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Market Survey of Unmanned Surface Vehicles and Unmanned Aerial Vehicles for Maritime Applications

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Defence R&D Canada – Ottawa

Canada

Contract Report
DRDC Ottawa CR 2013-069
October 2013

Market Survey of Unmanned Surface Vehicles and Unmanned Aerial Vehicles for Maritime Applications

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Abstract

Defence Research & Development Canada – Ottawa conducted a market survey of unmanned platforms (both surface and aerial) for use in naval applications. The study looked at specific characteristics of the platforms such as name, manufacturer, country of origin, dimensions, weight, payload, endurance, loiter speed, maximum speed, available payload power, launch/recovery method, intended application and any other relevant information available on the system. The study excluded systems not fit for naval applications such as fixed wing platforms requiring extended runways for takeoff and landing. Other platform requirements for this study included a payload capacity greater than 4.5 kilograms and endurance greater than 1 hour.

Résumé

Recherche et développement pour la défense Canada – Ottawa a mené une étude de marché sur les véhicules sans pilote (marins et aériens) pour des applications navales. L'étude a examiné les caractéristiques spécifiques des plates-formes telles que le nom, le fabricant, le pays d'origine, les dimensions, le poids, la charge utile, l'endurance, la vitesse de flâner, la vitesse maximale, puissance de charge utile, méthode de lancement/récupération, application prévue et toute autre information pertinente disponible sur le système. L'étude exclut toutefois les aéronefs nécessitant de longues pistes de décollage et d'atterrissage. Les autres exigences de système pour cette étude comprennent une capacité de charge supérieure à 4.5 kg et d'une endurance supérieure à 1 heure.

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Executive summary

Market Survey of Unmanned Surface Vehicles and Unmanned Aerial Vehicles for Maritime Applications

Claude Viau; DRDC Ottawa CR 2013-069; Defence R&D Canada – Ottawa; October 2013.

This report is delivered to Defence Research and Development Canada (DRDC Ottawa) in accordance with the terms of Contract W7714-115077 (Radar Threat Analysis Support), Call-Up #4.

The "Defence Against Future RF Threats" project targets the improvement of the defence of naval platforms against modern radars used for target acquisition on launch aircraft and terminal homing on anti-ship missiles. Improvements to current and future threats are reducing the reaction time available for ship defence. The goal of the project is to improve the survivability of naval platforms through the synergistic use of all electronic attack assets on a given platform and/or cooperating platforms to provide the best possible ship and/or area protection.

In order to achieve the goals of the project, Defence Research & Development Canada – Ottawa conducted a market survey of unmanned platforms (both surface and aerial) for use in naval applications. The study looked at specific characteristics of the platforms such as name, manufacturer, country of origin, dimensions, weight, payload, endurance, loiter speed, maximum speed, available payload power, launch/recovery method, intended application and any other relevant information available on the system. The study excluded systems not fit for naval applications such as fixed wing platforms requiring extended runways for takeoff and landing. Other platform requirements for this study included a payload capacity greater than 4.5 kilograms and endurance greater than 1 hour. The International Unmanned Vehicle Systems (www.uvs-info.com) Remotely Piloted Aircraft Systems 2012 yearbook was used as the principal list of UAVs for this survey.

The report is organized in two main sections: unmanned surface vehicles (USV) and unmanned aerial vehicles (UAV). The survey reviewed nearly 70 USVs and over 230 UAVs (fixed and rotary wing). Within each of these major sections, systems are listed in alphabetical order. Each system includes a description, specifications and images with appropriate references. At the end of the USV and UAV section, a list of other platforms surveyed (but not in the main report) is also included for reference. Finally, two appendices are included summarizing the complete list of surveyed platforms with system parameters.

Sommaire

Market Survey of Unmanned Surface Vehicles and Unmanned Aerial Vehicles for Maritime Applications

Claude Viau ; DRDC Ottawa CR 2013-069 ; R & D pour la défense Canada – Ottawa; octobre 2013.

Ce rapport est remis à la Recherche et développement pour la défense Canada (RDDC Ottawa) en conformité avec les conditions du contrat W7714-115077 (Appui à l'analyse des menaces radar), Tâche #4.

Le projet intitulé « Defence Against Future RF Threats» vise l'amélioration de l'autodéfense des navires contre les radars de désignation d'objectifs et les autodirecteurs de missiles antinavires. L'avancée technologique des menaces actuelles et futures réduit le temps de réaction nécessaire pour l'efficacité des systèmes de contre-mesures navales. L'objectif du projet est d'améliorer la capacité de survie des plates-formes navales grâce à l'utilisation synergique de tous les actifs d'attaque électroniques à la disponibilité du navire ou d'un groupe coopératifs lorsque la protection d'un air est nécessitée.

Afin d'atteindre les objectifs de ce projet, RDDC Ottawa a mené une étude de marché sur les véhicules sans pilote (marins et aériens) pour des applications navales. L'étude a examiné les caractéristiques spécifiques des plates-formes telles que le nom, le fabricant, le pays d'origine, les dimensions, le poids, la charge utile, l'endurance, la vitesse de flâner, la vitesse maximale, puissance de charge utile disponible, méthode de lancement/récupération, application prévue et toute autre information pertinente disponible sur le système. L'étude exclut toutefois les aéronefs nécessitant de longues pistes de décollage et d'atterrissage. Les autres exigences de système pour cette étude comprennent une capacité de charge supérieure à 4,5 kg et d'une endurance supérieure à 1 heure. L'organisme International Unmanned Vehicle Systems (www.uvs-info.com) publie un annuaire (2012) de véhicules aériens sans pilote qui fut utilisé comme source principale pour la liste de système.

Le rapport est organisé en deux grandes sections: les véhicules marins sans pilote et les véhicules aériens sans pilote. L'étude a revu près de 70 véhicules marins et plus de 230 systèmes aériens. Dans chacune de ces sections principales, les systèmes sont classés par ordre alphabétique. Chaque système comprend un paragraphe pour la description, les spécifications et les images avec références appropriées. À la fin des deux sections majeures, une liste des autres plates-formes étudiées (mais pas incluses dans le rapport) est présentée à but de référence. Enfin, deux annexes sont incluses résumant la liste complète des plates-formes étudiées avec leurs paramètres de système.

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Unmanned Surface Vehicles

Barracuda

Manufacturer: Meggitt Training Systems Canada
Country: Canada
Application(s): Maritime Threat Simulation/Unmanned Operations

Description:

According to the manufacturer [1]:

The Barracuda™ replicates high-speed naval tactics and a variety of operational guidance plans including straight-on high-speed attack, crossing patterns, zig-zag, and other evasive maneuvers. The system can be equipped with visual, radar and laser signature enhancements to present a convincing likeness of a variety of naval threats to exercise naval guns, radar and visual IR sensors for naval combat systems. The system has also proven to be an effective air-to-ground target.

The Barracuda™ Sea Surface Target System is based on a modified, Navy standard, fiberglass hull, rigid inflatable boat (RHIB), powered by a 225 hp marine diesel engine. The Barracuda™ operates at speeds up to 36+ knots, which is a significant performance increase over any other target system in this category. The Barracuda™ System allows for remote control from distances greater than 10 nautical miles or can be configured for over the horizon (OTH) control. A digital radio command link controls the target's course and speed, while telemetry and video signals from the target provide the operator with system performance and position information. A self-contained tracking capability is achieved using position data from the onboard Global Positioning System (GPS).

Specifications:

Length (m)	7.23	
Beam (m)	2.75	
Weight (kg)	2074	
Payload (kg)	227	
Speed (kts)	20	36+
Endurance (hrs.)	15	5
Range (m)	300	180
Control TM Range	Over-the-horizon (unlimited distance) tested to 6000 km	
Video TM Range	>10 nm (subject to control station antenna height)	
Control System	Universal Target Control Station (UTCS) – STANAG 4856 Compliant	

Payload:

- Scanning Projectile Impact Evaluation System (SPIES)
- Active Radar Augmentation System

- Passive Radar Augmentation (20 - 500 m_2, I-Band)
- Visual Augmentation (Smokes, Flags, Flares, Strobes)
- Capable of carrying auto-winch

Diagrams:

Figure 1 - Barracuda USV [1]

Figure 2 - Barracuda USV [1]

Figure 3 - Barracuda USV (left) and HSITT (right) [1]

Blackfish USV

Manufacturer: QinetiQ North America
Country: United States
Application(s): Force protection in ports and harbor

Mission overview [2]:

- Port and harbor security
  - Personnel and resource security
  - Intruder interdiction
  - Ship and cargo security
- Naval special warfare support
  - Threat identification and classification
  - Intrusion alerts and deterrents
  - Deployment of resources to mission sites
- Tactical ISR
  - Situational awareness
  - Mapping and obstacle identification

Description:

According to the manufacturer [2]:

Blackfish, QinetiQ North America's unmanned surface vehicle (USV), provides a flexible and powerful solution for maritime force protection in ports and harbors. With a top speed of over 40 kt, Blackfish gets eyes on target fast while keeping the operator a safe distance from threats. With Blackfish on scene, the optional 2-dimensional high-resolution sonar and integrated pan-tilt unit allows authorities to locate, classify, and pursue underwater diver and swimmer threats.

Specifications:

Length (m)	3.22
Weight (kg)	515
Payload (kg)	150
Max Speed (kts)	40
Endurance (hrs.)	1
Range (nm)	0.56

Payload:

Available Sensors [2]:

- PTZ video camera
- Satellite compass
- High-resolution 2-D sonar
- Underwater video camera

Diagrams:

Figure 4 - Blackfish USV [2] [3]

Boomeranger, Eclipse, Sea Serpent

Manufacturer: 5G Marine International Inc., Al Seer Marine
Country: United States / United Arab Emirates
Application(s): Force protection and harbor patrol

Description:

According to the Maritime Reporter [4]:

5G International crew […] has linked up with Abu Dhabi, UAE-based Al Seer Marine to jointly develop and deliver a revolutionary family of Unmanned Surface Vessels that, if delivered as designed, will open a world of opportunities for marine robotics precisely at the time when the technology is gaining traction in military and commercial sectors. Set to debut at this month's [Feb 2013] International Defense Exhibition and Conference (IDEX) in Abu Dhabi, the Al Seer Marine/5G offering includes three vehicles:

- Sea Serpent, the small 3-m "jet ski" version;
- Boomeranger, the larger 11-m RIB; and
- Eclipse, the top-of-class 11-m monohull.

Specifications:

	Sea Serpent	Boomeranger	Eclipse
Length (m)	3	11	11
Max Speed (kts)	60	50	60
Endurance (hrs.)			10+

Diagrams:

Figure 5 - Sea Serpent (left) and Boomeranger (right) USV [4]

C-CAT 4

Manufacturer: Autonomous Surface Vehicles (ASV) Ltd.
Country: United Kingdom
Application(s): Water quality sampling, environmental assessments and hydrography

Description:

According to the manufacturer [5]:

The C-Cat 4 is a lightweight, easily deployed, highly manoeuvrable multipurpose work class Unmanned Surface Vehicle (USV). The system is designed for use in water quality sampling, environmental assessments and hydrography.

The C-Cat 4 features a rugged aluminium hull that transforms into a form for easy transport in a standard 20' container.

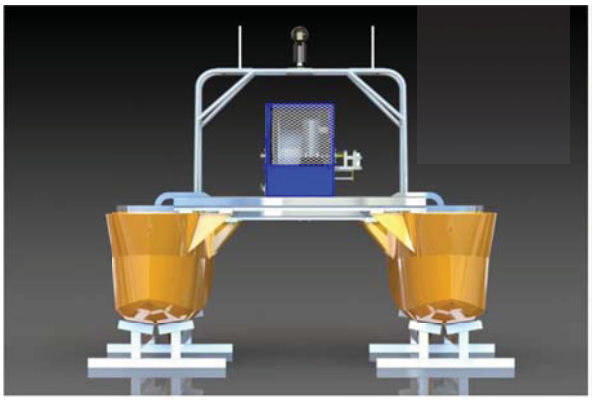
The vessel is powered by two electric motors and can be supplied with a small on board Diesel Genset if operations beyond 6 hours are required.

The vessel can be operated on pre-programmed routes which can be updated at any point through the easy to use ASView PC operator interface. If required, the vessel can be operated in direct control mode where the user has direct control of the speed and direction via a hand held joystick unit.

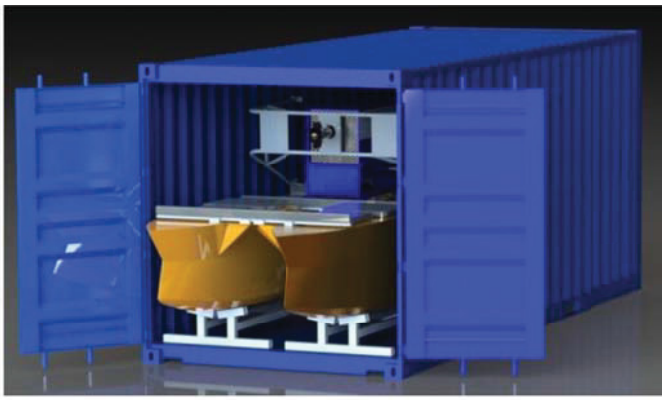
Specifications:

Length (m)	4.25
Beam (m)	2.9
Height (m)	2.5
Weight (kg)	750
Payload (kg)	350
Speed (kts)	6
Endurance (hrs.)	8 (bat.) 48 (diesel)
Range (nm)	200

Diagrams:



Catamaran form suits deployment of sensors in and out of the water. Cross deck winch option shown.



System folds for transport in standard 20' container.

Figure 6 - C-CAT 4 USV [5]

C-STAT Mobile Buoy Systems

Manufacturer: Autonomous Surface Vehicles (ASV) Ltd.
Country: United Kingdom
Application(s):

According to the manufacturer [6]:

- Surface to underwater communications node
- Port, harbour and ship security
- Oceanographic data collection
- Subsea asset positioning

Description:

According to the manufacturer [6]:

The C-Stat offers a new capability in the positioning of equipment at sea for extended durations without the need for ships or sea-bed anchoring.

The C-Stat uses a state-of-the-art autonomous controller and station keeping system integrated with sister company, C&C Technologies C-NAV® GPS system. Power is provided by a novel diesel electric hybrid system featuring two industrial brushless propulsion motors each driving a propeller via a marinising gearbox. The hull has been optimised for ocean performance and ease of launch and recovery.

Three sizes of C-Stat have been developed, offering deployments of 4 days, 15 days and over 30 days. ASV can supply integrated sensor payloads or assist end users in configuring their own. The control system user interface allows for the automated control and monitoring of multiple units via line of site of satellite radio communications.

Specifications:

Length (m)	2	3.5	6
Beam (m)	2.4	4	5.8
Weight (kg)	350	650	2000
Payload (kg)	20+	50+	150+
Speed (kts)	3.5	4	5
Endurance (hrs.)	48	360	720
Range (nm)	250	700	1500

Diagrams:

Figure 7 - C-STAT USV [6]

C-SWEEP

Manufacturer: Autonomous Surface Vehicles (ASV) Ltd.
Country: United Kingdom
Application(s): Multi-Role Mine Countermeasure USV

According to the manufacturer [7]:

- Mine Sweeping
- Mine Hunting
- Deployment of inspection and disposal ROVs
- Deployment, tracking and recovery of AUVs
- Hydrographic survey
- Remote sensing and surveillance

Description:

According to the manufacturer [7]:

C-SWEEP is a rugged, high performance Unmanned Surface Vehicle (USV), designed to offer a high degree of directional stability and payload capacity. It provides substantial towing capacity for long-endurance mine countermeasures operations and a robust electrical generating capacity to support modern mine sweeping equipment requirements.

Key Features

- Robust composite or aluminium hull
- Twin diesel engines
- ASV's proven control system
- Direct control
- Semi-autonomous & autonomous modes
- Real time data and video feedback
- Sensor data channels & redundant emergency stop system
- Protected wheelhouse for manned operations (dive support boat etc)

Specifications:

Length (m)	2
Beam (m)	2.4
Weight (kg)	350
Payload (kg)	20+
Speed (kts)	3.5
Endurance (hrs.)	48
Range (nm)	250

Diagrams:

Figure 8 - C-Sweep USV [7]

C-Target

Manufacturer: Autonomous Surface Vehicles (ASV) Ltd.
Country: United Kingdom
Application(s): Naval Target Drones

- Naval Gunnery Training
- Weapons and platform trials
- Ship Command & Control and pre-deployment assessments
- Surface-Surface & Air-Surface applications

Description:

According to the manufacturer [8]:

C-TARGET is a range of lightweight, easily deployed and highly manoeuvrable fast marine target boats that can operate individually or as part of a swarm. Designed for use in naval gunnery training, weapons testing, and ship command and control assessments, the range includes offshore vessels that can tow inflatable and rigid targets in up to Sea State 4.

Key Features

- Highly survivable & repairable rugged aluminums hulls
- Outboard engine & electronics recessed in protected area that can be fitted with ballistic panels
- Inboard Diesel engine options available for ships which can't store petrol
- Single point lift for easy launch & recovery & rugged fender for ease of handling
- The C-Target 3 has an innovative 2-part hull allowing 4 systems to fit one standard 20' container
- Remote operation through direct control or programmable console
- Optional console and seating module for conventional manned use
- Wide range of optional visual, radar & thermal enhancements
- Can be customised to resemble specific craft & configured as a low cost USV with the addition of upgraded cameras & control functionality

Specifications:

	C-Target 3	C-Target 5	C-Target 6	C-Target 9	C-Target 13
Length (m)	3.5	5	6.5	8.95	13
Beam (m)	1.4	1.7	2.2	2.4	3
Height (m)	1.3	2	2.7	3.5	3.5
Weight (kg)	325	600	950	2750	5500
Speed (kts)	25	32+	35	50	45+

Payload:

Controls: ASView, direct or automated control

Communications: UHF, 10km+

Options: All can be controlled as single boat or multi-boat; have visual, radar & thermal enhancements and be supplied with real time video link and missed distance indicators (MDI).

Diagrams:

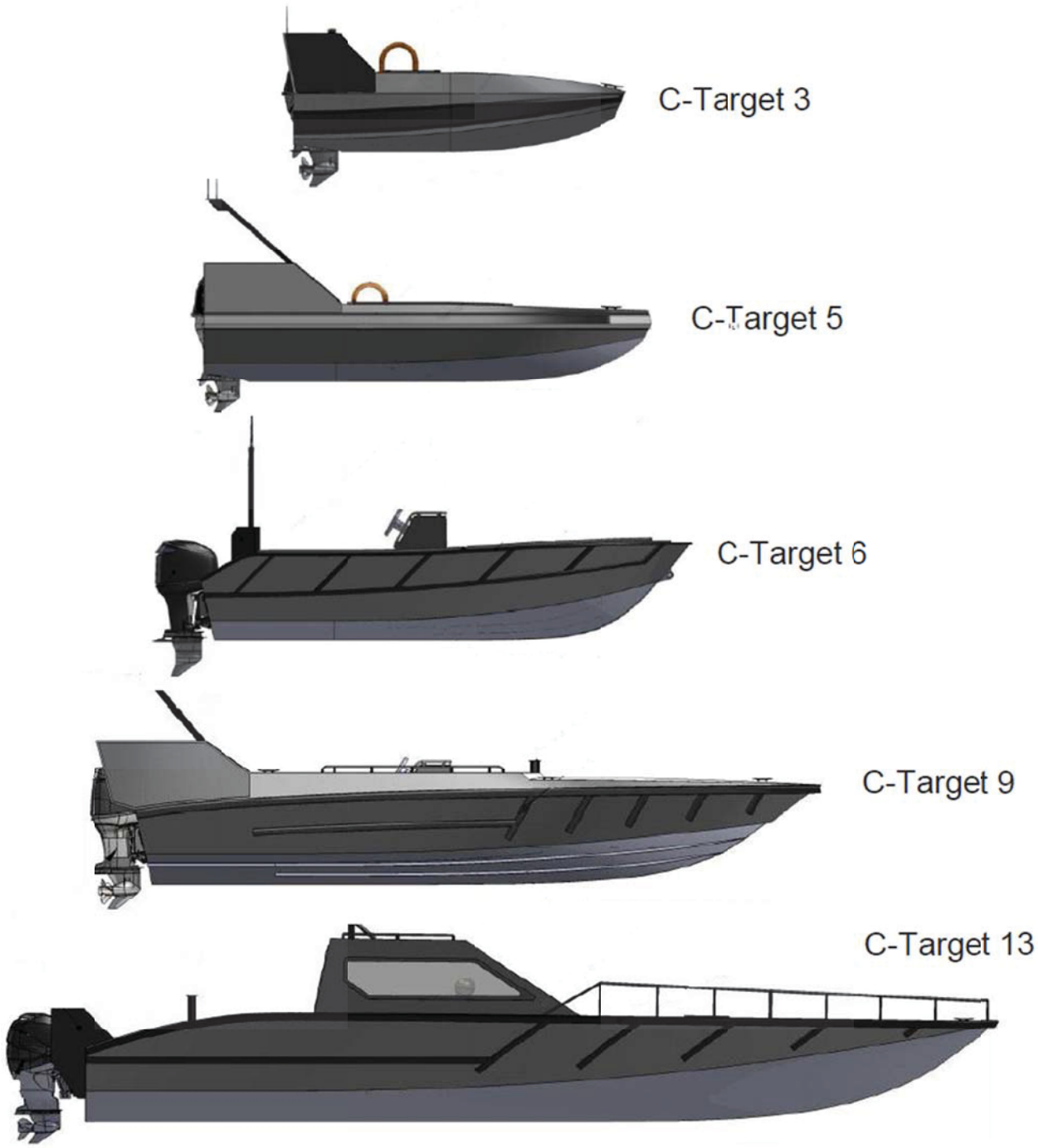


Figure 9 - C-Target Naval Drones [8]

Fast Inshore Attack Craft Representative Targets (FIAC RT)

Manufacturer: Atlas Elektronik UK
Country: United Kingdom
Application(s): Remote-Controlled Targets

Description:

According to the manufacturer [9]:

FIAC RT is an armoured Fast Inshore Attack Craft that acts as a fully representative target that can be used for live small arms firing practice and development of response tactics.

