control has multiple IO ports, PWM, GPIO, Serial, and CAN for payload control. These allow to command connected devices automatically or just use the datalink tunnel between the onboard and control station units.

Onboard unit comprises of all the important requirements needed to connect with the control station segment, regulate the vessel, take effective measures, and take charge of the payload.

Can be referred to as a reduced fail-safe maritime system that has advanced suite of sensors and processors embedded in other to achieve an advanced regulation of unmanned surface vessels.

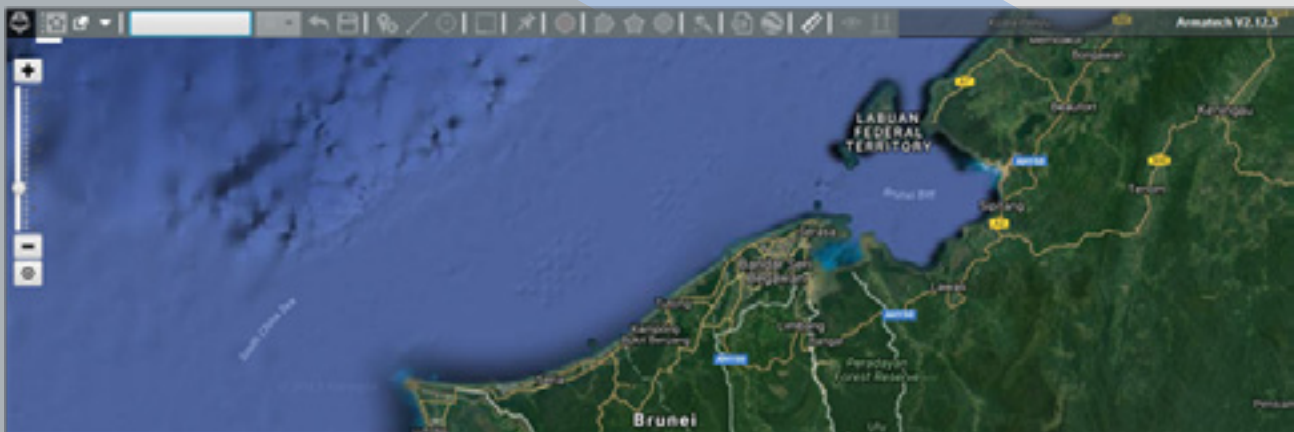
CONTROL MODES

Manned Mode	In this mode, autopilot is switched off and the operator uses regular boat controls. You can still observe the position as well as other variables available on the user interface. Instead of using boat controls, you can also make use of a joystick if it is connected to the autopilot.
Manual Mode	The operator is able to have remote control over the boat through the use of a joystick connected to the electronics of the control station.
Automatic Mode	The USV independently follows a path that is already predefined, which automatically helps it avoid any impediment.
Semi-Automatic Modes	The configuration is on request, which means it automatically follows the route and regulates the speed through the joystick.
Hold	Retain a fixed direction.

MISSION CONFIGURATION

There are several tools that can be used to make the elements of the map used for the mission. Some of these tools include: lines, obstacles, circles, and waypoints.

A mission setup tool is built to serve as an on map drawing tool used to achieve intuitive path design. Waypoints can be defined in the software, relative waypoints to an object in motion, custom links in between waypoints, obstacle definition, forbidden areas.



- **Waypoints:** A waypoint that has clear longitude and latitude can be a destination, a position for change of course as the mission is going on, or an ending.
- **Obstacles:** The obstacle tool is used to determine an area on the map that cannot be crossed by the USV. This area is a repulsion potential field for the USV

SPECIFICATION

Vessel Specifications

Vessel type	High speed interceptor, single hull	Material	Vacuum infused composite
Dry Weight	2700kg	Fuel Capacity	475 ltrs
Length	10m	Fuel type	Diesel
Beam	2.32m	Engine	MD 450
Draft	30"	Propulsion	Sterndrive
Max. speed	50 Knots	Datalink Range	40km Line Of Sight (LOS)

USV CONTROL SYSTEM

Control System	ATTACK
Datalink	900 MHz
Encryption	AES 256 bit
Mission Planning	Intuitive map drawing
	Pre-programmable and inflight editable Selectable map
	Mapping & surveillance tools, No go areas with Custom routines
Data Logging	Onboard and on control station data log, with custom information (position, speed, battery)
Configurable automatic routines	Activation events: Waypoint reach, Inside /Outside polygon, Low fuel, Datalink
Automatic actions	Take photo, Activate payload, Go to a waypoint
Fail-safe routine	User-configurable
	Return home
	Hold position
	Go to a waypoint
	Continue mission



Fig: Payload

PTZ EO/IR GYRO-STABILIZED DUAL SENSOR

EO sensor	1920 * 1080, 1/4" 0.01lux color to B/W CCD
Lens	8mm320mm, 40 optical zoom, auto focus
Thermal sensor	336 X 256 pixel, 5th generation uncooled FPA, 50mk NETD, 7.5 - 14um spectral range
Thermal lens	25 ~ 75mm motorized zoom lens
Rotation range	Pan: 360° continuously, Tilt: - 45° + 45°
Protection level	IP67, TVS 1500V anti-lighting, anti-surge

360° Situation awareness

“ The understanding of the elements in the surroundings is particularly important when operating Unmanned Systems where poor decisions may lead to serious consequences.



Fig: 360° Situation awareness

4 X PTZ SITUATIONAL AWARENESS CAMERA

Image sensor	1920 * 1080, 1/2.8" 0.005lux@F1.6
Lens	30x optical zoom, auto focus
Focal Length	4.3mm ~ 139mm
Infrared distance	80m
Infrared intensity	Automatically adjusted, depending on zoom ratio
Rotation range	Pan 360° continuously, Tilt: -30° +90°
Protection level	IP66, TVS 4000V Lightning protection, surge protection, voltage transient

Sense and avoid

Throughout the mission, the system is informed of the distance to all objects in the environment so it can calculate a safe route. In case the USV approaches dangerously close to an object during the mission, the system is warned of that risk to safely avoid it. The system will detect, track, evaluate, prioritize, declare, determine, command and execute. These functions will be repeated as long as the object can be seen.



“ Return home can be programmed without presetting a route. Where the USV automatically will avoid obstacles while coming back in a straight line.

- Long-range signal 175m at 10°
- Update rate 50ms
- Medium-range signal 65 m at 45°
- **Radar:** 77GHz Electronically Scanning Radar (ESR)

Additional payload:

- Flood light
- Search lights x 2
- Hailer x 2
- Marpol blue flashing light
- Navigation lights
- Remote Controlled Weapon System
- Underwater Sonar System
- Underwater Diver Deterrent System
- Obstacle Avoidance System