The Fast Inshore Attack Craft (FIAC) Representative Target (RT) has been specifically developed to meet the needs of Royal Navy FIAC response training and offers the following key benefits to the user:

- Tactics and response development with no human risk
- Modular design
- Safe, simple operation & maintenance
- Reusable
- Fully optimized survivability
- Designed for re-use of modular core control systems

Specifications:

Length (m)	3.5
Beam (m)	1.25
Height (m)	1.1
Endurance (hrs)	6
Speed (kts)	50
Range (nm)	16

Payload:

Controls: Line of Sight (visual / RF)
Communications: UHF Radio Modem (Definable Operation Frequency)

Diagrams:

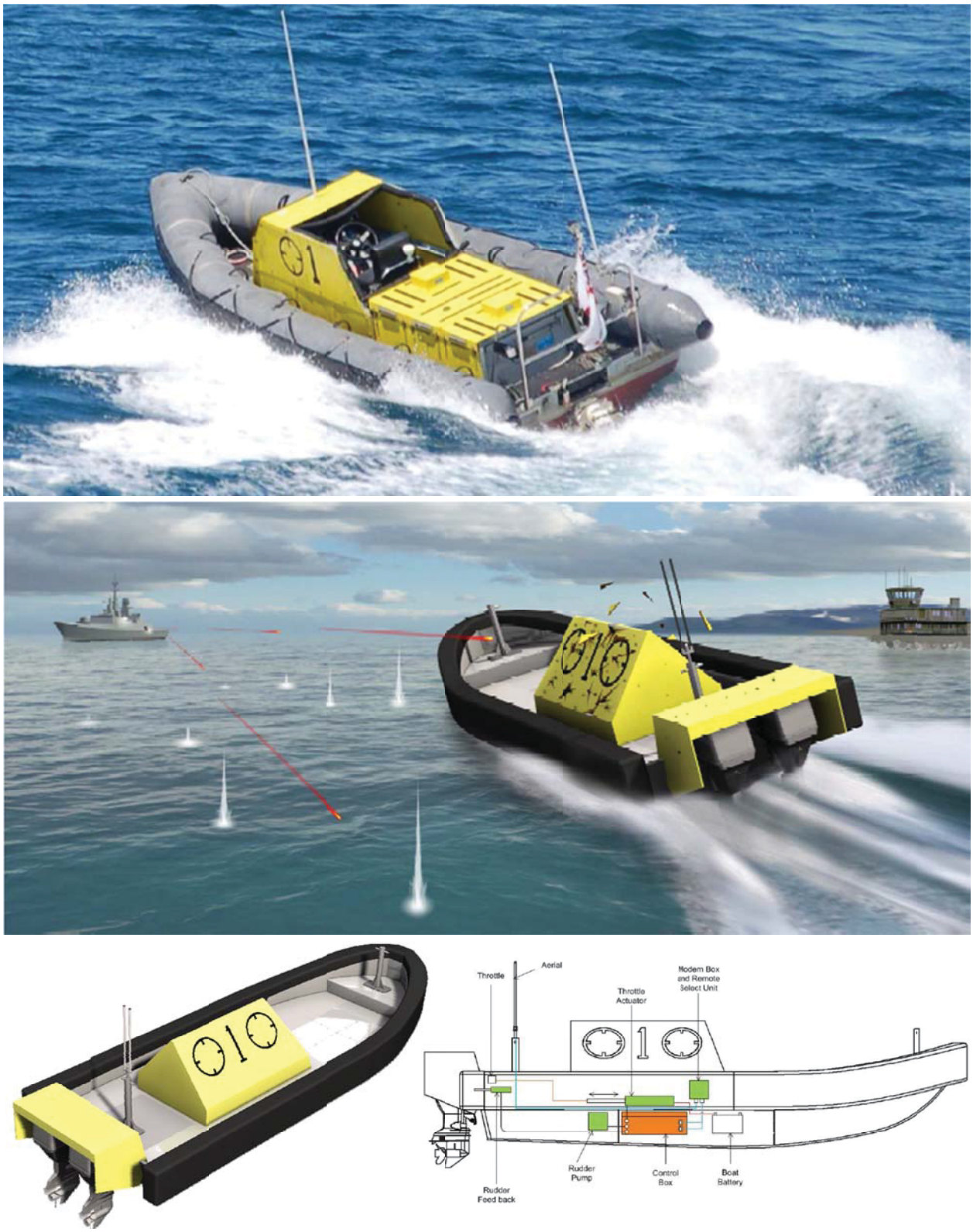


Figure 10 - FIAC RT USV [9]

Fleet-Class CUSV

Manufacturer: AAI Corp., General Dynamics Robotic Systems, Maritime Applied Physics Corp.
Country: United States
Application(s): Multi-Warfare Missions

- Mine countermeasure (MCM)
- Anti-submarine warfare (ASW)
- Communications relay
- Intelligence, surveillance and reconnaissance (ISR)
- Surface warfare (SUW)
- Electronic warfare (EW)
- UAS/UUV launch and recovery missions.

Description:

According to U.S. Navy [10]:

The Fleet Class USVs are 11 meter planing or semi-planing hull craft. They provide moderate speed/endurance while towing MCM sweep gear or high speed and very long endurance to support ASW, SUW, or EW missions. They also support manned operation through the ability to remove and replace their mission systems in less than 24 hours.

According to AAI Corp. [11]:

Our Fleet-Class Common Unmanned Surface Vessel (CUSV) incorporates AAI's unmanned maritime command and control station as part of our multi-warfare, multi-mission and multi-payload solution. The CUSV includes:

- AAI's common command and control system
- Data link
- Reconfigurable and versatile payload bay
- Common payload launch and recovery controller
- Modular USV system open architecture and commercial, off-the-shelf technology

The CUSV utilizes a modular architecture that accommodates platform reconfiguration and interchangeable payloads.

According to Wikipedia [12]:

The Fleet class USV is an Unmanned Surface Vessel designed for the United States Navy to be deployed from Freedom and Independence class littoral combat ships and intended to conduct mine and anti-submarine warfare missions. As of 2012 four ships of the class have been built; the first was delivered to the U.S. Navy in 2008.

Designed to match the weight and handling limits of a conventional rigid-hulled inflatable boat, the hull of the Fleet class USV is designed for good seakeeping in most sea states, and the vessels are equipped

with advanced controls for autonomous navigation and operation. They are also designed to be converted to manned operation through the replacement of mission modules within a 24 hour period.

Specifications:

Length (m)	12
Beam (m)	3.4
Weight (kg)	9000
Payload (kg)	2300
Endurance (hrs)	48+
Speed (kts)	35+
Range (nm)	1200

Diagrams:

Figure 11 - Fleet-Class USV [10]

Figure 12 - Fleet-Class USV [12]

Figure 13 - Fleet Class CUSV [13]

Hammerhead

Manufacturer: Meggitt Training Systems Canada
Country: Canada
Application(s): Maritime Threat Simulation/Unmanned Operations

Description:

According to the manufacturer [14]:

The Hammerhead™ replicates high-speed naval tactics and a variety of operational guidance plans including straight-on high-speed attacks, crossing patterns, zig-zag patterns, and other evasive maneuvers. The system can be equipped with visual, radar and laser signature enhancements to present a convincing likeness of a variety of naval threats to exercise guns, radar and visual sensors for naval combat systems.

The Hammerhead™ was specifically designed to simulate a Fast Inshore Attack Craft (FIAC) in a multi-vehicle swarm of up to 40 vehicles simultaneously. The Hammerhead™ also excels in replicating Fast Attack Crafts (FAC) naval threats.

Specifications:

Length (m)	5.2		
Beam (m)	1.4		
Weight (kg)	900		
Payload (kg)	227		
Speed (kts)	10	20	30
Endurance (hrs.)	12	8	5
Multi-Unit Control	up to 16 vehicles simultaneously		
Control System	MTSC UTCS STANAG 4586 compliant		
Optional Video TM Range	5 nm (subject to CS antenna height)		

Payload:

- Visual Augmentation (Smokes, Flags, Flares, Strobes)
- Passive Radar Augmentation (20 - 500 m_2, I-Band)
- Active Radar Augmentation (RF-SAS) System
- Video TM

Diagrams:

Figure 14 - Hammerhead USV [14]

Figure 15 - Hammerhead USV [14]

Figure 16 - Hammerhead USV [14]

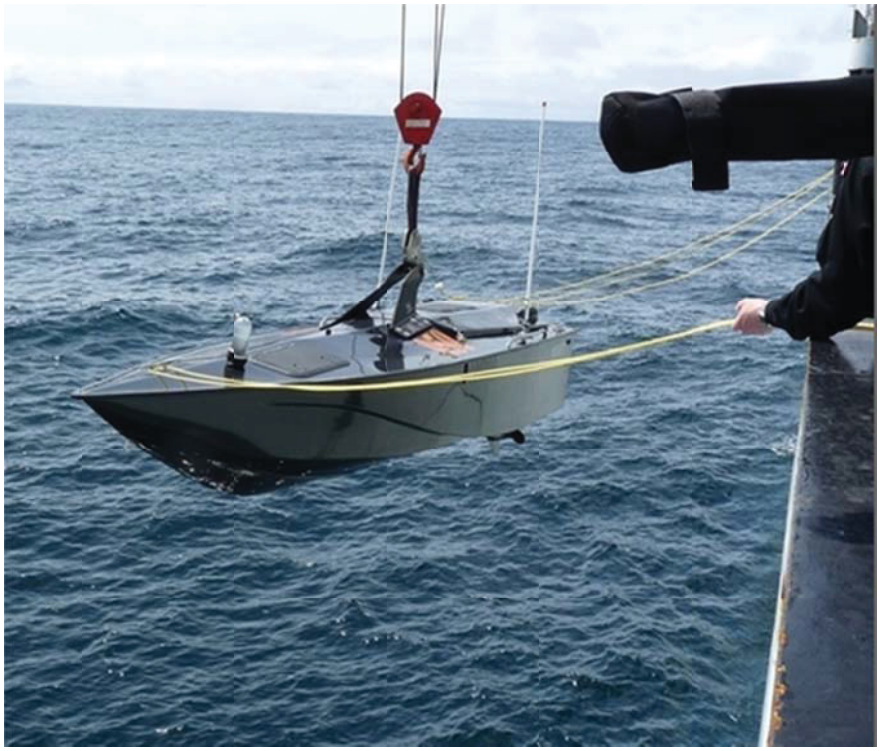


Figure 17 - Hammerhead USV [14]

Harbor-Class High Speed USV (HSUSV)

Manufacturer: AAI Corp.
Country: United States
Application(s): Harbor Surveillance and Security

Also capable of [10]:

- Mine countermeasure (MCM)
- Anti-submarine warfare (ASW)
- Surface warfare (SUW)
- Maritime interdiction operation (MIO) support
- Special operations forces (SOF) support

Description:

According to the U.S. Navy [10]:

The Harbor Class USVs use a 7 meter RIB with moderate endurance as the basis for its missions. The requirements for the Harbor Class are driven by the need to be hosted by the majority of warships to perform ISR and MS missions. The ISR payload will be arch-mounted such that it can remain in place for manned operation of the craft.

According to manufacturer [11]:

[…] our Harbor-Class High Speed Unmanned Surface Vessel (HSUSV) includes:

- AAI's common command and control system
- Data link
- Optional manned and/or unmanned operation
- Large deck on the bow for the installation of sensors or equipment (payloads)
- Modular USV system open architecture and commercial, off-the-shelf technology

The HSUSV platform can readily be switched back to a manned configuration, or controlled as a manned or unmanned platform. Agile, fast and highly maneuverable, the HSUSV is ideal for harbor surveillance and security, anti-terrorism, force protection and quick reaction/quick response missions in narrow channels and waterways or in constrained harbor environments.

Specifications:

Length (m)	< 7
Endurance (hrs)	12+
Speed (kts)	35+

Diagrams:

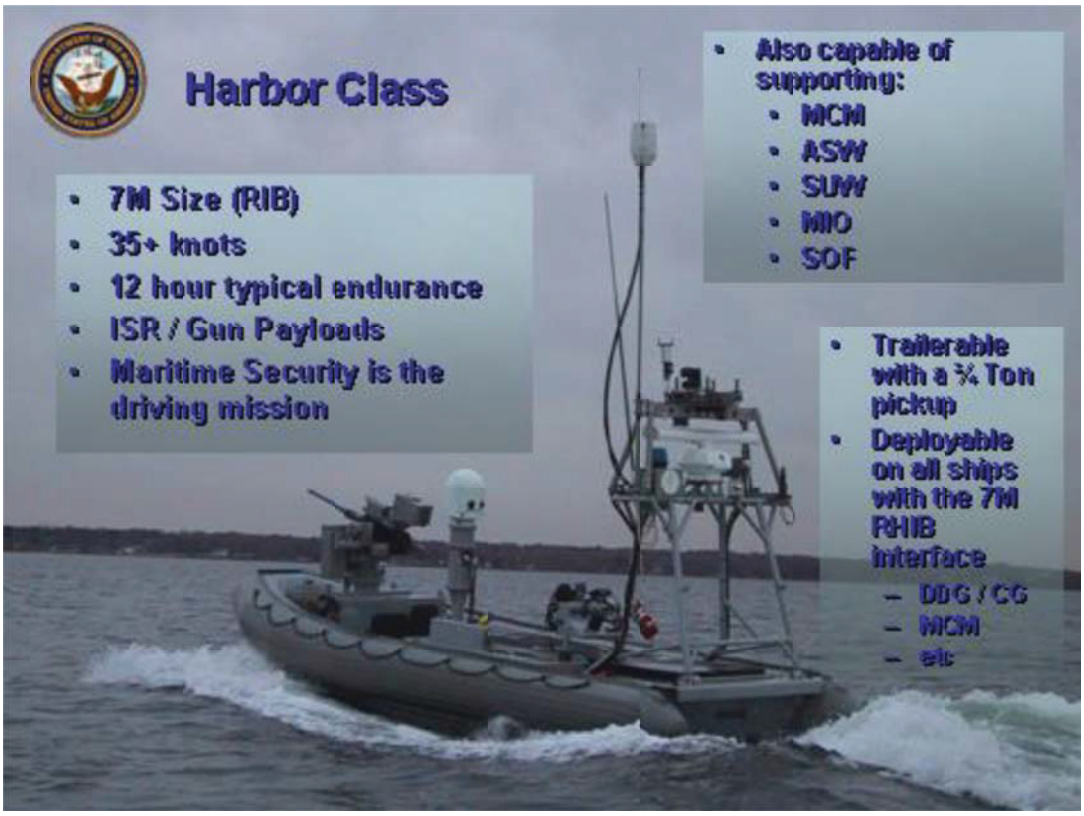


Figure 18 - Harbor-Class USV [10]

Figure 19 – Harbor-Class USV [11]

Inspector Mk 1

Manufacturer: ECA Robotics
Country: France
Application(s): Remote controlled targets

According to RUVSA [15]:

Coastal and port security, coast guard missions including underwater search, mine warfare, naval combat, shallow water survey, hydrography and oceanography, surveillance and reconnaissance missions.

Description:

According to the manufacturer [16]:

INSPECTOR Mk1 is a 7 meter RHIB, easy to deploy USV, developed for Navy crews training in self-defense against asymmetrical threats and for development and certification of weapon systems.

Typical Missions [16]:

- Small weapon Attack Trainer (SWAT)
- Artillery & Missile at sea training
- Weapon development & qualification
- Surface Survey & electronic warfare
- Mine sweeping system
- Pollution fighting

Control Unit Portable Man Machine Interface for [16]:

- Mission Planning
- Mission Monitoring
- Real-Time Payload Control

Specifications:

Length (m)	7.1
Beam (m)	2.5
Weight (kg)	2100
Speed (kts)	35
Endurance (hrs.)	15
Range (nm)	10 nm

Payload:

As per manufacturer [16]:

- Expendable Towed Target

- 360° N/D Video System (MDIS)
- Electro-Optical

According to RUVSA [15]:

- K-Ster mine killer
- side scan sonar
- forward-looking/obstacle avoidance sonar
- multi-beam echo sounders
- sub-bottom profiler
- magnetometer

Diagrams:

Figure 20 - Inspector Mk 1 USV [16]

Figure 21 - Inspector Mk 1 USV [16]

U.S.V Inspector MK 2

Manufacturer: ECA Robotics
Country: France
Application(s): Imagery & Bathymetric Survey

Description:

Typical Missions [17]

- Shallow and very shallow water survey and inspection
- Littoral and inshore hydrographic operations
- Harbor and Offshore assets survey and protection
- Object detection and classification

Main Features [17]

- Easy reconfigurable sensor carrier
- Repetitive survey with high navigation accuracy
- High endurance at sea
- High reliability and operational effectiveness
- Enhances security for crews

Specifications:

Length (m)	8.4
Beam (m)	2.95
Weight (kg)	4700
Speed (kts)	25
Endurance (hrs.)	20 @ 6kts

Payload:

According to manufacturer [17]:

- Multi Beam Echo Sounder
- Sub Bottom Profiler
- Side Scan Sonar
- Magnetometer
- EDGETECH 4600

Diagrams:

Figure 22 - U.V.S. Inspector MK 2 [17]

Interceptor USV

Manufacturer: 5G Marine International Inc.
Country: United States
Application(s): Force protection and harbor patrol

Description:

According to Naval Drones [18]:

The Interceptor unmanned surface vehicle was developed by AAI, MRVI and Sea Robotics and first demonstrated in 2007 for use in harbor patrol and force protection. The Interceptor is 6.5 meters long and can achieve speeds of 55 mph. The USV has greater than 24 hours of endurance and a range of up to 1,000 nautical miles. The vessel is currently marketed by 5G Marine Systems

According to Defense Update [19]:

Interceptor is designed for security and public service applications such as anti-piracy patrol, harbor security and oil rig surveillance. It began sea trials in September 2006. The Interceptor can operate autonomously commanded by an on-board mission computer and navigation system, taking the vessel on the pre-determined course and commands the prescribed tasks. There are onboard sensors to modify the progress of the vessel according to changing external circumstances, for example collision avoidance. Alternatively, the vessel can be remotely controlled via radio link.

Specifications:

Length (m)	6.5
Beam (m)	2.44
Weight (kg)	2.44
Range (nm)	1000
Max Speed (kts)	48
Endurance (hrs.)	24

Diagrams:

Figure 23 - Interceptor USV [19]

Kingfisher M200

Manufacturer: Clearpath Robotics
Country: Canada
Application(s): Maritime research vessel

Description:

According to the manufacturer [20]:

The Kingfisher M200 Unmanned Surface Vessel is designed for environmental professionals and civil engineers who are looking for a faster, easier, and safer way to get the data they need. An autonomy-ready variant is also available to researchers who need a reliable, easily transportable vessel for their work.

Specifications:

Length (m)	1.3
Beam (m)	0.94
Height (m)	0.34
Weight (kg)	29
Payload (kg)	10
Speed (kts)	3.9
Available Power	NiMH 14.4V 40Ah

Payload:

According to the manufacturer [20]:

The aluminum frame provides a lightweight structure for mounting additional sensing hardware.

Water-based ISR - Kingfishers are quiet and maneuverable. Enhancing the standard payload configuration with improved sensing capabilities and deploying several units lets you extend your presence over the water.

Diagrams:

Figure 24 - Kingfisher M200 USV [20]

Figure 25 - Kingfisher M200 USV [20]

Figure 26 - Kingfisher M200 USV [20]

Piranha USV

Manufacturer: Zyvex Marine
Country: United States
Application(s): Harbor patrol, ISR, surface warfare, anti-piracy

Description:

Note the identical platform design between the Piranha (USA) and Vigilant (Singapore). According to Zyvex Technologies [21]:

Singapore company ZyCraft is bringing in a new USV called the Vigilant [based on the Piranha design] from the United States to modify and test in Singapore waters around early August. It is also said to be more fuel efficient.

According to the manufacturer [22]:

The Piranha USV Concept is a long range unmanned concept vessel designed to demonstrate today's latest materials technology and design theory. Advanced unmanned vessels enable a broad range of unmanned operations on the sea, reducing operational costs and unnecessary risks. Constructed out of carbon fiber nano-composites, the Piranha set new standards in range and payload for an unmanned vessel.

According to Unmanned website [23]:

Built using Zyvex Technologies' Arovex™ carbon nanotube (CNT) reinforced carbon fibre prepreg the Piranha weighs 8400 lbs; boats of similar size typically weigh 40 000 lbs. The 75% lighter Pirahna is therefore easier to transport and more cost-effective to operate. After 6 months of extensive testing, the Piranha has completed its final sea trial – an approximate 600 nautical mile (nm) rough-weather sea test off the shores of Washington and Oregon, USA. According to Zyvex, a conventional aluminum or glass fibre reinforced plastic boat would have consumed 50 gallons or more per hour at cruise speed, but test results show that Piranha consumed only 12 gallons of fuel per hour while cruising at 25 knots.

Specifications:

Length (m)	16.46
Weight (kg)	3810
Payload (kg)	6805
Cruise Speed (kts)	25+
Range (nm)	2800

Diagrams:

Figure 27 - Piranha USV [22]

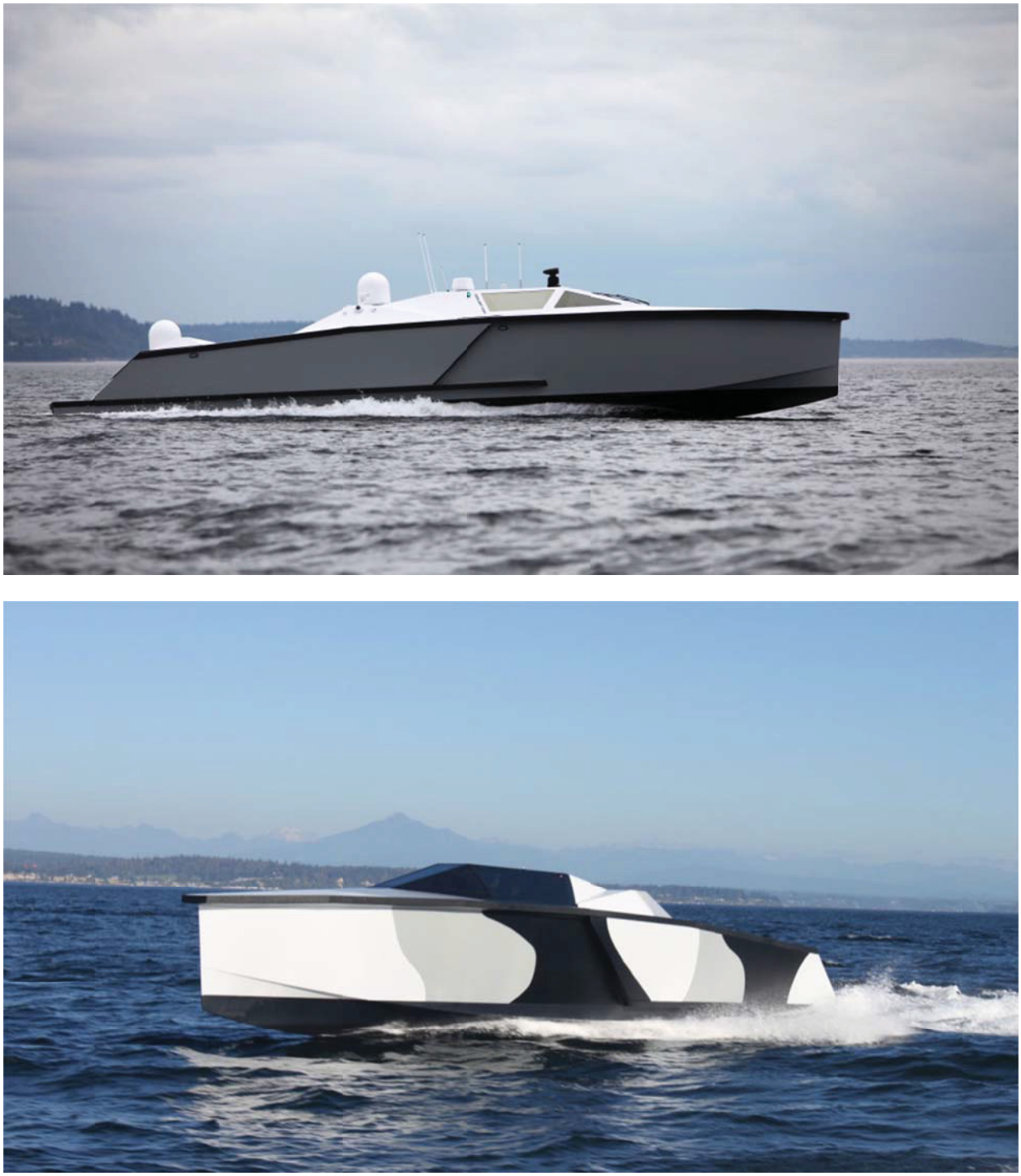


Figure 28 - Piranha USV [22]

Piraya USV

Manufacturer: Kockums AB (a part of ThyssenKrupp Marine Systems)
Country: Sweden
Application(s): Coast Guard and Security

Description:

According to the manufacturer [24]:

The platform offers a new highly efficient and cost effective method for patrolling coastal waters, a requirement accentuated by the increased terror threat from the seas. Because of its flexible design and rapid deployability, the Piraya offers the ideal solution for such requirements by navies, water police, and coast guard services and can be tailored to the customer's specific needs.

Group control is now recognized as the next important leap towards the efficient and effective use of unmanned vehicles. USV control can be taken directly through dedicated R/C units or indirectly through the Autonomous Vehicle Control (AVC) tool. Open interfaces allows integration with legacy C2 and communication systems. Mission planning and vessel automation is designed in accordance with specific needs.

The use of Piraya as part of forward early warning unit in a larger network in maritime safety and interdiction operations has been proven in the Tactical Network Topologies series of experiments (Bordetsky and Netzer, NPS, paper 178 at the 14th ICCRTS, Washington DC, June 2009). In addition to technical trials, Kockums is developing methods for handling a range of functions such as vessel preparation, transfer between logistics teams and tactical USV management, and collection and merging of sensor data from various sources.

Specifications:

Length (m)	**4**
Beam (m)	1.4
Weight (kg)	400
Payload (kg)	100
Speed (kts)	20
Range (m)	30

Payload:

According to manufacturer [24]:

- TV/IR surveillance cameras
- Radar
- Communication relay devices
- CBRN sensors
- Loud speakers

Diagrams:

Figure 29 - Piraya USV [24]

Protector

Manufacturer: Rafael Advanced Defense Systems
Country: Israel
Application(s): Unmanned Naval Patrol Vehicle

Description:

According to the manufacturer [25]:

The Protector is an integrated naval combat system, based on unmanned, autonomous, remotely controlled surface vehicles. Highly maneuverable and stealthy, the Protector can conduct a wide spectrum of critical missions, without exposing personnel and capital assets to unnecessary risk. The Protector's anti-terror mission module payload includes sensors and weapon systems. The search radar and the Toplite electro-optical (EO) pod enable detection, identification and targeting operations. The weapon systems are based on Rafael's Typhoon remote-controlled, stabilized weapon station, capable of operating various small caliber guns. The highly accurate, stabilized weapon station has excellent hit-and-kill probability.

Protector is mission reconfigurable through its plug-and-play design, allowing utilization of various mission modules:

- Anti-terror Force Protection (AT/FP)
- Intelligence, Surveillance and Reconnaissance (ISR)
- Naval warfare: ASW, MIW, MCM, ASUW, EW
- Maritime, Port Security

Specifications:

Length (m)	9	11
Beam (m)	3.5*	n/a
Height (m)	4.5*	n/a
Speed (kts)	50	n/a

(*not available from manufacturer but found in reference [26])

Payload:

- Toplite electro-optical (EO) pod
- Mini-Typhoon remote-controlled weapon station
- Lightlink communication equipment
- Radar
- Visual cameras
- Laser range finders
- PA system and light projector

Diagrams:

Figure 30 - Protector USV [27]

Figure 31 - Protector USV [27]

Rodeur

Manufacturer: Sirehna (a DCNS company)
Country: France
Application(s): Maritime Surveillance

Description:

According to l'Association Technique Maritime Aéronautique [29]:

In 2006, SIREHNA decides to develop its own multi-mission USV: RODEUR. On a 9.2m, 2 x 350Hp and 1.5t payload RHIB basis adapted to future FREMM frigates, RODEUR is a demonstrator particularly adapted to various civilian and military missions. Waiting for future French USV projects such as DUBM 44 or cooperation projects, SIREHNA presently studies payload integration and advanced functions for specific missions.

Specifications:

Length (m)	9.2
Payload (kg)	1360
Speed (kts)	50

Diagrams:

Figure 32 - Rodeur USV [30]

SARPAL

Manufacturer: International Submarine Engineering (ISE)
Country: Canada
Application(s): Search and rescue portable, air-launchable autonomous marine vehicle

Description:

According to the manufacturer [31]:

SARPAL (Search and Rescue Portable, Air-Launchable) is a remotely-operated, air-droppable, diesel-powered marine vehicle (MV) initially developed for the Department of National Defense (DND), to recover victims in marine crisis.

The SARPAL MV will be deployed from the CC-130 aircraft over the crisis site and operated from the aircraft using command, control (C2) and live video. The platform is based around a Zodiac Hurricane commercial rigid hull inflatable, which is molded to an ISE rigid lower hull containing propulsion, control, communications, and mission electronics. The standard mission package includes GPS navigation, audio (currently marine VHF), video and self-propulsion, all of which are remotely operated from the aircraft. Waypoint navigation is used for defining search patterns or rendezvous points for recovery. Realtime Video is selectable (currently, over a single channel) from four cameras: fore (color and infrared), aft and interior.

Specifications:

Length (m)	4.9
Beam (m)	2.06
Height (m)	2.08
Weight (kg)	1089
Payload (kg)	907
Speed (kts)	5
Endurance (hrs.)	24

Diagrams:

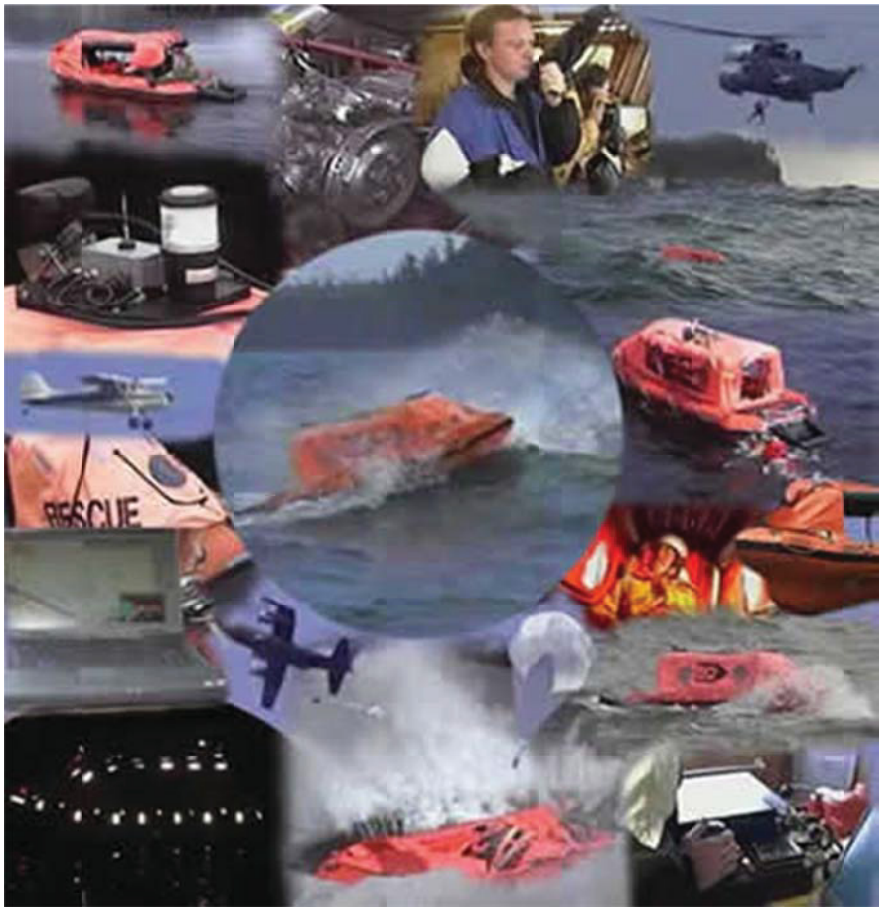


Figure 33 - SARPAL USV [31]

SeaOWL MK VI

Manufacturer: DRS Defense Solutions
Country: United States
Application(s): ISR, Port and harbor security

Description:

According to the manufacturer [32]:

The DRS SeaOWL is a semi-autonomous/autonomous marine craft allowing real-time data collection and transmission for a variety of missions without endangering personnel. Its compact size enables it to be deployed from a wide range of vessels and shore locations. With its shallow draft and low profile, it supports superior maneuverability and mobility in riverine and coastal areas where larger craft cannot operate effectively. The SeaOWL's unique design includes a patented, multi-channel hull that maximizes speed and stability. A remote operator in a secure location can patrol miles of coastline or harbor, effectively gathering real-time images of data on both surface and subsurface targets.

Specifications:

Length (m)	3.8
Beam (m)	2.16
Height (m)	0.91
Weight (kg)	672
Payload	544
Max Speed (kts)	40
Endurance (hrs.)	35

Payload:

Payload options [32]:

- Underwater camera
- Sonar
- Night vision camera
- Thermal camera
- Radar
- Spotlights
- Microphones/speakers
- Lethal/non-lethal weapons
- Environmental sensors
- Remotely Operated Vehicles (ROVs)
- Unmanned Underwater Vehicles (UUVs)

Navigational Options [32]:

GPS receiver:	Indicates craft location in latitude and longitude by satellite
Computer mapping system:	Destination way-points and autopilot
X-Band transponder:	Enhances on-shore radar return

Diagrams:

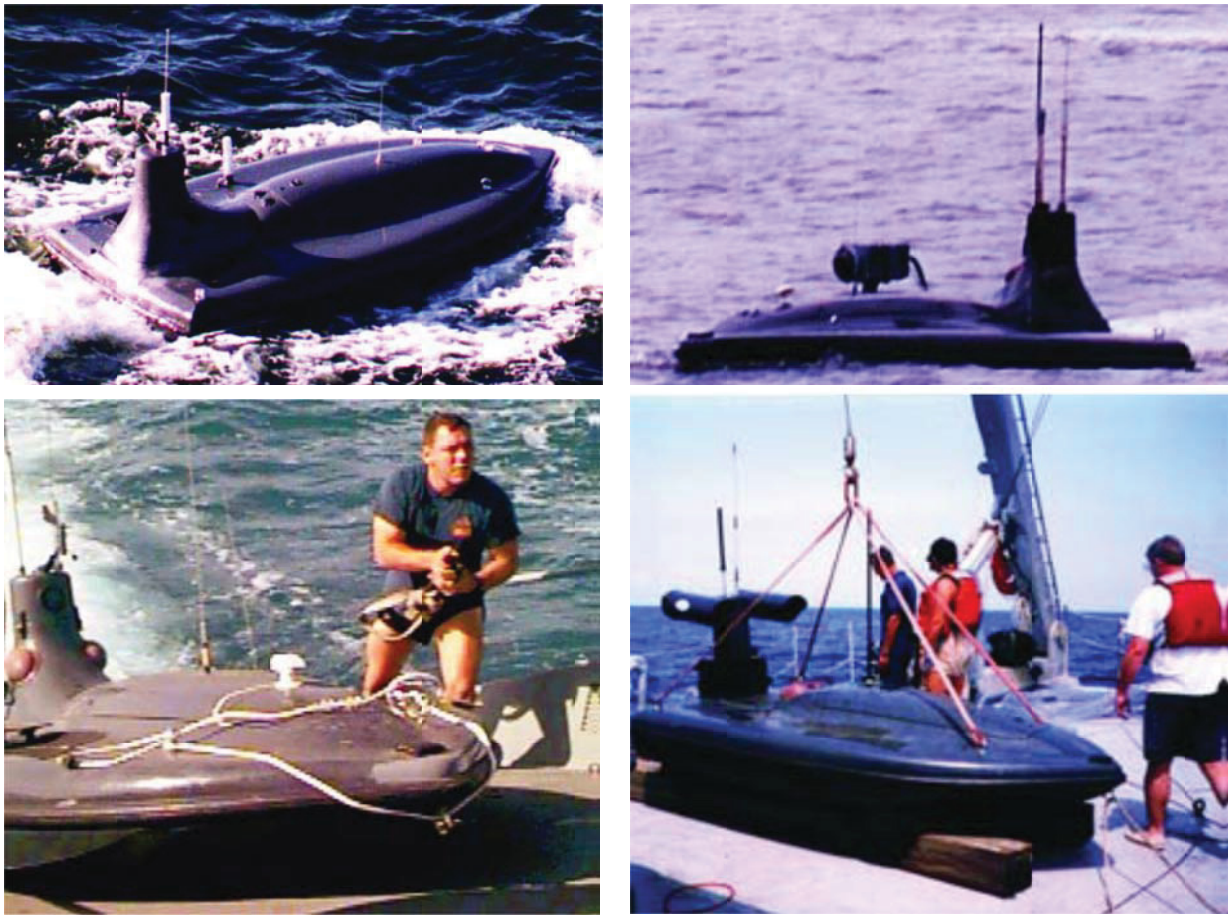


Figure 34 - SEAOWL MK VI USV [32]

SeaFox MkI / SeaFox MkII

Manufacturer: Northwind Marine Inc.
Country: United States
Application(s): Fleet and port security

Description:

According to the MarineLink.com [33]:

Air dropable, ship deployable and multi-mission configurable, big things do come in little packages. Northwind Marine's unmanned surface vehicle (USV); the "SeaFox" is a little package delivering multiple capabilities for the expanding requirements of fleet and port security. Originally commissioned through the Office of Naval Research (ONR) Tech Solutions Program for towing air gunnery training targets at 40 knots, the 16-ft x 5-ft Northwind Marine Inc. engineered, alternative fuels USV, is compact and capable of carrying relatively large payloads. Other potential applications include pre-fire weapons range clearance, location inspection for reconnaissance teams, night surveillance, data relay and commercial fishing support,

Specifications:

According to NSWC [34]:

	Mk I	Mk II
Length (m)	4.9	5.2
Beam (m)	1.75	2.4
Weight (kg)	1020	1180
Payload (kg)	113	227
Max Speed (kts)	40	12
Range (nm)	300	200

Payload:

According to NPS CAVR [35]:

Communications

- 440MHz command and control link for remote control and/or emergency stop
- 2.4GHz wireless mesh network

Sensors

- Dual BlueView obstacle avoidance sonar (2D)
- Horizontal plane and vertical plane
- Independent, computer-controlled pan/tilt actuators
- Remote or computer-controlled actuation (deploy/retract)
- Dual HoodTech Stabilized Pan/Tilt/Zoom video camera turrets
- Electro-optic camera

- Infrared camera
- Six fixed wide angle video navigation cameras
    - (3) Daylight (color)
    - (3) Low Light (black & white, lowlight (3)
- ComNav DGPS Satellite Compass
- HG1700 Inertial Measurement Unit (IMU)
- 3 axis acceleration and angular rate (ring laser gyro)
- HMR3000 Compass (heading, pitch, roll)
- Raymarine ST60 water speed sensor

Diagrams:

Figure 35 - SeaFox Mk II [34], [35]-[37]

Seastar

Manufacturer: Aeronautics Systems
Country: Israel
Application(s): Home-Land Security and Naval Applications

SeaStar Applications [38]:

- Harbor and Strategic Facility Protection
- Coast patrol
- Ship Protection
- Oil rig Protection
- Optical and Electro-Magnetic field of sight extension
- ISR missions
- Target designation
- Jamming and Decoy Missions
- Force Protection

Description:

According to the manufacturer [38]:

SeaStar presents a revolution in maritime operations, featuring unmanned capabilities for the entire array of Home-Land Security and Naval applications. The SeaStar USV system is an unmanned, remote-controlled vessel capable of carrying out a wide range of naval or maritime missions. SeaStar is equipped with a full array of sensors required for remote operation and any of a variety of mission specific payloads. SeaStar open-architecture system design, controlled by Aeronautics' unique and proved UMAS™ Multi-application Command & Control system, which enables:

1. Integration of the- Seastar into any C4I network.
2. Command & Control of the- SeaStar from any maritime, aerial and ground vehicle or station.
3. "Plug & Play" integration of any kind of payload or weapon system.
4. SeaStar is a versatile platform for various applications.

Specifications:

Length (m)	7	11
Beam (m)	2.6	3.5
Weight (kg)	2200	6000
Payload (kg)	1500	2500
Endurance (hrs.)	n/a	10
Speed (kts)	27	45
Range (nm)	125	300

Payload:

SeaStar Payloads [38]:

- Day/Night (EO/IR) sensors
- Target acquisition sensors
- ESM/ECM ELINT/COMINT
- Sonar
- Public address system. Non-Lethal / Weapon Systems (Water/Noise/Stun)
- Maritime stabilized Gun and Fire control system

Diagrams:

Figure 36 - Seastar USV [38]

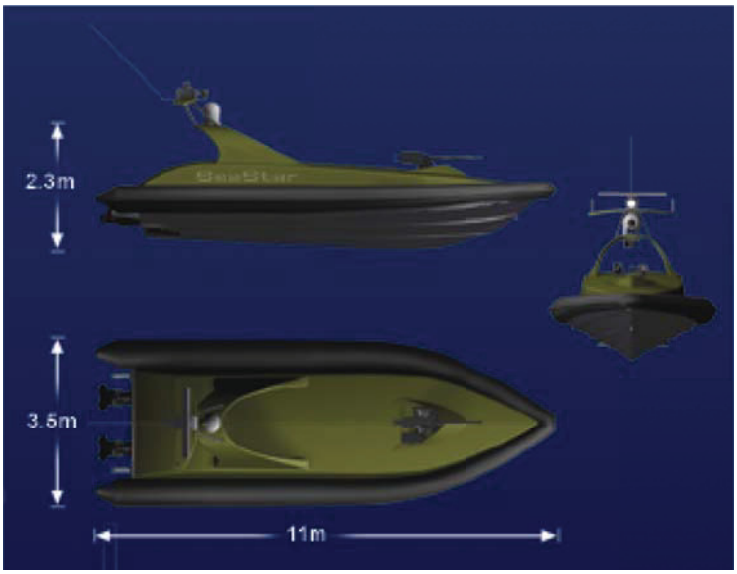


Figure 37 - Seastar USV [38]

Sentinel Family of USVs

Manufacturer: Accurate Automation Corp.
Country: United States
Application(s): ISR and Threat Reconnaissance

Description:

According to the manufacturer [39]:

Our USVs range from 5 to 12 meters and include a 38ft Brunswick Ocean Racer […] to accommodate a variety of mission objectives efficiently. Each USV will be provided with a standard set of services designed to work together as an integrated system in adapting to the various mission modules over the life of the USV.

We are able to launch and recover small UAVs from our USV. These UAVs are networked with the USV and provide a forward presence for the operator. The Automatic Launch and Recovery System (ALaRS) has been developed for Unmanned Aerial Vehicle (UAV) operations onboard Unmanned Surface Vessels (USVs), including the Navy's Sentinel and NEO USVs. Deploying UAVs extends the mother ship's over-the-horizon combat operations zone. UAVs have been successfully launched and recovered onboard USVs under ALaRS control.

Specifications:

Length (m)	4.67
Beam (m)	1.96
Weight (kg)	626
Payload (kg)	454
Max Speed (kts)	50
Range (nm)	150

Diagrams:

Figure 38 - Sentinel USV [39]

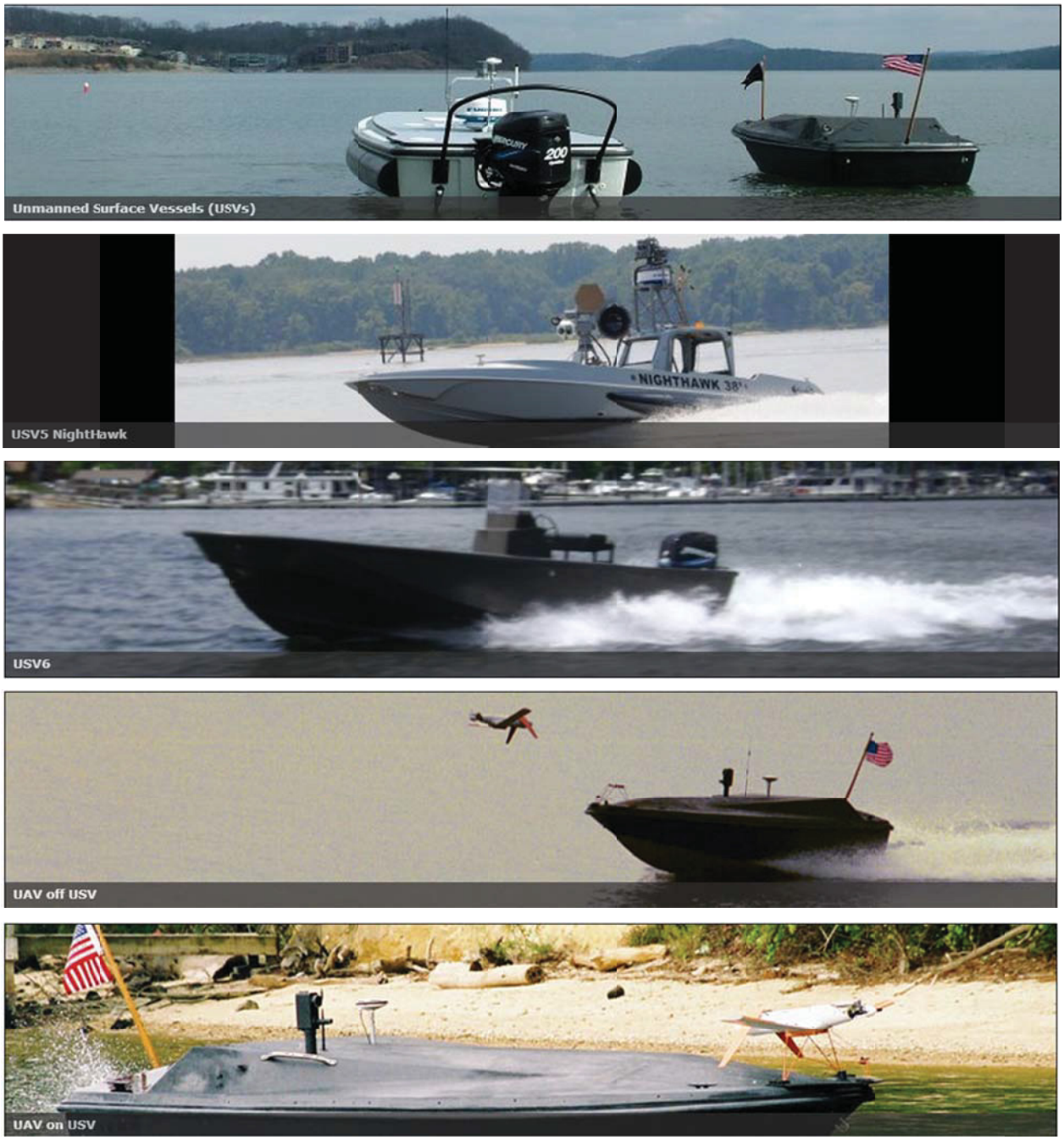


Figure 39 - Sentinel Family of USVs [39]

Sentry

Manufacturer: Atlas Elektronik UK
Country: United Kingdom
Application(s): Reconnaissance and Surveillance Missions

Other potential application [40]:

- Unmanned harbor patrol & security
- Battlefield reconnaissance
- Intruder investigation
- Payload deployment
- Communications relay
- Environmental monitoring

Description:

According to the manufacturer [40]:

SENTRY is a new concept in unmanned surveillance. A water jet based compact platform, combined with a stealth design and multiple payloads allows for a variety of mission roles for this exciting vehicle. With real time stabilised day / night vision link and intuitive remote operator control from a PC workstation, SENTRY is equipped for a variety of military and civilian roles.

Specifications:

Length (m)	3.5
Beam (m)	1.25
Height (m)	1.1
Endurance (hrs)	6
Speed (kts)	50
Range (nm)	16

Payload:

According to the manufacturer [40]:

- microwave data link communications
- stabilized real-time day / night high resolution cameras,
- full lighting rig that meets current maritime navigation standards,
- loud-hailer system
- smoke marker launcher

Optional COTS Sensors:

- Radar
- D/GPS
- High Resolution Sonar
- Underwater Camera
- Inertial Measurement Sensor

Diagram:

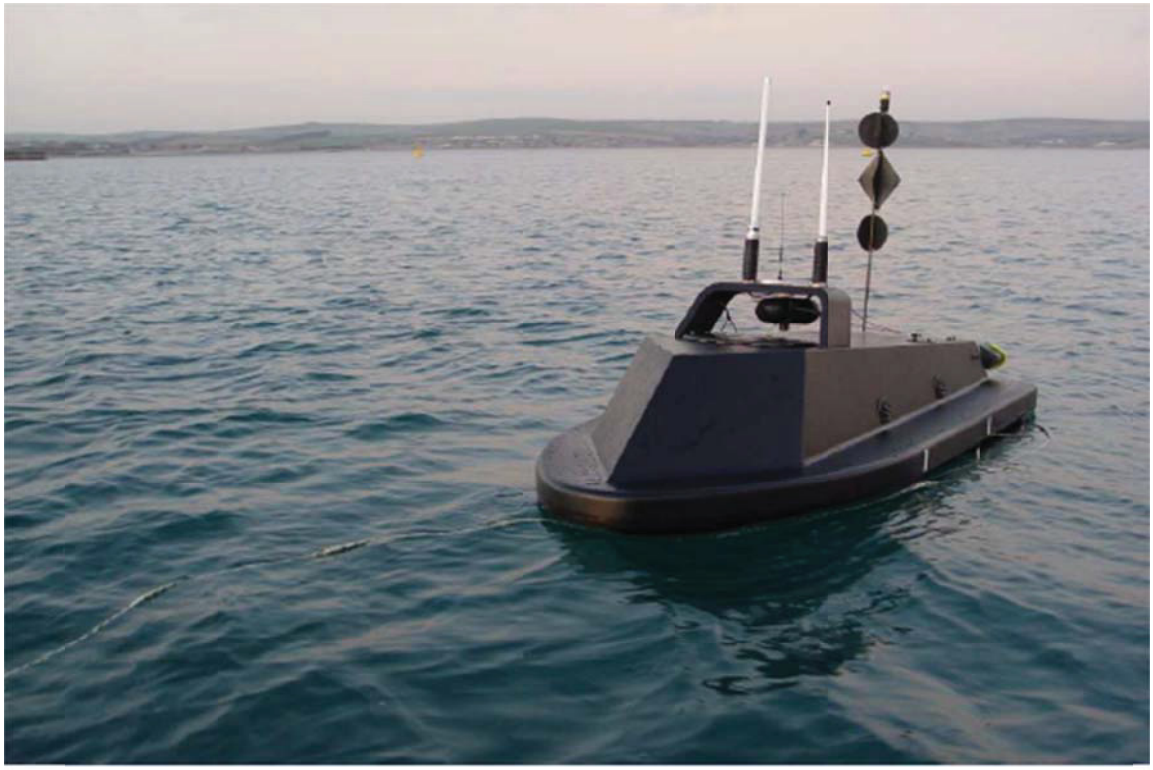


Figure 40 - Sentry USV [40]

Silver Marlin

Manufacturer: Elbit Systems Ltd.
Country: Israel
Application(s): Maritime Patrol Missions

Silver Marlin is designated for [41]:

- Intelligence, surveillance and reconnaissance (ISR)
- Force protection/anti-terror missions
- Anti-surface and anti-mine warfare
- Search and rescue missions
- port and waterway patrol
- Electronic warfare

Description:

According to manufacturer [41]:

The Silver Marlin is a second generation USV and differs from those developed to date. While most currently available USVs are remote-controlled, the Silver Marlin is an autonomous USV. The second generation Silver Marlin is fully capable of performing complete missions independently, such as: departing and returning to homeport and maintaining an observation point.

The autonomous system is designed for optimal performance on low-level control activities such as optimal turning rate, optimal speed for fuel consumption, and accurate sailing and navigation with cruise sensors and stabilization systems to prevent capsizing. It has an adaptive feature, capable of self-tuning the control system in response to environmental or mission changes.

Specifications:

Length (m)	10.67
Weight (kg)	4000
Payload (kg)	2500
Speed (kts)	45
Endurance (hrs.)	24-36
Range (m)	500

Payload:

According to manufacturer [41]:

- Compact Multi-Purpose Advanced Stabilized System (CoMPASS) sensor turret
- CCD TV camera
- 3-5 micron FLIR
- Laser: Aiming, Rangefinder, Designator and Target Illuminator
- Small boat detection capability
- 7.62 mm Overhead Remote Control Weapon System

Diagrams:

Figure 41 - Silver Marlin USV [41][42]

Spartan Scout

Manufacturer: U.S. Naval Undersea Warfare Center (with support from Radix Marine, Northrop Grumman, and Raytheon)
Country: United States
Application(s): ISR and force protection

Description:

According to the U.S. Navy new release [43]:

The Spartan Scout, a Department of Defense (DoD) Advanced Concept Technology Demonstration (ACTD), is under the direction of the Naval Undersea Warfare Center Division, Newport.

Deployed aboard Gettysburg, it is part of the Navy's only deployed strike group, which is conducting missions in support of Operations Iraqi and Enduring Freedom.

Spartan is a modular, reconfigurable, multi-mission, high-speed, semi-autonomous unmanned surface vehicle (USV) capable of carrying payloads of 3,000 and 5,000 pounds for seven-and-11-meter craft, respectively. Integrated as an expeditionary sensor and weapons system designed to be a primary "force-leveler" against asymmetric threats, it enables a battle force commander to match inexpensive threats with an appropriate response.

The Spartan Scout ACTD is aimed at addressing joint warfighting needs in the increasingly complex and contested littoral areas of the world. In the ACTD, Spartan is specifically focused on demonstrating the military utility of modular, multimission USVs as extended sensor and weapons platforms conducting intelligence, surveillance and reconnaissance (ISR)/ target acquisition; precision strike; and shallow-water undersea warfare missions in support of joint task force, battle group, amphibious and sealift operations.

The current version of the Spartan Scout used by Gettysburg is the ISR Spiral. The ISR version allows the ship's crew to establish a Recognized Maritime Picture around the cruiser and carrier, provide force protection and possibly provide real-time surveillance around ships being boarded by Navy teams.

"Future Spirals are planned to demonstrate warfighting capability in scenarios engaging hostile threats with gun and missile systems. Additional demonstrations will include mine warfare capabilities. Also, planning is ongoing to develop and demonstrate antisubmarine warfare capabilities," said Ricci.

Specifications:

Length (m)	7	11
Payload (kg)	1361	2268

Diagrams:

Figure 42 - Spartan Scout USV [43][44]

Stingray

Manufacturer: Elbit Systems Ltd.
Country: Israel
Application(s): Homeland Security and Coast Guard applications

According to manufacturer [45]:

- Reconnaissance (ISR)
- Force Protection/Anti-Terror (FP/AT)
- Anti-Surface Warfare (ASuW)
- Mine Warfare (MIW)
- Littoral Anti-Submarine Warfare (ASW)
- Port, oil rigs and sea structures defense and security
- Search And Rescue (SAR)
- Battle Damage Assessment (BDA)
- Exclusive economic zone monitoring of illegal activity
- Pollution detection and treatment

Description:

According to Defense Update [46]:

Stingray can perform autonomously or be remotely controlled by a single operator located at the shore station or onboard the ship.

The development is based on Elbit's extensive experience in the development and operation of unmanned air vehicles (UAV) and mini UAVs. The USV is controlled from a portable control station, from which operators can monitor and operate the mission payloads and perform mission planning.

The USV is designed for homeland security and coast guard applications including clearing shipping lanes and underwater search missions. Potential naval combat applications include target identification, Intelligence reconnaissance and surveillance (ISR) missions. Other applications include EW and ELINT.

Specifications:

Length (m)	3.2
Payload (kg)	250
Speed (kts)	45
Endurance (hrs.)	8

Payload:

- Gimbaled and gyro-stabilized EO/IR, laser marker & tracker
- Micro CoMPASS IMINT payload
- Day CCD high-resolution
- 3rd-Generation, night-cooled thermal imager

- Laser target illuminator (marker)
- Auto target tracking
- USV and control station are connected via wireless LoS,
- Comprised of several separate communication systems providing operator telemetry enabling them to control the system and monitor location
- GPS, inertial measurement, fluxgate compass

Diagrams:

Figure 43 - Stingray USV [46]

Tianxiang One

Manufacturer: Shenyang Shin Kong Corporation
Country: China
Application(s): Meteorological surveying

Description:

According to Naval Drones [47]:

The Tianxiang One is a carbon fiber hulled unmanned surface vehicle produced by Shenyang Shin Kong Corporation, a subsidiary of China Aviation Science and Industry Corporation. Tianxiang can be operated autonomously or with a ground-based operator. The vessel is designed for meteorological survey and conducted those operations in support of the sailing competition for the 2008 Olympic Games in Beijing.

The unmanned vessel "Tianxiang One" has a self-stabilizing system to stabilize the vessel while working in the high wave ocean environment. The USV is also equipped with reliable power system, which enables the USV traveling hundreds of kilometers as a weather explorer as long as 20 days in the ocean. It significantly increases China's ability of responding to marine incidents, environment monitoring in the oceans and large lakes, and disaster warning. The hull of Tianxiang One is a 6.5 meters long carbon fiber hull. It has many cutting-edge technologies including smart driving system, advanced radar system, satellite communication system, image processing and transmission system. The vehicle can perform autonomously or be remotely controlled by operators located at ground station. When performing autonomously, the vehicle could follow preprogrammed routes in the predefined search area while avoiding obstacles on the way.

Specifications:

Length (m)	6.5
Endurance (hrs.)	480 (20 days)
Range (m)	100's of km

Diagrams:

Figure 44 - Tianxiang One USV [47]

U-Ranger

Manufacturer: Calzoni (L-3 Communications Corp.)
Country: Italy
Application(s): Integration platform for various payload

Description:

According to the manufacturer [48]:

Calzoni USV design started with Italian MOD as a drone intended for minesweeping operation, based on our experience in mine hunting solutions. Next generation evolved to a dual-use unmanned full modular surface platform called U-RANGER* designed to integrate different sensors and payloads to suite various mission types. It offers solutions to all the environments and conditions where unmanned operations are required for safety and flexibility.

The system controls the vehicle through the following operating modes:

- Manual assisted: remote manual control by means of joystick/keyboard of the vehicle heading and thrust.
- Automatic: automatic track-keeping of planned tracks. Vehicle motion is continuously monitored by the master station.
- Autonomous: automatic mode without radio-link. The vehicle operates on the planned track in covert operation. In Autonomous mode the vehicle has the capability to perform the planned manoeuvers without any direct external control thanks to Obstacle Avoidance and Target Identification features.

Specifications:

Length (m)	
Beam (m)	
Weight (kg)	
Payload (kg)	
Speed (kts)	40
Endurance (hrs.)	
Range (m)	
Available Power	

Diagrams:

Figure 45 - U-Ranger USV [48]

USSV-HS

Manufacturer: Maritime Applied Physics Corp. (in conjunction with US NSWC)
Country: United States
Application(s): ASW, SuW, EW

Description:

According to the U.S. ONR [49]:

The Office of Naval Research (ONR) initiated a science and technology effort to develop clean-sheet unmanned surface vehicle designs optimized for Navy missions. This resulted in the USSV-HTF and USSV-HS designs. The USSV-High Speed (HS) is optimized for high speed in a seaway. ONR is currently using both crafts for experimentation. The USSV-HTF is a semi-planing monohull and the HS is a hydrofoil; both are powered by twin diesel engines. The USSVs use an autonomous control system. More advanced autonomy - which will enable mission-level planning, perception-guided maneuvers and tactical behaviors - is currently in development.

Specifications:

According to NSWC [34]:

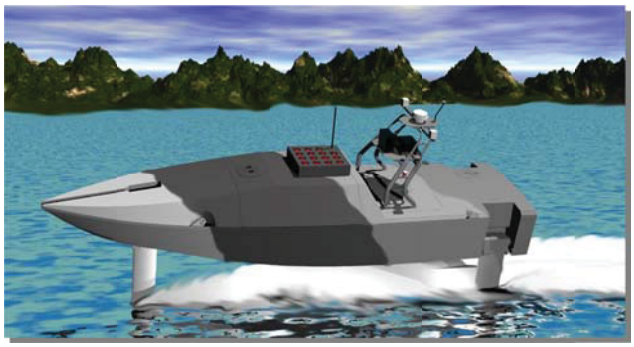
Length (m)	11.9
Beam (m)	2.9
Weight (kg)	6804 (partial) 9752 (full)
Payload (kg)	2041
Endurance (hrs)	11
Max Speed (kts)	40
Range (nm)	200

Payload:

Electronic Attack (EA) payload for the USSV-HS [50]:

To exploit the opportunity of fielding advanced capabilities using unmanned platforms, the Tactical Electronic Warfare Division at NRL is developing an advanced electronic attack (EA) payload for surface ship defense that is suitable for unmanned vehicles like those planned for use with the Littoral Combat Ship. Used singly, the unmanned vehicles provide a long-duration self-protection countermeasure system. Used in multi-vehicle constellations, the unmanned vehicles with EA payloads can be used to provide an area defense capability over large sectors. NRL has teamed with the Naval Sea Systems Command, Carderock Division, to integrate an electronic warfare (EW) payload onboard a sophisticated unmanned surface vehicle called the High Speed Unmanned Sea Surface Vehicle (HS-USSV).

Diagrams:



This image was sourced from the internet. It was deemed to contain Controlled Goods by CTAT and has therefore been removed for compliance with legislation.

Figure 46 - USSV-HS [49]

USSV-HTF

Manufacturer: Maritime Applied Physics Corp. (in conjunction with US NSWC)
Country: United States
Application(s): ASW, SuW, EW, MCM

Description:

According to the U.S. ONR [49]:

The Office of Naval Research (ONR) initiated a science and technology effort to develop clean-sheet unmanned surface vehicle designs optimized for Navy missions. This resulted in the USSV-HTF and USSV-HS designs. The USSV-High Tow Force (HTF) is optimized for tow force, payload fraction, endurance and seakeeping. ONR is currently using both crafts for experimentation. The USSV-HTF is a semi-planing monohull and the HS is a hydrofoil; both are powered by twin diesel engines. The USSVs use an autonomous control system. More advanced autonomy - which will enable mission-level planning, perception-guided maneuvers and tactical behaviors - is currently in development.

Specifications:

According to NSWC [34]:

Length (m)	11.9
Beam (m)	2.9
Weight (kg)	4082 (partial) 8165 (full)
Payload (kg)	2041
Endurance (hrs)	19
Max Speed (kts)	21
Range (nm)	350

Diagrams:

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Figure 47 - USSV-HTF [34][51]

USV-450, 600, 1000, 2600, 5000

Manufacturer: SeaRobotics Unmanned Systems
Country: United States
Application(s): Bathymetric and hydrographic surveys; coastal, harbor and river surveillance

Description:

According to the manufacturer [52]:

SeaRobotics (SRC) specializes in small, smart vessels that are remotely or autonomously operated. Our clients include major military and commercial organizations, both US and foreign. SRC's seasoned marine survey software interfaces with most data acquisition hardware, software and sensing systems.

Many of our vessels are small, modular and man-portable, allowing rapid deployment in remote areas or deployment by larger vessels. Our command and control systems are user-friendly and compact, allowing backpack mobilization.

Heavy payload catamaran USV
The USV-450 heavy payload catamaran has a maximum speed of 2m/s, a weight of 40 kg, LOA of 1.9m, and an 80kg instrument capacity, this vessel is an ideal base for complex instrument deployment systems, on board power generation and various special projects. The USV-450 heavy payload catamaran is an ideal base for complex instrument deployment systems, on board power generation and various special projects.

Mission-reconfigurable USV (MRUSV)
Our USV-600 MRUSV has a maximum speed of five m/s, weight of 40kg, LOA of 3m, and an 8 kg instrument capacity, this vessel is capable of the most demanding stream gauging or survey applications.

High speed trimaran USV
Our USV-1000 high-speed trimaran has a maximum speed of 2m/s, weight of 40kg, LOA of 1.9m, and an 80kg instrument capacity, this vessel is an ideal base for complex instrument deployment systems, onboard power generation and various special projects.
Special applications include unmanned multi-beam survey system with integrated Teledyne ODOM ES3-M sonar.

Catamaran MRUSV
The USV-2600 MRUSV has a weight of 41kg, LOA of 3.0m, a beam of 1.1m, and speed over 10kt. Instruments are easily reconfigured on our keyed-track and open-deck, catamaran design. Numerous sensors and energy storage options are available for the MRUSV.

Self-righting mono-hull USV
Our USV-5000 self-righting mono-hull USV has a maximum speed of 3.5m/s, a weight of 100kg, LOA of 4m, and a 50kg instrument capacity, enabling its use for multi-beam surveys. This vessel is very efficient and capable of heavier sea and surf zone operations due to self-righting features. The mono-hull is stable because of its deep keel and length.

Specifications:

	450	600	1000	2600	5000
Length (m)	1.9	3	1.9	3	4
Beam (m)	1.3	1.1	1.3	1.1	
Weight (kg)	40	40	40	41	100
Payload	80	8	80		50
Max Speed (kts)	3.9	9.7	3.8	10	6.8

Payload:

According to manufacturer [52]:

Sensors include, but are not limited to: acoustic doppler current profilers (ADCPs), multi-frequency side-scan sonars (SSS), sub-bottom profilers (SBPs), turbidity, conductivity, temperature and depth. Video can be provided from our vessels in various formats. Our sensors include: compass, attitude (roll / pitch) power consumption and other performance measures for general vessel management.

Diagrams:

Figure 48 - USV-450 [52]

Figure 49 - USV-600 [52]

Figure 50 - USV-1000 [52]

Figure 51 - USV-2600 [52]

Figure 52 - USV-5000 [52]

Venus-9, Venus-11, Venus-16

Manufacturer: Singapore Technologies (ST) Electronics Ltd.
Country: Singapore
Application(s): Naval and Security Missions

Description:

According to manufacturer [53]:

The ST Electronics Venus USV is based on a composite 9m hull platform, integrated with Guidance Navigation Control (GNC), Electronics and Sensors Systems. ST Electronics has taken a modular design approach in the development of the Venus USV. The modular design concept envisages a common platform reconfigurable for multiple missions, through integrating different payload modules, offering a high level of mission autonomy.

The Venus USV is intended to be adaptable in fulfilling the needs for a range of naval and security missions. The first prototype has already successfully completed its remote control and waypoint navigation trials and is now in its next development phase of mission payload integration.

Specifications:

	Venus-9	Venus-11	Venus-16
Length (m)	9	11	16
Beam (m)	2.8*		
Height (m)	5*		
Payload (kg)	1000*		
Speed (kts)	50*		
Endurance (hrs.)	8*		

(*not available from manufacturer but found in reference [54])

Payload:

Potential payload options may include [53]:

- Mine Counter-Measure - equipped with a synthetic aperture sonar and expendable mine disposable system
- Force Protection - combining radar and electro-optic sensors with a small-calibre remote weapon station
- Anti-submarine Warfare - equipped with an active dipping sonar
- Electronic Warfare - equipped with electronic warfare sensors
- Maritime Surveillance
- Precision Fire - equipped with short range missile system

Diagrams:

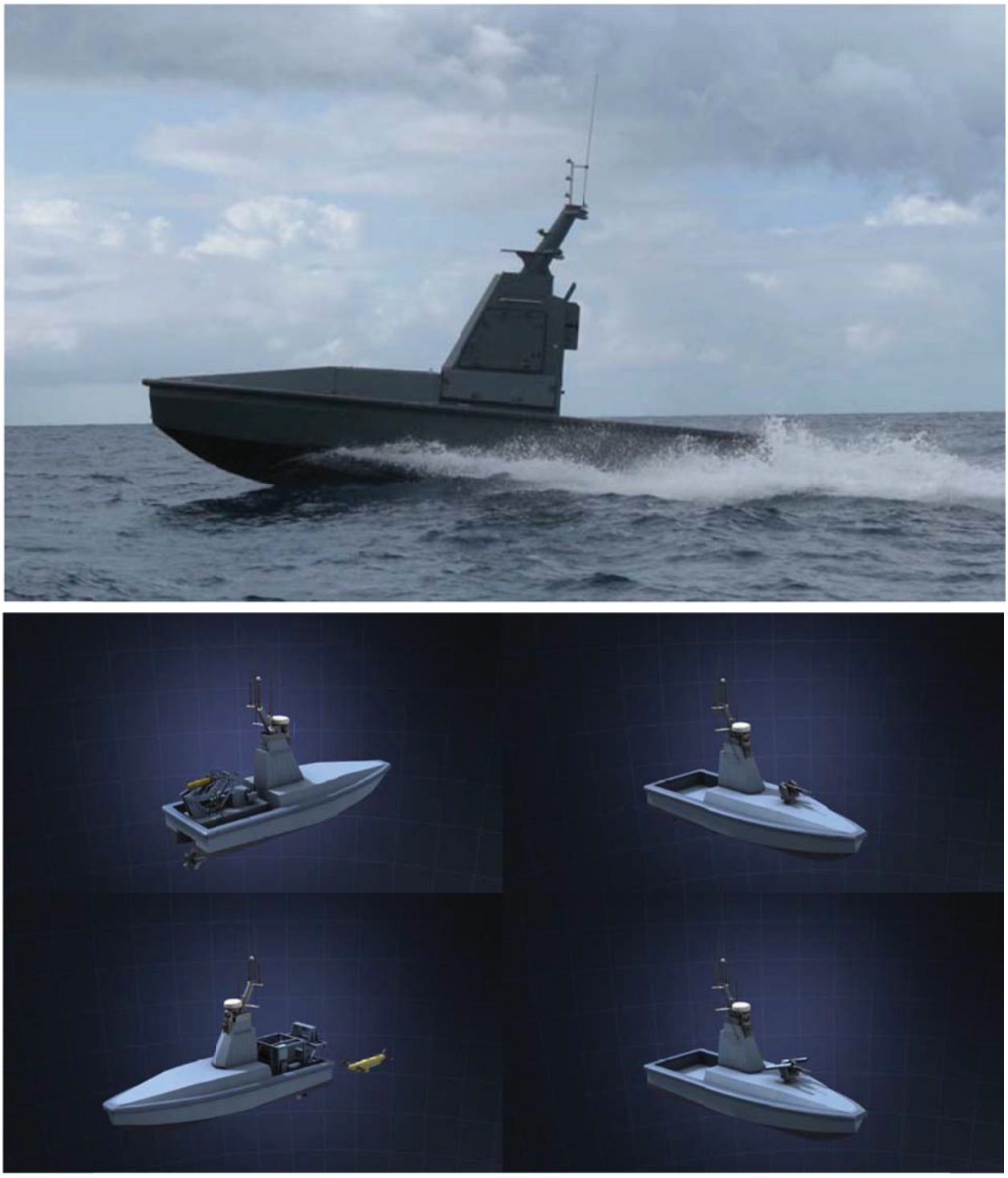

Figure 53 - Venus USV [53]

Vigilant IUSV

Manufacturer: Zycraft Ltd.
Country: Singapore
Application(s): Multi-Mission Payload Vessel

- Maritime Security & Surveillance
- Oceanographic Survey & Research
- Search & Rescue & Maritime Logistics
- Harbor Defense

Description:

Note the identical platform design between the Piranha (USA) and Vigilant (Singapore). According to Zyvex Technologies [21]:

Singapore company ZyCraft is bringing in a new USV called the Vigilant [based on the Piranha design] from the United States to modify and test in Singapore waters around early August. It is also said to be more fuel efficient.

According to the manufacturer [55]:

The Vigilant IUSV is a state of the art multi-mission unmanned vessel. Built from advanced nanotechnology enhanced material, the IUSV achieves unparalleled range and payload. It is the only USV that features the Seakeeper™ system stabilization onboard resulting in exceptional seakeeping that optimizes system performances, especially at loiter speeds. These technologies enable the IUSV to remain effective at sea for long periods of time making it a real force multiplier.

The Vigilant IUSV is designed to operate independently of a mother craft. Its size and enhanced seakeeping qualities enable shore to shore operations. Even in rough seas, one can expect the IUSV to remain operational without worrying about launch and recovery issues that often plague operations involving a mother craft. Command and control is achieved via satellite communications systems, thus enabling the IUSV to operate anywhere in the world.

The Vigilant IUSV™ (Independent Unmanned Surface Vessel) features a large 3m x 3m x 2m modular payload space that will allow for many different types of payloads based on customer's needs. Up to 3 tons of payload is possible.

Designing around a payload frame enables easy payload interchangeability, ease of maintenance and rapid introduction of new systems. As payloads are enclosed, protection against the harsh environment is assured and this means improved operational reliability and post mission maintenance. Payload modules dealing with Above Water and Underwater Surveillance, Harbor Protection, Search and Rescue, Maritime Logistics, and Oceanographic Research are available. Payloads can be easily customized to requirements.

Specifications:

Length (m)	16.5
Beam (m)	3.6
Empty Weight (kg)	6000
Full Load Weight (kg)	13000
Payload – Fuel and Cargo (kg)	7000
Max Speed (kts)	30
Cruise Speed (kts)	12
Range @ Cruise (nm)	2000
Patrol Endurance (days)	30

Diagrams:

Figure 54 - Vigilant IUSV [55]

WAM-V

Manufacturer: Northwind Marine Inc.
Country: United States
Application(s): Shallow water hydrographic surveying

Typical Applications [56]:

- Port & riverine operations and surveillance
- Launch and recovery (LAR) of small to large AUVs/UUVs/ROVs
- Manatee/Whale Speed Zone Enforcement
- Surveillance of remote Marine Protected Areas & fishing grounds
- Deployment/retrieval of oceanographic sensors
- WAM-V USV outfitted with mini-typhoon guns, night vision cameras, CVLWT and dipping sonar to locate submarines.
- WAM-V USVs can provide Protected Passage and Sea Shield capabilities.
- WAM-V USV outfitted with UUV/AUV equipped with expendable mine neutralization system (EMNS).
- Maritime Interdiction Operations (drug smuggling, contraband)

Description:

According to the manufacturer [56]:

The WAM-V technology is uniquely suited for unmanned operation. WAM-V USVs maximize the advantages of control system miniaturization with low weight vessels. Designed specifically for unmanned applications, the WAM-V USVs are ready to receive and respond to instrument and control packages. The top deck easily accommodates these packages in the highest position, free of obstructions. The 2:1 length-to-beam ratio, suspension system and articulating joints provide excellent stability in a wide range of sea states and shock mitigation to C4 and payload packages.

Using the foldable feature of the WAM-V USV, the footprint of the vessel can be reduced by up to 75%. The vessel can be launched in the folded configuration by a crane, A-frame, stern ramp or drogue system for RIBs and then remotely unfolded. This allows the WAM-V USV to be deployed and to carry out missions, e.g. UUV deployment and retrieval, when other vessels of comparable size cannot.

Specifications:

Length (m)	3.67	10.1
Beam (m)	1.83	4.88
Weight (kg)	68	1360
Payload (kg)	45	454
Max Speed (kts)	15	35
Range (nm)	43.5	500

Diagrams:

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Figure 55 - WAM-V USV. 3 m (left), 10 m (right) [56]

X-Class

Manufacturer: Unknown. Program by the U.S. Navy PEO LCS
Country: United States
Application(s): ISR and Threat Detection

Description:

According to U.S. Navy PEO LCS [57]:

[..] the modular unmanned surface craft littoral (MUSCL), which is an "X-Class," man-portable USV platform. MUSCL is designed for Riverine combatant craft (Riverine patrol boat or Riverine assault boat) support to employ as a waterborne "point man" to increase situational awareness during operations on inland waterways. The system supports Navy Expeditionary Combat Command requirements and is capable of carrying different sensors and payloads to provide a variety of capabilities, such as intelligence, surveillance, reconnaissance and threat detection. MUSCL is scheduled for delivery to the Fleet in FY2011 as a user operational evaluation system (UOES).

Program Executive Office, Littoral Combat Ships (PEO LCS), delivered the first three unmanned surface vessels to the U.S. Navy's Riverine Group One, Nov. 1 2011. MUSCL is a two-man portable craft with capabilities that include intelligence, surveillance, and reconnaissance missions that provide real-time monitoring of suspicious vessels, personnel, and activity along waterways, shorelines, and under bridges and piers.

Specifications:

According to Navy SBIR 2012.1, the current point design described below is representative of one craft [58]:

Length (m)	1.7
Beam (m)	0.6
Weight (kg)	14
Payload (kg)	14
Endurance (hrs)	12
Speed (kts)	25
Available Power	80 W

Diagrams:

Figure 56 - X-Class MUSCL [57]

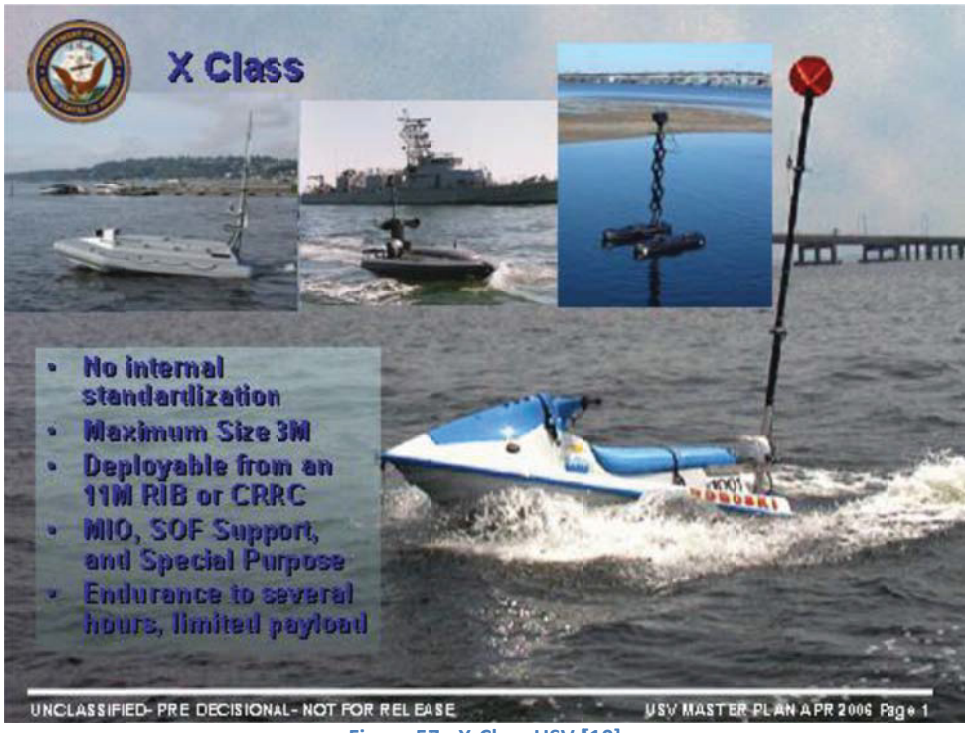


Figure 57 - X-Class USV [10]

XG-2

Manufacturer: Shenyang Shin Kong Corporation
Country: China
Application(s): Anti-submarine mission, search and rescue

Description:

According to the Journal of Marine Science Application [59]:

Shenyang Shin Kong Corporation, a subsidiary of China Aviation Science and Industry Corporation, introduced the conceptional unmanned boat XG-2 in 2006. The XG-2 USV could be used for anti-submarine missions. The communication between the USV and control station on the ground is via satellite communication. The vehicle is equipped with missiles and could be used as search and rescue vessel or patrol vessel in gulf and lakes. By changing the onboard mission modules, the vehicle can serve for a wide range of applications.

Z-Boat 1800

Manufacturer: Northwind Marine Inc.
Country: United States
Application(s): Shallow water hydrographic surveying

Description:

According to the manufacturer [60]:

Oceanscience Z-Boats offer a completely new option for shallow water hydrographic surveying. The Z-Boat system is a turnkey survey package, including GPS and echo sounder, remote control electronics, and an integrated data telemetry system. Remote control of the survey boat is easy using GPS position and heading available in real time on the shore laptop. A high power remote control system offers up to 1km range, with a survey endurance of over 8 miles on a single battery pack. For surveys in fast flowing rivers, the dual outdrive Z-Boat offers a maximum speed of over 10 kts (5 m/s).

Specifications:

	1800	1800HS (High Speed)
Length (m)	1.8	1.8
Beam (m)	0.9	0.9
Weight (kg)	23	24
Payload (kg)	18.1	13.6
Max Speed (kts)	4	10
Range (km)	1	1

Diagrams:

Figure 58 - Z-Boat 1800 USV [60]

Other Surveyed USV Platforms

Name	Manufacturer	Country	Unmet Requirement(s)
High Speed Inflatable Towed Target (HSITT)	Meggitt Training Systems Canada	Canada	No available power in the towed target
SEAL	International Submarine Engineering	Canada	No available power. Intended to engage in the rescue and support of persons in distress who are floating on the surface of a body of water.
Sterenn Du	DGA/DCNS/ECA	France	Very large [un]manned surface vehicle used to deploy several autonomous underwater vehicles (AUVs) for maritime mine countermeasures
Catarob T-02	Subsea Tech	France	Remote controlled system limited to ~1km ; possibly unsuitable for blue water operations and sea states greater than 2.
Sonobot	EvoLogics	Germany	Max wind speed (5.4 m/s) and wave height (0.3m)
SAM 3	Kockums AB	Sweeden	Overall size, speed, deployment time and intended for minesweeping may not be suitable for ship protection.
C-Hunter	ASV Ltd.	UK	Semi-submersible USV

Unmanned Aerial Vehicles

A-5 “Sea Eagle”

Manufacturer: Scientifically Industrial Systems Ltd. (DB “VZLET”)
Country: Ukraine
Application(s): Surveillance

Descriptions:

According to the manufacturer’s literature [119], this system was a “prospective” development in 2008.

Specifications:

Length (m)	1.425
Wingspan (m)	3
MTO Weight (kg)	28
Payload (kg)	7
Loiter Speed (km/h)	60
Max Speed (km/h)	125
Operational Radius (km)	40
Endurance (hrs.)	5-6

Diagrams:

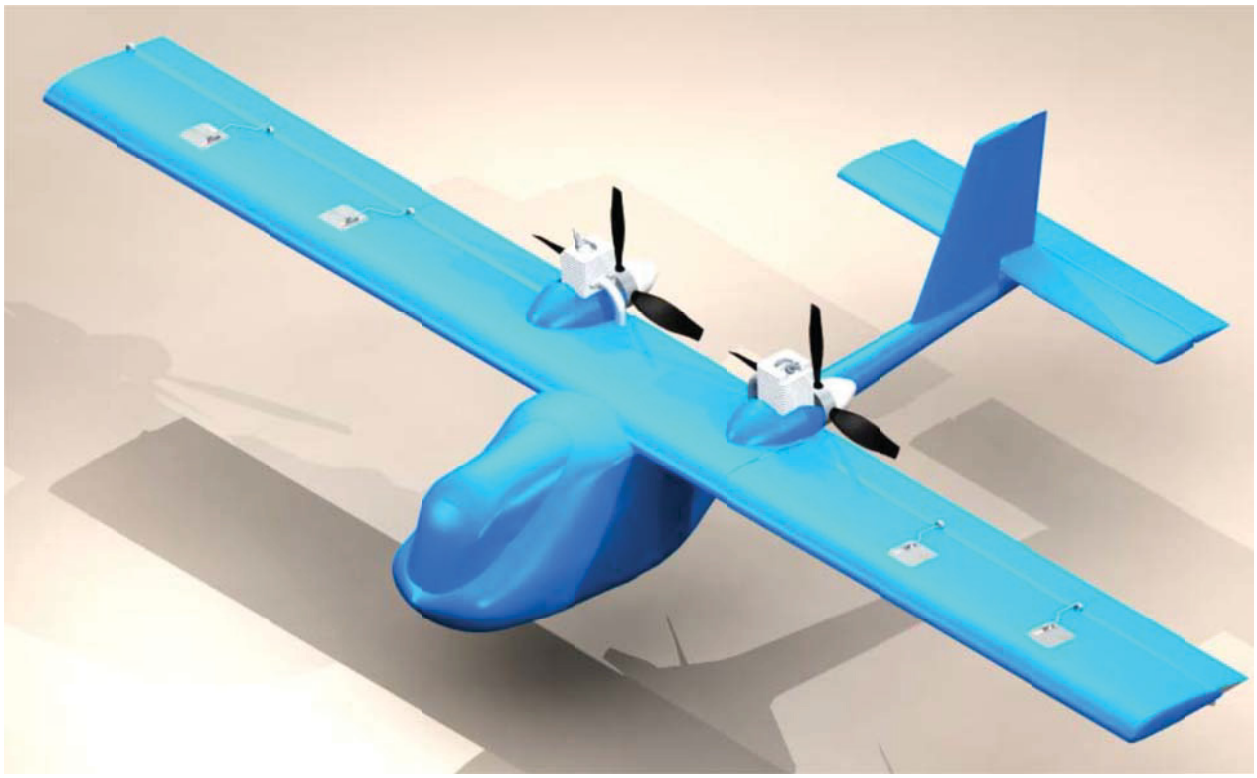


Figure 59 - A-5 "Sea Eagle" UAV [119]

A-6 “Golden Eagle”

Manufacturer: Scientifically Industrial Systems LTD (DB “VZLET”)
Country: Ukraine
Application(s): Surveillance, commercial

Descriptions:

Based on the manufacturer’s current website and previous presentation in Kharkov (2009), the A-160 appears to be an early design of the A-6 “Golden Eagle”.

Specifications:

Length (m)	3
Wingspan (m)	5
MTO Weight (kg)	160
Payload (kg)	50
Loiter Speed (km/h)	65
Max Speed (km/h)	208
Operational Radius (km)	158
Endurance (hrs.)	4-6

Diagrams:

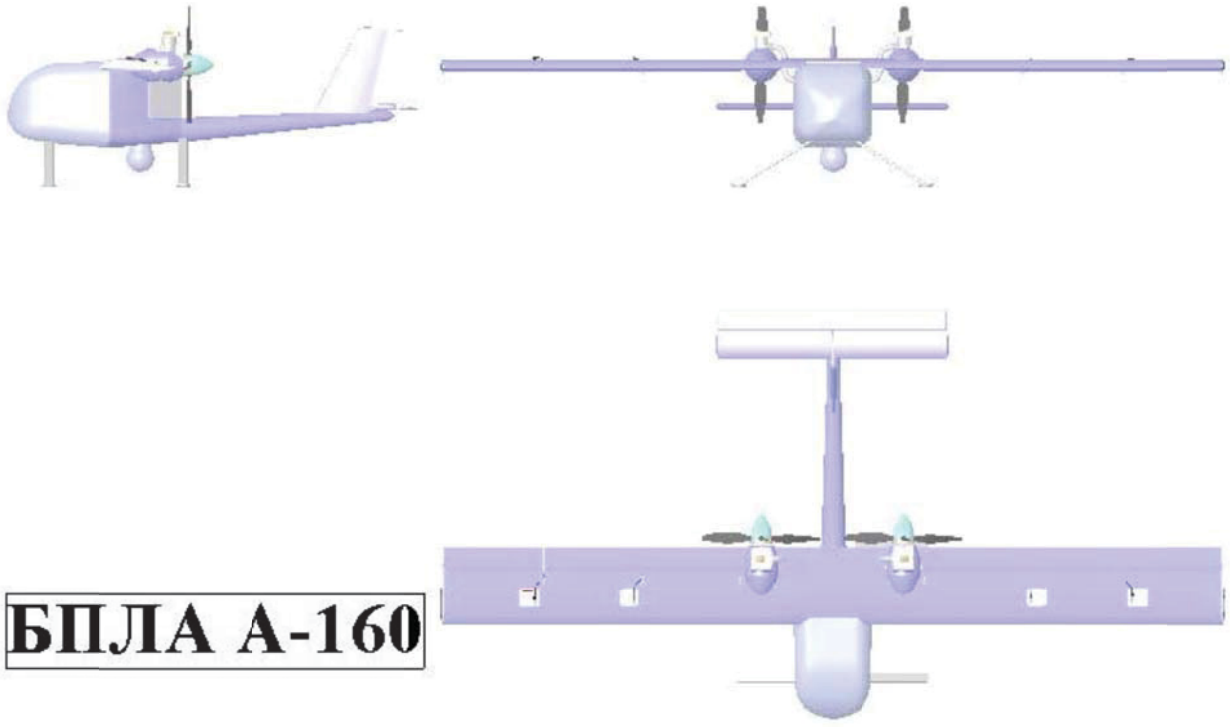


Figure 60 - A-160 (and likely the A-6 "Scan Eagle") [119]

AD-150 High Speed VTOL UAS

Manufacturer: American Dynamics Flight Systems
Country: USA
Application(s): Military

Descriptions:

According to the manufacturer [61]:

The AD-150 is American Dynamics Flight Systems' next generation maritime capable high speed Vertical Take-Off and Landing (VTOL) Unmanned Aircraft System (UAS).

The AD-150's capabilities to perform vertical take-offs and landings, and cruise at high speeds make the platform a unique and ideal choice for both land and sea based operations.

The AD-150 features a modular mission payload design, with internal bays and external stores located in the vehicle's center of gravity. The AD-150's versatile payload bay configuration allows the AD-150 to support the most demanding payload systems and missions.

Specifications:

Length (m)	4.4
Wingspan (m)	5.3
Height (m)	1.45
Max Speed (kts)	300
MTO Weight (kg)	1270
Payload (kg)	454.5

Diagrams:

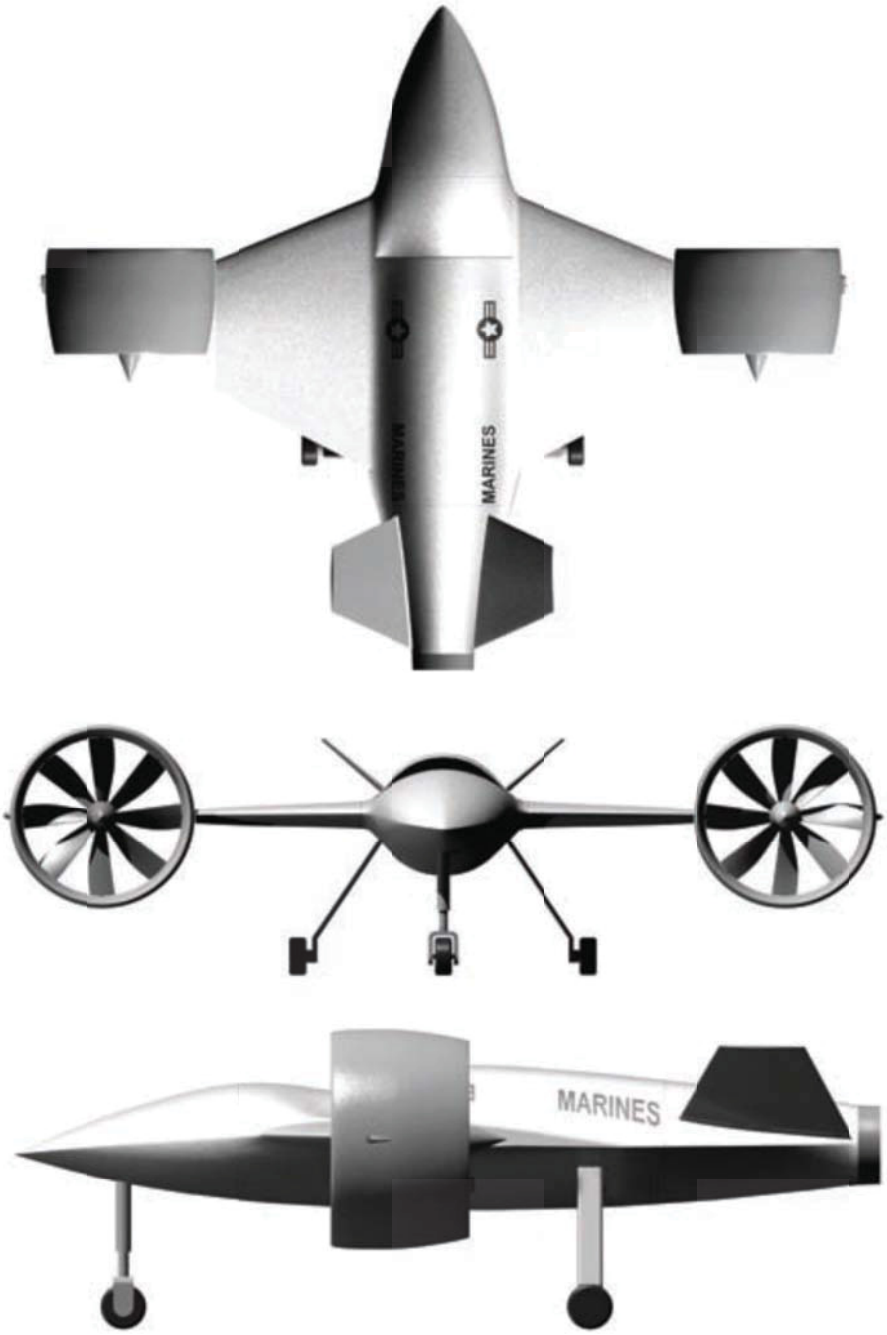


Figure 61 - AD-150 UAV [61]

Aesir VTOL UAVs

Manufacturer: Aesir Ltd.
Country: UK
Application(s): Commercial and civilian

Descriptions:

According to [132]:

A vertical take-off and landing dual ducted fan [using the] Coanda effect unmanned air vehicle with a 1,000kg (2,200lb) payload capacity has been unveiled by Peterborough, UK-based UAV company Aesir.

Named after the Norse god Hoder, the design is intended to perform logistics transport missions with an endurance of 8h, dry mass of 1,500kg and using JP-8 fuel.

Hoder is the largest of Aesir's range of UAVs. This also includes the 1m (3.28ft) diameter Odin, which has a 1h endurance with a 10kg payload, and the Vidar: a mini version of the Odin with a 100g payload capacity.

According to [133]:

There was also some highly innovative hardware, like Aesir Limited's Embla drone, which is a genuine flying saucer. Some other drones, like Honeywell's T-Hawk, look similar but rely on ducted fans. The Embla uses the Coanda effect, which causes a stream of air to stick to a surface. Air is drawn down onto the craft and around it, making two right-angled turns in the process. The craft is very stable to crosswinds and can travel at 45 miles per hour. Having no projecting rotor blades makes it suitable for working in a cluttered urban environment, as striking a wall will not be a disaster.

The Embla will be on the market by the end of the year, but Aesir was also showing off a mockup of a much larger craft called Hoder, capable of carrying up to half a ton. Like the Embla, this would be suitable for cities or other environments where helicopters might be hazardous, and it is large enough to work as an air ambulance or carry out resupply missions. **Aesir engineers believe they could have Hoder flying within two years.**

Note: The company website (www.aesir-uas.com) does not provide any specification on their systems.

Specifications:

	Vidar	Embla	Odin	Hoder
Diameter (m)	0.3		1	
Dry Weight (kg)	-	8.16	-	1500
Payload (kg)	0.1	-	10	1000
Endurance (hrs)	0.25	0.167	1	8
Max Speed (km/h)	-	128.7	-	-
Operating Ceiling (m)	-	3048	-	-

Diagrams:

Figure 62 - Early Vidar Prototype [135]

Figure 63 - Embla UAV [134]

Figure 64 - Hoder UAV [131] [134]

AiD-H Series Helicopter UAV (formerly Marvin Series)

Manufacturer: AiDrones GmbH (formerly Rotrob)
Country: Germany
Application(s): Commercial

Descriptions:

According to the manufacturer [62]:

The AiD-H helicopter series are versatile, lightweight, unmanned helicopters, designed for applications that require industrial grade reliability in demanding environments. It can fly for several hours along preplanned routes and do its mission fully autonomously - from takeoff to landing.
These systems are being used for:

- Industrial, agricultural, maritime, geographical and environmental surveillance
- Border and road control, law enforcement, SAR, disaster monitoring, fire detection
- Aerial Photography and filming, communications relay

Specifications:

	H14	H19	H32	H40
Rotor Diameter (m)	2.2	2.2	2.5	2.8
Length (m)	2	2	2.3	2.2
Empty Weight (kg)	10	10	18	20
Endurance (hrs.)	3	3	3	2
Payload (kg)	9	10	14	20
Max Speed (km/h)	120	120	120	120
Altitude (m)	3000	3000	3000	3000

Diagrams:

AiD-H14

AiD-H19

AiD-H32

AiD-H40

Figure 65 - AiD-H Series UAV [62]

APID 60

Manufacturer: CybAero
Country: Sweden
Application(s): Situational Awareness

- Hostile area surveillance
- Anti-terrorism / Anti-Piracy operations
- Border and Coast surveillance / Ship monitoring (AIS)
- Ground troop escort
- Electronic warfare
- Target Acquisition / Mapping
- Mine detection
- Communications relay
- Search and Rescue support

Description:

According to the manufacturer [63]:

The APID 60 UAS offers a State-of-the-art network-centric ground control station for rapid intelligence distribution. All flights are planned and controlled from the Ground Control Station by a simple point-and-click Graphical user interface. The APID 60 can also be operated in a semi-manual mode with a joystick if desired. In all operating modes the Flight Control System provides automatic attitude stabilization and keeps the vehicle within safe operating limits. The encrypted digital Data-link provides real-time information with a range of up to 200 km.

Maritime options
The APID 60 VTOL UAS can be equipped for true automatic ship deck landing. This unique system option, based on the principles of Global Navigation Satellite System, offers a possibility to automatically control the approach, landing and lock-down on the ship's deck. The APID 60 can also be equipped with the optional Heavy Fuel engine for use with JP-5/JP-8 type kerosene based fuel.

Specifications:

Length (m)	4
Width (m)	0.95
Height (m)	1.2
Rotor Diameter (m)	3.3
MTO Weight (kg)	180
Payload & Fuel (kg)	50
Dash Speed (km/h)	150
Cruise Speed (km/h)	90
Endurance (hrs.)	6-8

Diagrams:

Figure 66 - APID 60 UAV [63]

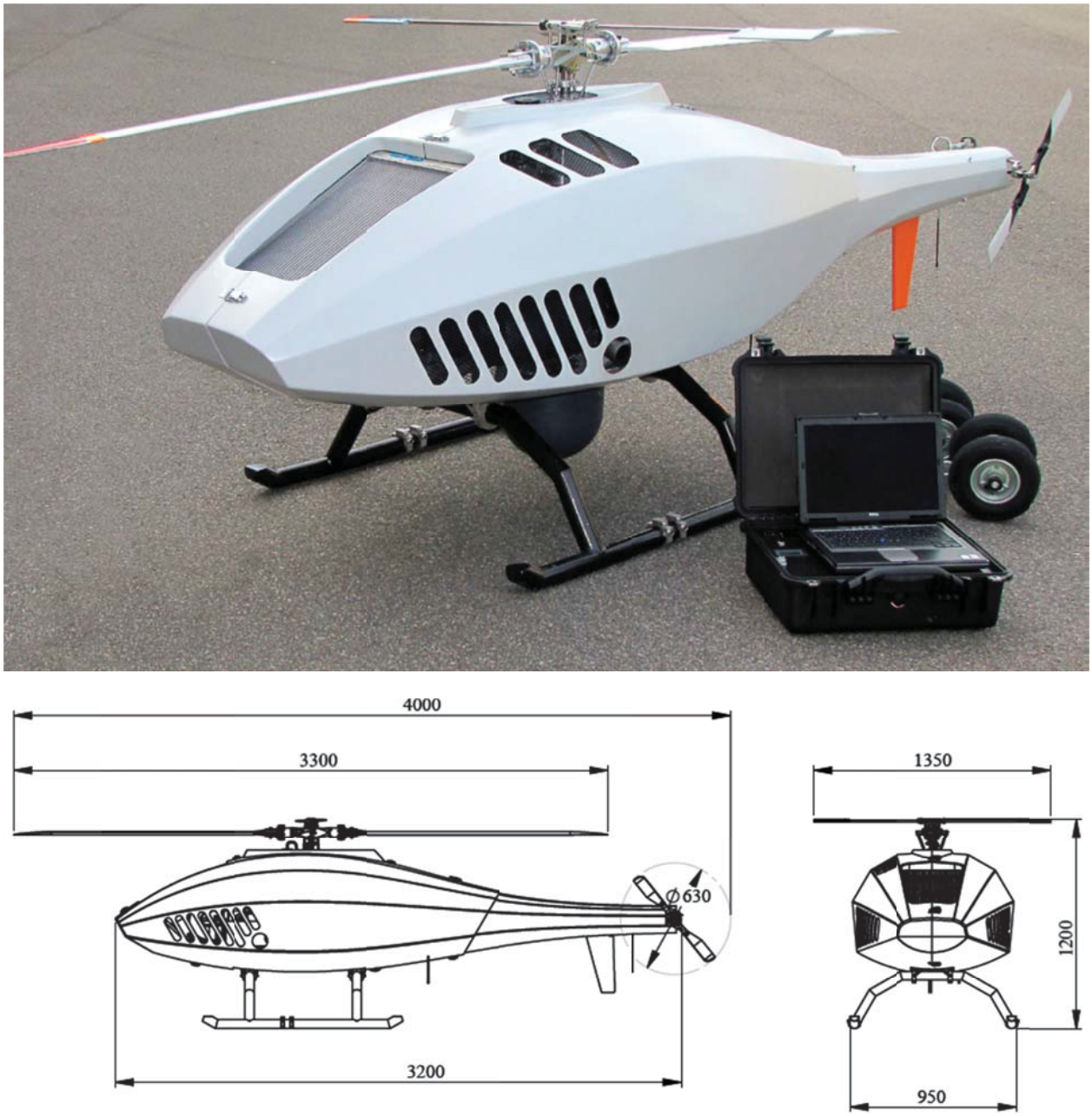


Figure 67 - APID 60 UAV [63]

ASN-7, 105B, 206

Manufacturer: China National Aero-Technology Import & Export Corporation (CATIC)
Country: China
Application(s): Multi-role

Descriptions:

According to the manufacturer [112]:

ASN-209 Tactical UAV System is a Medium Altitude and Medium Endurance (MAME) multi-role UAV platform system. The system is composed of Aircraft Platform, Avionics, Data Link, Ground Control Station, Launch Vehicle and Multi-function Payload. In civil application, it can be fitted with Synthetic Aperture Radar (SAR), electro-optical payload, and multi-function payload, etc. that can be applied for forest fire prevention, anti-drug action, communication, nature disaster forecast, ground observation, atmosphere measuring, aviation photo, resource detection, climate observation and artificial raining, etc.

In military operation, it can be with multiple operational configurations for Ground Moving Target Indication (GMTI), **Electronic Intelligence (ELINT), Electronic Warfare (EW)**, Ground Target Designation (GTD) and Communication Relay, etc

Specifications:

	ASN-7	ASN-105B	ASN-206
Length (m)	3.75	-	3.8
Height (m)	1.4	-	1.4
Wingspan (m)	5	-	6
MTO Weight (kg)	-	180	220
Payload (kg)	10	40	40
Max Speed (km/h)	360	200	210
Cruise speed (km/h)	-	-	-
Endurance (hrs.)	1	7	8
Operational Ceiling (m)	5000		
Operational Range (km)	40	150	200
Launch	Rocket Booster		
Recovery	-	Parachute	

Diagrams:

Figure 68 - ASN-7 Target Drone [112]

Figure 69 - ASN-206 UAV [112]

Figure 70 - ASN-209 UAV [112]

ASN-209

Manufacturer: ASN Technology
Country: China
Application(s): Multi-purpose UAV System

Descriptions:

According to the manufacturer [107]:

ASN-209 UAV System is a multi-purpose UAV product with mature technology. Via data link and ground control subsystem, ASN-209 UAV can perform aerial reconnaissance, battle field survey, target location, destroy validation and artillery fire adjustment in day and night in real time. ASN-209 UAV System is consists of aircraft, airborne mission payload, GCS, launch and recovery equipment.

ASN-209 uses rocket booster launch, parachute recovery, no need to use the airport makes the system operation flexible. GCS adopts digital computer control technology, which enables multitask planning and real-time editing during flight.

ASN-209 uses 2-boom, rear installed engine disposition. Excellent overall aerodynamic design and EMC design enable the system to install many different kinds of airborne equipment, **such as electronic countermeasures**, communication relay and weather detection.

The coverage radius is 200 km, endurance over 10 hours. ASN-209 UAV System can supervise big area and frontier within one sortie. If 2 UAVs take duty by turns, ASN-209 UAV System can work for 24 hours continuously.

Specifications:

Length (m)	4.273
Wingspan (m)	7.5
Height (m)	1.53
MTO Weight (kg)	320
Payload (kg)	50
Max Speed (km/h)	180
Cruise Speed (km/h)	120-140
Endurance (hrs.)	10
Ceiling (m)	5000
Range (km)	200
Takeoff/Landing	Rocket booster, parachute

Diagrams:

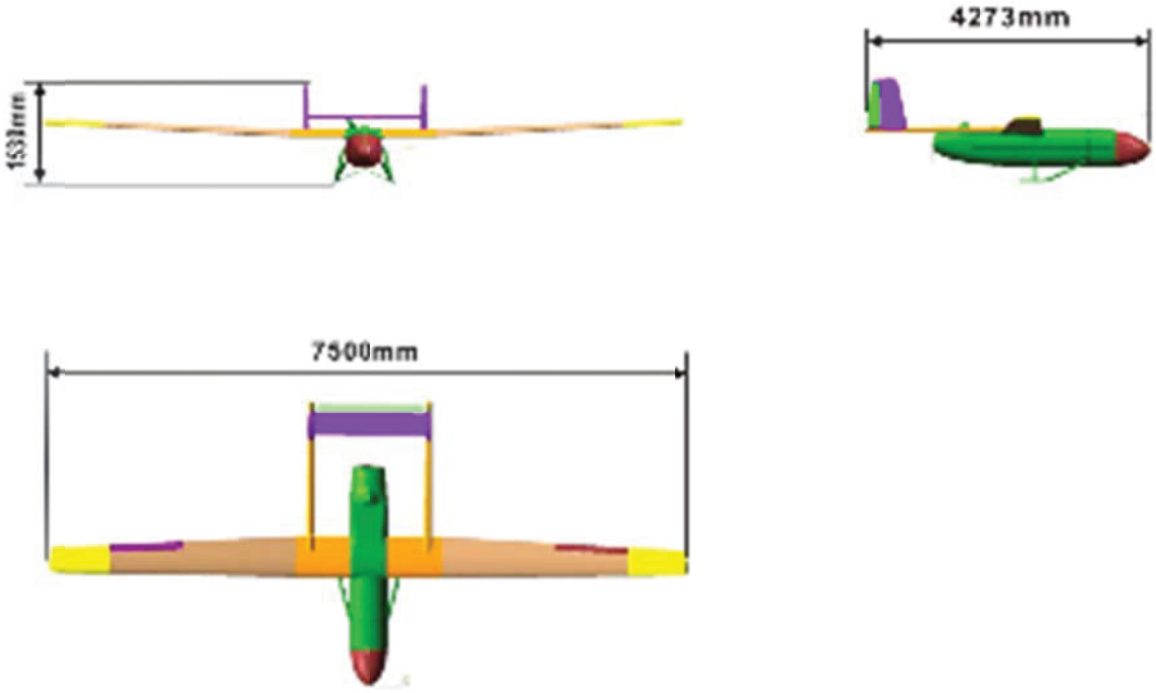


Figure 71 - ASN 209 UAV [107]

ASN-212

Manufacturer: ASN Technology
Country: China
Application(s): Short-range UAV System

Descriptions:

According to the manufacturer [107]:

ASN-212 Short Range UAV can install small sized TV, IR, digital camera or weather detection sensor. Mainly used for ground disaster exploration, petroleum pipeline detection, atmosphere exploration, etc. If is installed mini special payload, it can perform battle field survey, destroy validation and frontier patrol.

ASN-212 UAV system is consisted of aircraft, payload, data link and GCS. This type of UAV is characterized with 2-engine pulling structure, takeoff and landing roll. Its ceiling is 4800m.

Specifications:

Length (m)	2.4
Wingspan (m)	4.2
MTO Weight (kg)	50
Payload (kg)	6-12
Max Speed (km/h)	140
Cruise Speed (km/h)	60-90
Endurance (hrs.)	5
Ceiling (m)	4800
Range (km)	120
Takeoff/Landing	Catapult, parachute

Diagrams:

Figure 72 - ASN 212 UAV [107]

ASN-215

Manufacturer: ASN Technology
Country: China
Application(s): Multi-purpose UAV System

Descriptions:

According to the manufacturer [107]:

ASN-215 Multi-purpose UAV system can install many kinds of payload, such as digital camera, TV and FLIR. It can perform aerial reconnaissance, battle field survey, target location, and destroy validation and artillery fire adjustment in day and night in real time. ASN-215 UAV System is consisted of aircraft, GCS and logistic equipment.

Digital flight control and navigation system are adopted. Manual control, program control and emergency control can be used. Using GPS and data link to locate the aircraft, and the system operation is easy to master.

ASN-215 UAV system uses rocket booster launch, parachute recovery, no need to use the airport makes the system operation flexible. GCS adopts digital computer control technology, which enables multitask planning and real-time editing during flight.

ASN-215 UAV system mainly utilizes CCD＋FLIR as reconnaissance measures, and it is equipped with high resolution aero-camera. According to customers' requirements, ASN-215 system can install many different kinds of airborne equipment, **such as electronic countermeasures**, communication relay and weather exploration

Specifications:

Length (m)	3.75
Wingspan (m)	5
MTO Weight (kg)	220
Payload (kg)	60
Max Speed (km/h)	200
Cruise Speed (km/h)	120-160
Endurance (hrs.)	5
Ceiling (m)	6000
Range (km)	200
Takeoff/Landing	Rocket booster, parachute/glide landing

Diagrams:

Figure 73 - ASN 215 UAV [107]

ASN-216

Manufacturer: ASN Technology
Country: China
Application(s): Close Range UAV System

Descriptions:

According to the manufacturer [107]:

ASN-216 Close Range UAV can install small sized TV, IR, digital camera or weather detection sensor. Mainly used for earthquake situation exploration, weather detection, land exploration, geography mapping, search and rescue, electricity and petroleum pipeline detection, etc. If equipped with mini special payload, it can perform battle field survey, destroy validation and frontier patrol.

Specifications:

Length (m)	2.4
Wingspan (m)	3.75
MTO Weight (kg)	20
Payload (kg)	6
Max Speed (km/h)	140
Cruise Speed (km/h)	60-90
Endurance (hrs.)	6
Ceiling (m)	4,500
Range (km)	40
Takeoff/Landing	Catapult, glide landing/parachute

Diagrams:

Figure 74 - ASN-216 Close Range UAV [107]

ASN-229A

Manufacturer: ASN Technology
Country: China
Application(s): Reconnaissance and Precise Attack UAV

Descriptions:

According to the manufacturer [107]:

ASN-229A Reconnaissance and Precise Attack UAV is of great capability of payload and endurance. It can install reconnaissance equipment and mini precise guidance weapon at the same time, which makes it possible to reconnaissance, attack and destroy validation spontaneously. Operator can enhance the combat efficiency significantly by making decisions on the attack target and proper timing according to reconnaissance information, find and destroy those time-sensitive targets immediately..

Specifications:

Length (m)	5.5
Wingspan (m)	11
MTO Weight (kg)	800
Payload (kg)	100
Max Speed (km/h)	180
Cruise Speed (km/h)	160
Endurance (hrs.)	20
Ceiling (m)	10,000
Range (km)	2,000
Takeoff/Landing	Rocket Booster, Parachute

Diagrams:

Figure 75 - ASN 229A [107]

AT-x Family of UAVs

Manufacturer: Advanced UAV Technology Ltd.
Country: UK
Application(s): Commercial and civilian

- Traffic/crime surveillance
- Border and coastal security
- Chemical, radiation, explosive detection
- Gas/Oil pipeline, electric line inspection
- Mapping and surveying
- Communications relay
- Search and rescue operations
- Riots and crowd surveillance
- Emergency goods delivery
- Fire detection and surveillance
- Forestry and agriculture
- Convoy and motorcade escort
- Automatic surveillance and patrolling of pre-defined areas
- Hostage search
- Delivery of goods in life-threatening situations
- Fishing surveillance

Descriptions:

According to the manufacturer [131]:

Advanced UAV Technology (AUAVT) is offering a range of seven fully autonomous helicopters, covering payloads from 1.5kg to 350kg, and mission endurance from 30 min to over 16 hours. The seven models range from the man-portable AT-10 machine to the brand new 350kg dry weight AT-1000.

Specifications:

	AT-30	AT-100	AT-200	AT-300	AT-1000
Length (m)	1.638	1.47	2.79	3.35	7.35
Height (m)	0.622	0.685	0.86	1.17	2.27
Width (m)	0.355	0.51	0.76	0.91	1.645
Main Rotor Diameter (m)	1.981	2.01	3	3.3	6.84
Tail Rotor Diameter (m)	0.337	0.36	0.7	0.56	1.29
Dry Weight (kg)	7	16	25	58	300
Available Power (W)	-	150	150	250	450
Payload (kg)	5	8	22.7	50	350
Climb Rate (m/min)	122	122	122	122	122
Max Speed (km/h)	80	120	160	160	160
Endurance (hrs)	2.5	2.5	6	6	6

Diagrams:

Figure 76 - AT-30 UAV [131]

Figure 77 - AT-100 UAV [131]

Figure 78 - AT-200 UAV [131]

Figure 79 - AT-300 UAV [131]

Figure 80 - AT-1000 UAV [131]

ATRO-X VTOL (ORCA)

Manufacturer: Unmanned Systems Group
Country: Switzerland
Application(s): ISTAR, Maritime, Strike

Description:

According to manufacturer [64]:

ATRO-X offers a minimal logistical footprint due to its unique Tip Jet Rotor Propulsion System and modular design. With no gearbox, clutch or transmission, maintenance is kept to a bare minimum, giving the ATRO-X an unprecedented low running cost.

MARITIME
Considerable effort has been conducted in equipping the ATRO-X to operate in the maritime environment.

Specifications:

Length (m)	4.3
Rotor diameter (m)	6.2
MTO Weight (kg)	350
Payload Capacity (kg)	120
Cruise Speed (km/h)	120
Max Airspeed (km/h)	200
Endurance (hrs.)	2.5
Range (km)	200
Ceiling (m)	3500

Payload:

The basic system fields with the FLIR Ultra Force 350 Gimbal. Additional payloads may include synthetic aperture radars and ground moving target indicators such as the highly capable Selex PicoSAR. Maritime radar systems such as the Selex SeaSpray 5000e. **Electronic Warfare** packages such as Elint, Comint and Masint sensors. Electronic Support and Counter Measures, **Electronic Attack** and wide area airborne surveillance sensors are all possible on the Orca system.

Diagrams:

Figure 81 - ATRO-X VTOL UAV [64]

AutoCopter

Manufacturer: Neural Robotics Inc. (NRI)
Country: USA
Application(s): Surveillance

- surveillance
- traffic monitoring
- land survey
- mine-sweeping
- search & rescue

Descriptions:

According to the manufacturer [125]:

The AutoCopter is a self-stabilized unmanned mini-helicopter that can be used as an aerial platform in the sky. Applications include aerial photography, surveillance, pipeline and utility line inspection, crop health monitoring, etc. For those wanting to perform aerial photography the helicopter will maintain stability and position at whatever altitude. Payload is 15 lb. A turnkey aerial video system can be provided at additional cost.

The operator, without any helicopter piloting experience, can maneuver the helicopter (via the joysticks on the transmitter) forward, backward, sideways, and vertically. A Windows program is included to perform mission planning (on a laptop computer) within a 1.5-mile radius of the transmitter. The operator uses the laptop software to construct a GPS waypoint grid over a map of the desired location. The GPS track coordinates are then downloaded to the flight computer.

Notes:
1. NRI's website is no longer in service.
2. NRI's AutoCopter appears to be the baseline design for the Gunship AutoCopter [126], G15 and HD65 [118].

Specifications:

	Baseline	Gunship
Length (m)	2.18	2.54
Height (m)	0.66	0.73
Width (m)	-	0.55
Rotor Diameter (m)	-	2.13
Empty Weight (kg)	-	25
MTO Weight (kg)	20.4	47.6
Payload (kg)	6.8	13.6
Max Speed (km/h)	209	96.6
Range (km)	2.4	
Endurance (hrs.)	-	1
Max Altitude (m)	-	1524

Diagrams:

Figure 82 - NRI's AutoCopter UAV [125]

Figure 83 - Gunship AutoCopter [126]

Blue Horizon-II

Manufacturer: E.M.I.T Aviation Consult Ltd.
Country: Israel
Application(s): Surveillance

Descriptions:

According to the manufacturer [65]:

A fully integrated weapon system capable of capturing and reporting intelligence data in real-time and day/night operation over a pre-determined target zone. Characteristic missions include:

- Intelligence gathering.
- Close support operations.
- Target acquisition.
- Weapon guidance.
- Battle damage assessment.

The Blue Horizon -2 contains the necessary elements to achieve relevant UAV missions, either as a stand-alone system or as an integral part of a total intelligence and weapon delivery system.

Specifications:

Length (m)	3.2
Wingspan (m)	6.5
MTO Weight (kg)	180
Speed (kts)	60-120
Payload (kg)	37
Deployment	STOL or Catapult
Recovery	STOL or Parachute or arresting hooks
Available Power (W)	1800

Diagrams:

Figure 84 - Blue Horizon II [65]

Blueye Soft-Wing UAV

Manufacturer: BlueBird Aero Systems
Country: Israel
Application(s): Surveillance

Descriptions:

According to the manufacturer [66]:

Bluebird Aero System Ltd. has developed a unique, comprehensive, low cost, end-to-end solution for monitoring and protecting areas of interest. The solution includes the Blueye™ UAV that was specifically designed for military and civilian usages and a photogrammetric system (airborne payload and a ground station).

The Blueye™ UAV is a friendly and easy to use platform. Its unique capability to accurately follow a predefined route enhances the accuracy of the products. Moreover, Bluebird's UAV can repeatedly cover specific areas of interest and thus supply a sequence of high resolution and accurate maps and geographic details of the same specific area at different time periods.

Specifications:

Endurance (hrs.)	9
Payload (kg)	18
Max Speed (km/h)	65
Range (km)	50
Takeoff/Landing	STOL

Diagrams:

Figure 85 - Blueye UAV [66]

Butterfly UAV

Manufacturer: E.M.I.T Aviation Consult Ltd.
Country: Israel
Application(s): Surveillance

Descriptions:

According to the manufacturer [67]:

The butterfly UAV is a Paramotor glider (Paraglider) based UAV.

The Butterfly UAV main Features are:

- High payload carrying capacity.
- Operational simplicity.
- Logistical simplicity.
- Easy to maintain.
- Cost effective.

Specifications:

Endurance (hrs.)	4
Payload (kg)	230
Max Speed (km/h)	55
Range (km)	120
Takeoff/Landing	STOL (50 m)
Wing Area (m^2)	50
Length	3.2

Diagrams:

Figure 86 - Butterfly UAV [67]

Camcopter S-100

Manufacturer: Schiebel Corporation
Country: Austria
Application(s): Military and security

Descriptions:

This system is also known as the **Al-Saber UAV** in the United Arab Emirates.

According to the manufacturer [117]:

Its robust design means the CAMCOPTER© S-100 is ideally suited to be used for maritime missions and has been proven on single spot ships world-wide, coping very well in wet and strong wind conditions.

Its compact size and light weight means the S-100 can be easily maneuvered, stowed and maintained in vessel hangars. A frigate-sized hangar can store up to five S-100s alongside a large manned helicopter, and successfully complements operations traditionally completed by manned helicopters.

It is fully marinized against corrosion through the extensive use of carbon fiber composites, stainless steel, titanium, anodization and special coatings.

Because of its VTOL capability, it can perform takeoffs and landings on helicopter deck-equipped ships. It is also equipped with a harpoon deck capture systems for use with standard NATO grids as well as for the optional installation of emergency floats.

Programming for an autonomous mission is controlled via a simple point-and-click graphical user interface with payload imagery transmitted to the Control Station (CS) in realtime. Redundant Inertial Navigation Systems (INS) and Global Positioning System (GPS) ensure highly accurate navigation and stability. In the case of loss of link, an automatic home point function is activated.

Specifications:

Length (m)	3.11
Height (m)	1.12
Rotor Diameter (m)	3.4
MTO Weight (kg)	200
Empty Weight (kg)	110
Payload (kg)	50
Max Speed (km/h)	240
Typical Cruise Speed (km/h)	185
Loiter Speed (km/h)	102
Endurance (hrs.)	6
Service Ceiling (m)	5486
Data Ling Range (km)	180

Diagrams:

Figure 87 - CAMCOPTER S-100 [117]

CH-160

Manufacturer: Challis Heliplane UAV Inc. - a division of Challis Helicopters Inc.
Country: Canada
Application(s): Military and civilian missions

Specifications:

Length (m)	6.55
Width (m)	1.83
Height (m)	2.13
Rotor Diameter (m)	5.94
Tail Rotor (m)	1.02
Base Weight (kg)	245
Fuel Weight (kg)	100
MTO Weight (kg)	345
Endurance (hrs.)	4
Max Speed (kts)	139
Cruise Sped (kts)	96
Ceiling (m)	

Diagrams:

Figure 88 - CH-160 UAV [68]

Copter 1B, Copter 4

Manufacturer: Survey Copter
Country: France
Application(s): Military and commercial applications

- Detection, reconnaissance and identification
- Combat in rural and urban areas
- Agricultural and maritime applications
- Reconnaissance, surveillance and inspection
- Paramilitary surveillance
- Commercial applications
- Protection and surveillance of sensitive sites and of borders
- Public safety missions
- Commercial applications

Description:

According to manufacturer [69]:

The UAV helicopters are machines equipped with a payload to perform their mission in automatic or manual mode, via an on-board auto-pilot and a ground control station. They transfer the data collected by the on-board sensors in real time.

The helicopter type UAVs are selected for missions with very restricted take-off and landing areas (a few m^2), requiring rapid access to the area of interest followed by slow flyovers or even hovering. They can perform missions with several take-offs and landings, drop loads, or put them down and retrieve them.

Specifications:

	Copter 1B	Copter 4
Length (m)	2	2
Rotor diameter (m)	1.8	2.2
MTO Weight (kg)	15	25
Empty Weight (kg)	8.5	25
Payload Capacity (kg)	5	10
Cruise Speed (km/h)	40	40
Altitude (m)	1500	1500
Endurance (hrs.)	0.75	1
Range (km)	5	8

Diagrams:

Figure 89 - Copter 1B UAV [69]

Figure 90 - Copter 4 UAV [69]

Copter Mosquito

Manufacturer: SurveyCopter
Country: France
Application(s): Surveillance, detection and reconnaissance

Descriptions:

According to the manufacturer [115]:

The vector is composed of a motorized unit, which integrates an autopilot, a data link for communication and a payload chosen in consideration of the mission to perform. The autopilot includes an automatic navigation system based on the principle of waypoints (coordinates in 3D space). The payload (camera visible, infrared, etc.) is integrated in gyro-stabilized gimbals that compensates the movements of the vector and allows the operator to point out the camera toward a target or an area of interest. The "ground control station" consists of 2 PC and their control joysticks. The operator can prepare and then follow the mission of the vector on the PC, take and store real-time images. The vector can manually be controlled through the autopilot and a joystick. A second joystick controls the payload. The "ground control station", through a tracking turret constantly pointing towards the vector (automatic pointing device), send data to the UAV as well as receives data and video from the UAV during the flight.

The Copter Mosquito is a UAV of long endurance, adapted from a robust and proven reliability micro light aircraft design. The Copter Mosquito is even capable of performing a vertical controlled speed descent to reach a predetermined zone of clearance, if an engine failure occurs.

Specifications:

Length (m)	4.9
Height (m)	2.11
Rotor Diameter (m)	5.5
MTO Weight (kg)	240
Payload (kg)	70
Max Speed (km/h)	120
Cruise Speed (km/h)	95
Endurance (hrs.)	4
Operational Ceiling (m)	2400
Operational Range (km)	380

Diagrams:

Figure 91 - Copter Mosquito UAV [115]

CQ-10B SnowGoose

Manufacturer: MMIST
Country: Canada
Application(s): Cargo UAV with multi-payload capabilities

Description:

According to manufacturer [70]:

The SnowGoose Unmanned Aerial Vehicle (UAV), NSN 1550-01-505-3010, is a multi-purpose, autonomous, aerial cargo delivery system […]. It combines MMIST's latest developments in autonomous guidance and precision cargo delivery. The SnowGoose UAV is capable of full autonomous flight within the boundaries of approved air space, according to the pre-programmed mission. Flight of the UAV is monitored and controlled from a SATCOM ground control station. The SnowGoose modular payload bays allow for multi-mission capability with simple integration of a wide range of available payload equipment packages.

Self-Launch Capability
The SnowGoose UAV can be equipped with a gyro rotor head that provides near vertical takeoff and landing capability. The self-launch variant or "BRAVO" SnowGoose UAV system has vertical takeoff and near vertical landing capability, is designed to be operated from unprepared launch and landing sites and has unmatched flexibility with regard to operating location and terrain. The CQ-10B variant is an incremental upgrade to the existing CQ-10A system. The operator simply selects and installs the self-launch kit and programs the selected launch mode during mission planning.

Specifications:

Payload (kg)	227
Endurance (hrs.) @ 100 lb payload	24
Range (km)	150
Landing footprint (radius in m)	30

Diagrams:

Figure 92 - CQ-10B SnowGoose UAV [70]

DP-X UAV Family

Manufacturer: Dragonfly Pictures
Country: USA
Application(s): Reconnaissance, ISR

Descriptions:

According to the manufacturer [98]:

The **DP-4X Dependable** was developed by Dragonfly Pictures Inc. to provide a two-man deployable, vertical takeoff and landing (VTOL) unmanned aircraft system (UAS). The UAS deploys with forward troops, not aviation personnel, to provide front line commanders superior situational awareness, understanding, and laser designation during mobile operations in complex terrain.

The **DP-5X Wasp** was developed for DARPA by Dragonfly Pictures Inc. to provide a two man deployable, laser designating, vertical takeoff and landing (VTOL) unmanned aircraft system (UAS). The UAS deploys with forward troops, not aviation personnel, to provide front line commanders laser designation for networked tactical laser guided munitions, during mobile operations in complex terrain.

The **DP-5XT Gator** was designed by Dragonfly Pictures, Inc. to provide communication relay, mine detection, CBRN detection, reconnaissance, security/early warning, target acquisition and designation for precision fires, throughout the battalion area of influence by remotely over watching and reporting changes in key terrain, avenues of approach and danger areas in open and rolling, restrictive, and urban areas. Four DP-5XT aircraft and System components fit in a 20' ISO Sea Container. Two forward deployed non-Aviation personnel can launch an aircraft in <30 min. in both day/night and adverse weather to provide the front line and commanders superior situational awareness and understanding during mobile operations in complex terrain.

The **DP-6 Bat** enables covert and positive identification of high value targets and their vehicles. This autonomous one-man deployable, vertical takeoff and landing (VTOL) unmanned aircraft system (UAS) is nearly silent and maintenance free due to its electric propulsion system. The operator can re-charge batteries in 15 min. or swap batteries in 3 min. To obtain continuous endurance the operator can tether and hover the DP-6 above a ground power source. The DP-6 maximizes payload while remaining within the non-regulated 50 lbs gross weight limit. The DP-6 provides a mobile adhoc WIFI network, eavesdropping, or close range imagery for superior situational awareness and understanding during mobile operations in complex terrain.

The **DP-10 Boomerang** was developed by Dragonfly Pictures Inc. to provide the endurance, speed, and simplicity of a fixed wing with vertical takeoff and landing (VTOL). The DP-10 missions will include surveillance, collection of enemy order of battle information, battle damage assessment, port surveillance, communication relay, and support of maritime interdiction, surface warfare, battlespace management, and targeting for maritime and littoral strike missions. The DP-10 exceeds the capabilities of other VTOL UAS configurations at an affordable cost.

The **DP-11 Bayonet** was developed by Dragonfly Pictures Inc. to provide the endurance, speed, and simplicity of a fixed wing with vertical takeoff and landing (VTOL). The DP-11 will provide persistent Intelligence, Surveillance, and Reconnaissance (ISR) support for tactical level maneuver decisions and unit level force defense/force protection for Naval ships and Marine Corps land forces. This system will support building the Recognized Maritime Picture, Maritime Security Operations, Maritime Interdiction Operations, and support of Naval units operating from sea/shore in the global war on terrorism.

The **DP-12 Rhino** description and specification were not available from manufacturer's website but found on RUVSA [123].

Specifications:

	DP-4X Dependable	DP-5X Wasp	DP-5XT Gator	DP-6 Whisper	DP-7 Bat	DP-10X Boomerang	DP-11 Bayonet	DP-12 Rhino
Length (m)	2.6	3.35	3.81	1.8	1.92	7.3	1.92	3.35
Width (m)	0.61	-	0.71	0.49	0.69	0.7	0.69	-
Height (m)	0.84	1.22	1.49	0.76	1.64	2.29	1.64	-
Wingspan (m)	-	-	-	-	6.01	-	6.01	-
Rotor Diameter (m)	2.6	3.2	2.5	2		2.44	1.8	3.2
MTO Weight (kg)	95.25	245	395.5	22.7	295	861.8	295	215
Max Speed (km/h)	166.7	203.7	300	130	383.4	546.3	383.4	185.2
Payload (kg)	13.6	56	97.5	11.8	45	136	45	34
Endurance (hrs.)	3	4.8	6	1	12	23	12	5.5
Operating Range (km)	55.6	74.1	981	80.5	203.7	7146	887.1	-
Operating Ceiling (m)	3352	4572	-	4572	9144	10668	6096	3048

Diagrams:

Figure 93 - DP-4X UAV [98]

Figure 94 - DP-5X UAV [98]

Figure 95 - DP-6 Whisper UAV [98]

Figure 96 - DP-7 Bat UAV [98]

Figure 97 - DP-10 Boomerang UAV [98]

Figure 98 - DP-11 Bayonet UAV [98]

Figure 99 - DP-12 Rhino UAV [123]

Dragonfly

Manufacturer: Trek Aerospace
Country: USA
Application(s): Surveillance

- Military
- Emergency
- Security
- Cargo Transport
- Commuting
- Crop Dusting
- Recreation

Descriptions:

According to the manufacturer [106]:

Dragonfly's payload capacity offers commercial, military, and industrial users the ability to transport personnel and/or cargo economically and efficiently. From remote operations to pick up personnel stranded behind enemy lines and search and rescue missions, to civilians commuting to work or taking a vacation in the mountains, the applications are only limited by one's imagination. In 2004, we began development of our horizontally configured cargo-carrying vehicle, known as Dragonfly. Dragonfly's ability to quickly change its flight options from remote, to unmanned, or manned result in a well-rounded vehicle with unlimited potential. With the ability to transport a sizable payload, utilizing a minimal takeoff space, the Dragonfly is definitely a major contender in the VTOL and PAV markets.

Specifications:

Length (m)	4
Height (m)	1.9
Width (m)	3
MTO Weight (kg)	367
Payload (kg)	204
Max Speed (km/h)	378
Cruise Speed (km/h)	274
Loiter Speed (km/h)	137
Endurance (hrs.)	3
Hover Ceiling (m)	3931
Range (km)	925
Rate of Climb (m/min)	1676

Diagrams:

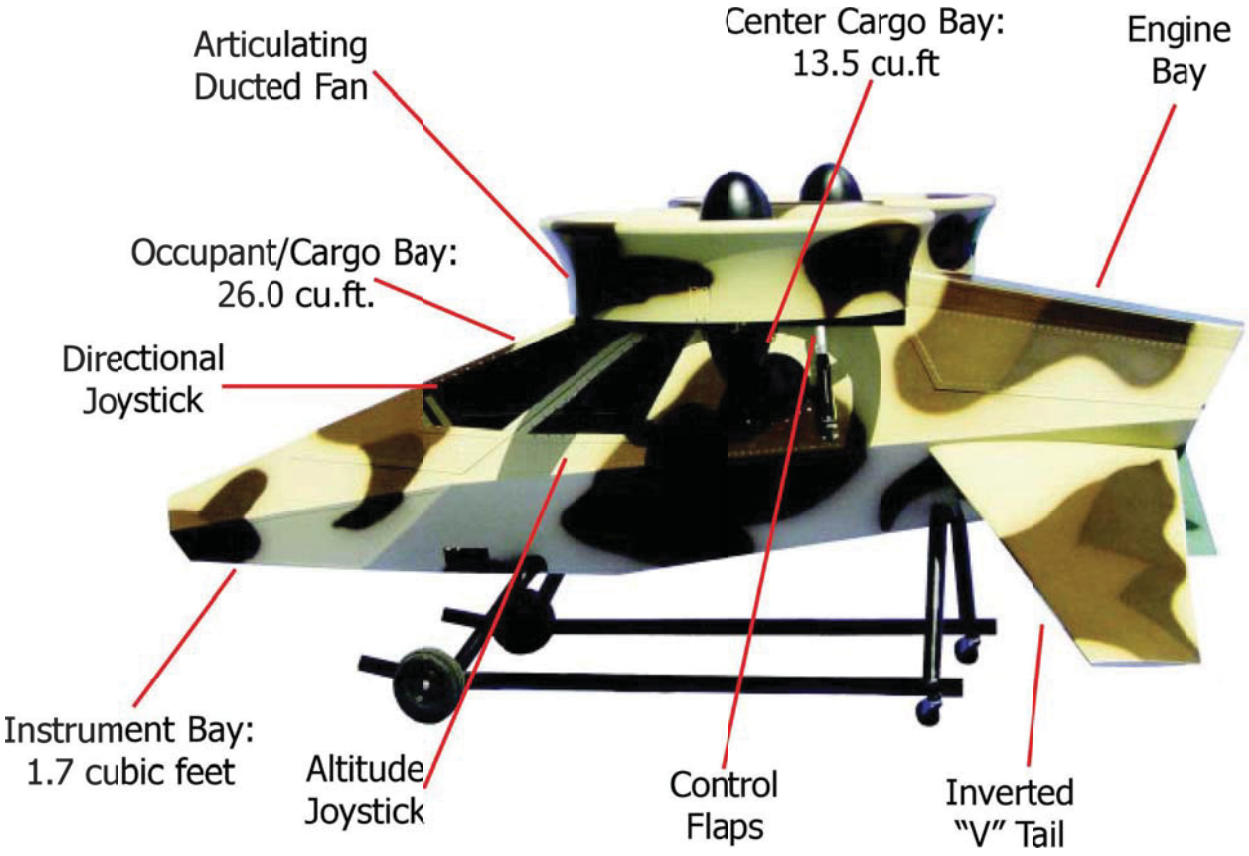


Figure 100 - Dragonfly UAV [106]

E950 UAV

Manufacturer: Challis Heliplane UAV Inc. - a division of Challis Helicopters Inc.
Country: Canada
Application(s): Military and civilian missions

Description:

According to manufacturer [71]:

"Patented" - high speed Heliplane flight technology

- Almost twice the flight speed compared to conventional helicopter
- Hover characteristics of helicopter , cruise like an airplane
- Stealth, electric power
- Ability to maintain stable view of target even in high speed shallow dive
- Full Auto take off & landings (VTOL)
- Multi programmable waypoints
- 3 axis stabilized camera systems / HD video play / or FLIR

Specifications:

Length (m)	1.81
Height (m)	0.65
Rotor Diameter (m)	2.085
Tail Rotor (m)	0.36
Payload (kg)	10
MTO Weight (kg)	35
Endurance (hrs.)	1
Range (km)	15

Diagrams:

Figure 101 - E950 UAV [71]

Figure 102 - E950 UAV [71]

Fury 1500

Manufacturer: AME Unmanned Air Systems (a ChandlerMay Company)
Country: USA
Application(s): Electronic Warfare

Descriptions:

According to the manufacturer [72]:

AME UAS's Fury® UAS provides the longest endurance and largest payload capability of any runway independent small or small-tactical UAS available today. It provides all of this in an easily deployable, heavy-fuel capable and affordable package. Originally designed for electronic warfare missions, Fury®'s multiple variants are able to withstand high electronic emissions environments while delivering more than 400 Watts to the payload during sustained flight. With its low signature, Fury® can support missions where radar, visual, infra-red, and acoustic detection is to be avoided.

Fury® provides the payload capacity, endurance, and communications capabilities that up to now have been only available on much larger, and more costly, platforms. Launcher deployed and net-captured, Fury® can operate from any situation across today's mission spectrum. Its large and modular payload bay and plug-and-play architecture simplifies payload integration while its STANAG 4586 control design enables quick implementation across multiple mission sets. Support, if needed, is available for operational training, repair, and maintenance, of the Fury®.

Specifications:

Wingspan (m)	3.7
Length (m)	1.4
Dash Speed(kts)	120
Cruise Speed (kts)	65-95
MTO Weight (kg)	136
Payload (kg)	57
Endurance (hrs.)	15
Max Altitude (m)	4572
Payload Power (W)	2000

Diagrams:

Figure 103 - Fury 1500 UAV [72]

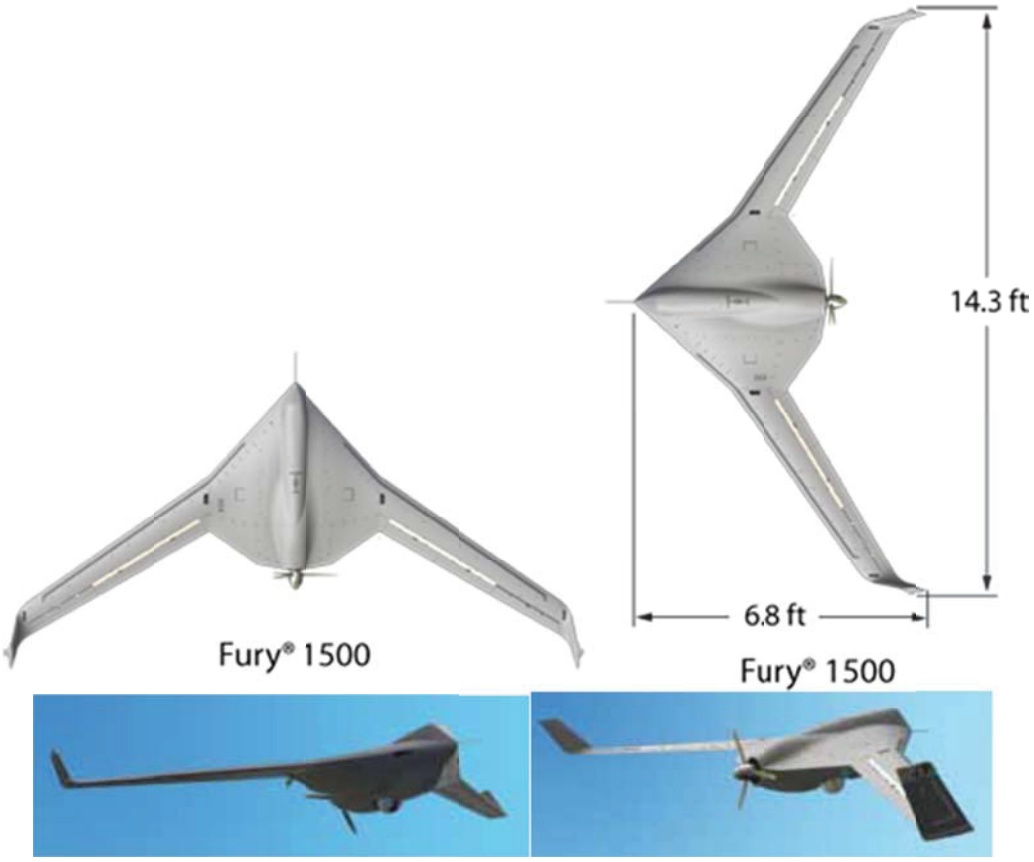


Figure 104 - Fury 1500 UAV [72]

G15, HD65

Manufacturer: Autocopter Corporation
Country: USA
Application(s): Agriculture, Viticulture

- Transmission lines
- Industrial inspections
- Wind farm inspections
- Security

Descriptions:

According to the manufacturer [118]:

We build and sell only complete systems. The total package includes all hardware and software needed: helicopter, GPS enabled software, cameras, gimbal and video downlink for live images to ground control station. Training is included.

We use a German engineered airframe for reliability and durability. The G15 [and HD65] can be ordered with a stabilized software option or auto pilot software. They both can hover and gather images. The auto pilot software allows for pre-planned auto flight missions that can be saved and repeated. All models are GPS enabled. Takeoff in 5 minutes from arrival to the launch site. The HD65 helicopter provides higher load capacity.

Specifications:

	G15	HD65
Length (m)	1.57	2.49
Rotor Diameter (m)	1.8	2.5
Payload (kg)	6.8	13.6
Endurance (hrs.)	1	1

Diagrams:

Figure 105 - G15 (left) and HD65 (right) Autocopter [118]

G18I Aeolus

Manufacturer: UAV Vision
Country: Australia
Application(s): Surveillance

Descriptions:

According to the Landseer Enterprises [73]:

The Aeolus is a prime candidate for a super stable surveillance platform, combined with the Mini Gyro Dome the system can reach speeds of 70 Knots and fly for a total of 3 hours. These features are well suited to power line inspection and fire spotting; you could even mount a Radio communication repeater system and have it hovering for 2 hours where you would not wish for a full size counterpart to go.

Specifications:

Rotor Diameter (m)	1.8
Length (m)	2
Height (m)	0.63
Dry Weight (kg)	7.5
MTO Weight (kg)	14
Payload (kg)	5
Endurance (hrs.)	2-3
Flight Control Range (km)	100
Aircraft Range (km)	300
Cruise Speed (km/h)	100

Diagrams:

Figure 106 - G18I Aeolus [73]

G3 Unmanned Helicopter

Manufacturer: Yotaisc Technologies
Country: China
Application(s): Multi-role

Military	**Civilian**
Reconnaissance and surveillance	Power line inspection
Communications Relay	Agricultural spraying and agricultural condition monitoring
Electronic interference	Border patrol
Target drone	Disaster monitoring and assessment
Biochemical detection	Surveying and mapping and geophysical prospecting
Leaflets placement	

Descriptions:

According to the manufacturer [113]:

Drone G3 unmanned helicopter employs the mature AF25B fuselage of COPTERWORKS and advanced HeliAP autopilot. It can achieve fully autonomous flight including automatic take-off, landing and route planning. It is a type of unmanned helicopters in a true sense. The navigation technology that integrates GPS and INS provides unprecedented flight positioning accuracy for the unmanned aerial vehicles. The redundant design is the most reliable guarantee for flight missions. The humane ground station interface allows you to easily monitor the status of the aircraft and plan routes. Drone G3 unmanned helicopter can assist you with a variety of tasks in a more relaxed and confident manner.

Specifications:

Length (m)	2.62
Height (m)	0.711
Width (m)	0.184
MTO Weight (kg)	33
Payload (kg)	11.5
Cruise speed (km/h)	55
Operational Ceiling (m)	2500

Diagrams:

Figure 107 - G3 UAV [113]

GC-201

Manufacturer: Geocopter
Country: Netherlands
Application(s): SAR, Security and Defense

Descriptions:

According to the Gizmag.com [74]:

Dutch unmanned rotorcraft system manufacturer Geocopter has shown there's still life in the traditional helicopter design yet with the official delivery of its first light unmanned helicopter called the GC-201. Designed and built just like a normal helicopter, the GC-201 features a twin gas turbine engine propulsion system, lightweight carbon fiber fuselage and full automatic takeoff, mission and landing capabilities.

The ability to easily swap between various sensor payloads makes the GC-201 suitable for usual range of applications that such craft are designed for: real-time aerial support to emergency services, search and rescue operations, environmental and traffic monitoring, mapping, and, of course, security and defense. Earlier this year the GC-201 received official flight approval from the Civil Aviation Authority of the Netherlands for operation in civil airspace.

Specifications:

Cruise Speed (km/h)	74
Ceiling (m)	2000
MTO Weight (kg)	90
Payload Capacity (kg)	30
Endurance (hrs.)	2.5

Diagrams:

Figure 108 - GC-201 UAV [74]

HEROS (Helicopter Robotics Systems)

Manufacturer: Tracking Systems
Country: Czech Republic
Application(s): Security and Defense

Intended use [75]:

- Traffic monitoring
- Detection of chemicals
- Radiation detection
- Border Watch
- Monitoring of pipelines, power lines, distribution networks, and so on
- Temporary retransmission of radio signals
- Remote sensing of Earth surface
- Patrolling in national parks
- Aerial photography and filming
- Aerial spraying

Descriptions:

According to [75]:

HEROS Helicopter (Helicopter Robotic Systems) developed by the company in Hradec Králové Track System and IDET 2009 was presented as a static exhibit, in conjunction with the accompanying vehicle.

Specifications:

Length (m)	4.7
Width (m)	1.8
Height (m)	2.1
Rotor Diameter (m)	4.2
Empty Weight (kg)	290
Payload (kg)	120
MTO Weight (kg)	465
Max Speed (km/h)	181
Cruise Speed (km/h)	139
Endurance (hrs.)	4
Max. Hovering Time (hrs.)	2.5
Operating Radius (km)	250
Telemetry Range (km)	80

Diagrams:

Figure 109 - HEROS UAV [75]

IAV1, IAV2

Manufacturer: BAE Systems
Country: USA
Application(s): Reconnaissance and surveillance

Descriptions:

According to [120]:

BAE Systems was selected in November 2004 to receive a USD2.5 million contract as one of three companies (with Aurora Flight Sciences and Honeywell Aerospace) to design and develop a ducted fan UAV as part of the first phase of DARPA's three-phase, three-year Organic Air Vehicle Class II (OAV II) programme for the US Army.

Performance objectives include a weight of less than 50 kg (110 lb) and endurance/range of up to 2 hours or 'several dozen' kilometres. The BAE prototype vehicle, originally designated IAV1, was developed as part of an independent R&D effort. After more than 100 tethered tests, it made its first untethered flight in April 2005, lasting 7 minutes and making two 10-waypoint circuits of a course at Hansen Field, California. Achievement of fully autonomous flight was announced two months later, but the IAV1 was eliminated from Phase 2 of the OAV II competition shortly afterwards.

Development continued with the improved and slightly larger IAV2, the first flight of which was made on 12 July and announced on 29 August 2005 along with news that BAE was targeting the US Marine Corps, Special Forces, Department of Homeland Security and US Forestry Service as potential customers. Payload integration was under way at that time. Ten days and 13 flights after the first flight, a fully autonomous sortie was made successfully, including automatic take-off, waypoint navigation with multiple ground speeds.

Specifications:

	IAV1	IAV2
Width (m)		0.94
MTO Weight (kg)	34	56.8
Payload (kg)		9
Max Speed (km/h)	37	185.2
Endurance (hrs.)	1	4.5

Diagrams:

Figure 110 - IAV1 (left), IAV2 (right) [120]

iFF-4.5 (“FireFox”)

Manufacturer: iMar GmbH
Country: Germany
Application(s): Multipurpose

Descriptions:

According to the manufacturer [116] and translated using Google Translate:

The iFF-4.5 “FireFox” is a hybrid aircraft with all the advantageous properties of a helicopter and a plane combined together. Thus, one is able, in helicopter mode without any additional Infrastructure to start without airport or runway, travel very long distances at high speed and land in an operational area, using low energy consumption.

For about 4 years (1999-2003) iMAR was active in the field of the development of a horizontal or vertical takeoff or landing (HOVTOL) unmanned drone of the type iFF-4.5 ("Firefox"). The "trick" of the patented development is that the FireFox has two separate drive units: a drive for the rotor helicopter mode and a drive for the propeller, both two-stroke, four-cylinder engine (UAV).

Note: At the time of writing, the iFF-4.5 “FireFox” was not listed on the company’s website as a current product.

Specifications:

Length (m)	5
MTO Weight (kg)	400
Payload (kg)	60
Max Speed (km/h)	500
Endurance (hrs.)	10
Operational Range (km)	1500

Diagrams:

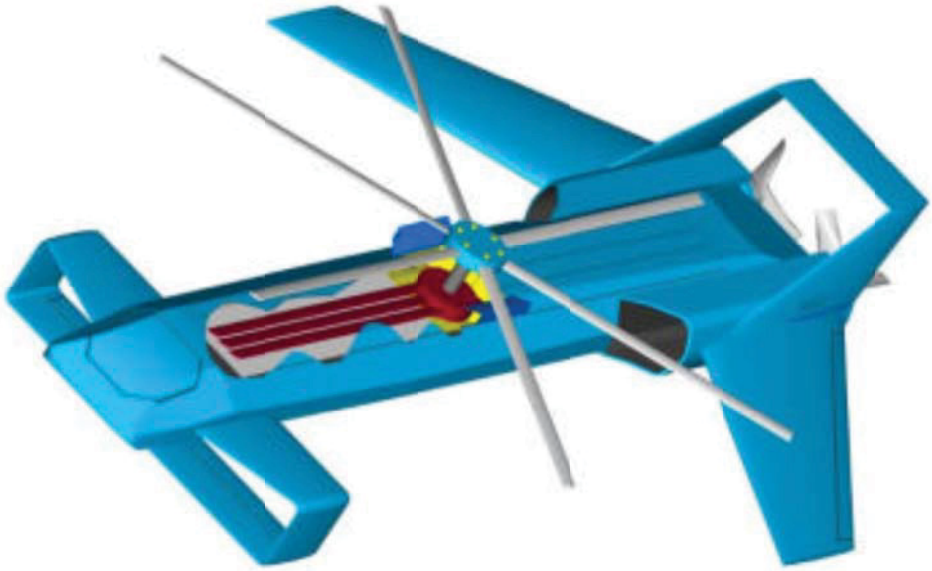


Figure 111 - iFF-4.5 "FireFox" Hybrid UAV [116]

Integrator (RQ-21A)

Manufacturer: Boeing Insitu
Country: USA
Application(s): ISR

Description:

According to the manufacturer [76]:

The Integrator™ unmanned aircraft (UA) is a product of Insitu, a wholly owned subsidiary of The Boeing Company. Integrator is a multi-mission, long-endurance UA that carries custom payloads for intelligence, surveillance and reconnaissance. The payload-centric design allows for easy integration with external systems.

Data link commands control the Integrator UA, reconnaissance sensors and payloads. Missions can be pre-programmed and executed autonomously. Integrator ground control systems allow for seamless integration and expandability, multi-vehicle control, remote and mobile operations and NATO-standard interfaces.

Insitu's Multiple UAV Software Environment (IMUSE) is a graphical user interface used for flight planning, monitoring and operation. IMUSE provides operators with comprehensive, easy-to-use tools for all phases of flight. Operators use the IMUSE map to indicate waypoints, targets, and aircraft tracks. The interface is designed such that the operator essentially draws lines for flight paths and target paths, and specifies which path to follow.

Specifications:

Length (m)	2.2
Wingspan (m)	4.9
MTO Weight (kg)	61
Payload (kg)	17
Speed (kts)	55-80
Service Ceiling (m)	4573
Endurance (hrs.)	24

Diagrams:

Figure 112 - RQ-21A Integrator [76]

Figure 113 - RQ-21A Integrator [77]

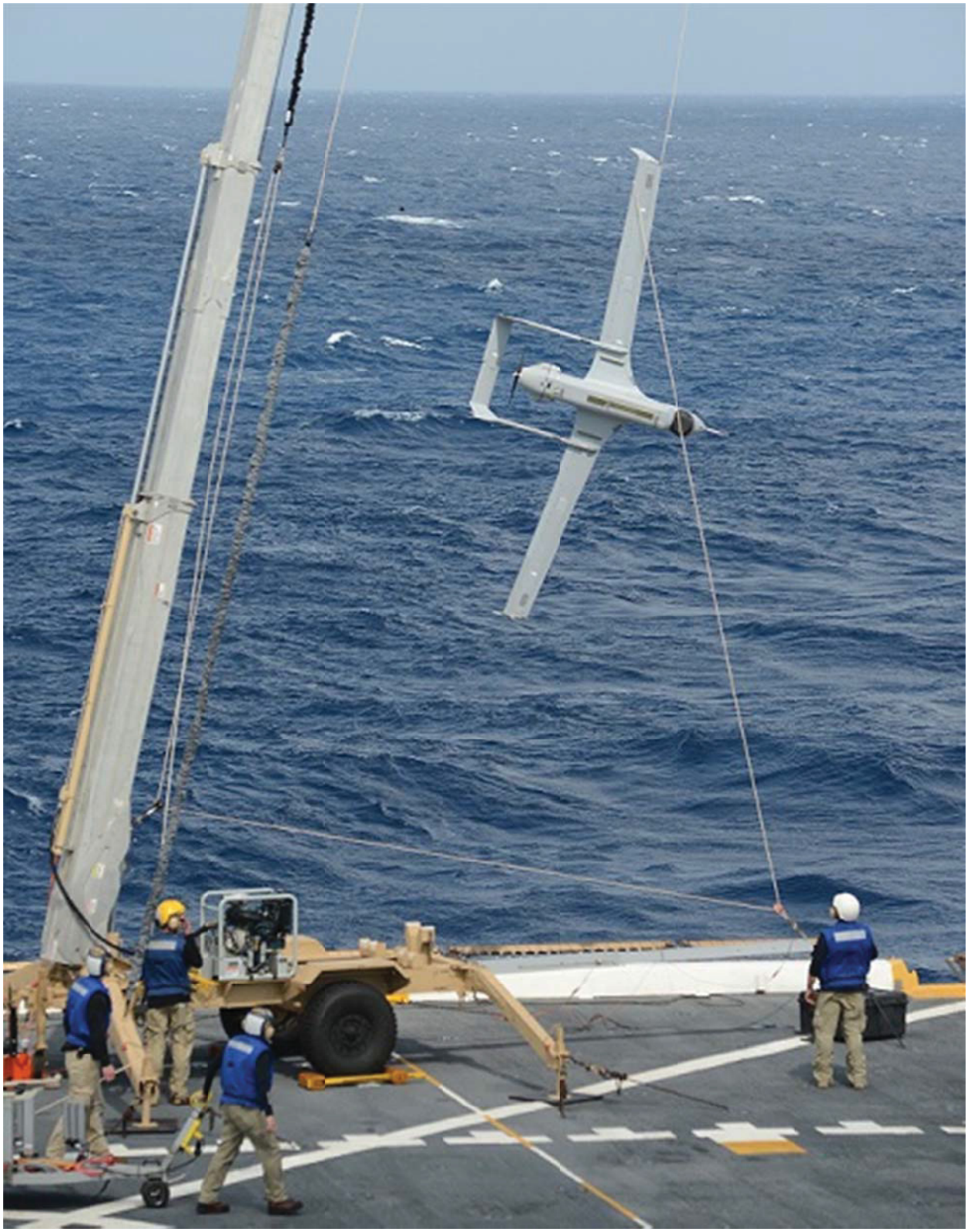


Figure 114 - RQ-21A UAV Recovery [77]

ITI 80-5 TH UAV

Manufacturer: Infotron
Country: France
Application(s): Multipurpose

Descriptions:

According to the manufacturer [114]:

INFOTRON designs and manufactures helicopter-type vertical take-off and landing counter-rotating rotor UAVs.

The IT180 is powered by a 46cc two-stroke engine (IT180-5 TH) or by an electric motor (IT180-3 EL). The heat-engine version can carry a top-mounted or underslung payload of up to 5 kg (3 kg for the electric version). The UAV's symmetrical build combines higher performance with proven reliability, making the IT180 less vulnerable to weather conditions such as wind, rain, etc.

The IT180 family of UAVs is built to a special, patented structural design, has a maximum speed of 90 km/h, a flight ceiling of 3,000 m, and over 2 hours endurance, which establish it as the benchmark in the mini-UAV market. INFOTRON's IT180 family of UAVs achieves high operational safety with a multiple array of onboard sensors controlled by integrated software that keeps it in contact with the base station over a secure three-way radio link. The avionics simplify handling by translating commands from the operator into flight controls. The autopilot mode lets the operator focus his or her attention on the gyro-stabilized camera (daylight optics, infrared or dual optical sensor) over the observation area, while the camera's focal power (x36 zoom lens) and stability provide the tools for making immediate and effective threat assessments from up to 10 km away.

Specifications:

Rotor Diameter (m)	1.8
MTO Weight (kg)	19
Payload (kg)	5
Max Speed (km/h)	90
Endurance (hrs.)	1.5
Operational Ceiling (m)	3000
Operational Range (km)	10

Diagrams:

Figure 115 - ITI80-5 TH UAV [114]

KOAX X-240

Manufacturer: Swiss UAV AG
Country: Switzerland
Application(s): Surveillance

Descriptions:

According to the manufacturer [78]:

The KOAX X-240 has been developed to provide maximum stability and payload capacity by only 45 kg MTOW. This system is most suitable for aerial photography or HD video filming. It`s low footprint allows easy transport and handling.

Specifications:

Service Ceiling ASL (m)	1500
Max Airspeed (km/h)	75
Rotor Diameter (m)	2.4
MTO Weight (kg)	45
Payload (kg)	8
Endurance (hrs.)	1.5
Mission Radius (km)	25

Diagrams:

Figure 116 - KOAX X-240 UAV [78]

LUNA NG

Manufacturer: EMT
Country: Germany
Application(s): C4ISR

Descriptions:

According to the manufacturer [79]:

LUNA NG TUAS is based on the combat proven LUNA TUAS. Both are all-weather, easy to operate tactical unmanned aircraft systems (TUAS) for real-time, day and night, command and control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR). Designed to accommodate multiple payloads, the versatile LUNA TUAS is successfully supporting peacekeeping missions in several countries, i.e. Kosovo and Afghanistan since year 2000. The system has been upgraded several times and is combat proven in different climates under severe weather conditions in difficult terrain (arctic, desert, jungle), leading to legendary operational effectiveness. The LUNA TUAS is a cost effective and reliable solution for military and civilian applications around the globe.

Specifications:

Length (m)	3
Wingspan (m)	3.0
Height (m)	1.1
MTO Weight (kg)	90
Typical Airspeed (km/h)	90
Ceiling (m)	5000
Endurance (hrs.)	12+
Data Link Range (km)	100+
Launch	Bungee catapult
Recovery	Net landing with automatic approach via DGPS or automatic parachute

Payload:

Cameras: Tiltable sensor platform with up to 7 color and IR zoom video, -arrays, -turrets, -high-definition, -hyperspectral, -pilot color video. Syntethic Aperture Radar (SAR; incl. GMTI), SIGINT-sensors, ESM, CBRN-sensors.ndard platform can be fitted with optional sensors. Data link relay for BLOS operations, encryption, GCS hand-off function, transponder.

Diagrams:

Figure 117 - LUNA NG UAV [79]

MANTA B

Manufacturer: BAE Systems
Country: USA
Application(s): ISR

Descriptions:

According to the Unmanned website [80]:

BAE System's Manta offers you tactical UAV capabilities in a low-cost, compact, durable aerodynamic platform with extended flight endurance. Manta's standard payload includes a daylight or Infrared pan/tilt/zoom camera providing long range, low altitude, and live situational awareness capability to organizations whose budget before now could not afford all the costs associated with larger UAVs. Manta's roomy payload bay with a large access panel offers easy access to your custom payloads. Add to that BAE System's experience in designing and integrating a number of payloads with custom installations you get an effective solution for intelligence, surveillance and reconnaissance needs.

Specifications:

Max Airspeed(kts)	110
Cruise Airspeed (kts)	39-90
MTO Weight (kg)	27.2
Payload (kg)	6.8
Endurance (hrs.)	6
Max Altitude (m)	4876
Payload Power (W)	14.4V, 15 or 30 AH
Launch	Pneumatic

Diagrams:

Figure 118 - Manta B UAV [80]

Model 706 Sea Bat

Manufacturer: Orion Industries
Country: USA
Application(s): Reconnaissance

Descriptions:

According to [127]:

This unmanned air vehicle prototype was designed in 1994 as a reconnaissance drone for the U. S. Navy. Scaled Composites, Inc. (Burt Rutan's company) manufactured the carbon-fiber airframe in 1995. The tandem engine design takes off vertically and transitions to horizontal flight. The forward engine can be shut down to extend endurance during loiter missions. The aircraft transitions to vertical flight to land on the four energy-absorbing struts. The Sea Bat used a flight control computer with gyros, accelerometers, GPS, air data and acoustic sensors. The program ended in 1997.

Specifications:

Length (m)	1.83
Wingspan (m)	3.05
Empty Weight (kg)	52.16
MTO Weight (kg)	90.72
Payload (kg)	22.68
Max Speed (km/h)	333.4
Max Altitude (m)	3048

Diagrams:

Figure 119 - Model 706 Sea Bat [127]

Museco Helicopter Drone

Manufacturer: EMT
Country: Germany
Application(s): Security and Defense

Descriptions:

According to the manufacturer [81]:

Guidance: Preprogrammed (3D waypoint list) using high resolution digital maps or high resolution aerial images; and/or remotely controlled. Mission program can be altered in flight. Differential GPS navigation and/or data link auto tracking (via range and azimuth data), option for automatic return flight to base.

Avionics: Inertial Navigation System, autopilot and aircraft system management are fully digital. Sensor package includes attitude gyro, rate of turn sensors, magnetic compass, air data sensors and accelerometers.

Data Link: Microwave link (C-band), tracking antennas in air vehicle and ground station. Command uplink, control and video/telemetry in real-time, jamming resistant. Range greater than 100 km.

Specifications:

Length (m)	3.2
Width (m)	0.9
Height (m)	1.1
Rotor Diameter (m)	0.35
MTO Weight (kg)	125
Payload (kg)	30
Endurance (hrs.)	3

Diagrams:

Figure 120 - Museco Helicopter Drone [81]

NEO S-300

Manufacturer: Swiss UAV AG
Country: Switzerland
Application(s): Surveillance

Descriptions:

Note: Supersedes the CamClone MK III design)

According to the manufacturer [82]:

The NEO S-300 features a traditional main and tail rotor assembly. This improved system focuses on safety by offering an integrated VTOL Parachute Rescue System (VPRS), redundant avionics and data-links.

Specifications:

Service Ceiling ASL (m)	2500
Max Airspeed (km/h)	120
Rotor Diameter (m)	3
MTO Weight (kg)	100
Payload (kg)	20
Endurance (hrs.)	2

Diagrams:

Figure 121 - NEO S-300 UAV [82]

NEO S-350

Manufacturer: Swiss UAV AG
Country: Switzerland
Application(s): Surveillance

Descriptions:

According to the manufacturer [82]:

The NEO S-350 features a traditional main and tail rotor assembly. This improved system focuses on safety by offering an integrated VTOL Parachute Rescue System (VPRS), redundant avionics and data-links. The NEO S-350 is the only system worldwide powered by a multiple fuel capable jet engine.

Specifications:

Service Ceiling ASL (m)	4500
Max Airspeed (km/h)	145
Rotor Diameter (m)	3.5
MTO Weight (kg)	145
Payload (kg)	35
Endurance (hrs.)	5
Mission Radius (km)	100

Diagrams:

Figure 122 - NEO S-350 UAV [82]

Orbiter 3 STUAS

Manufacturer: Aeronautics
Country: Israel
Application(s): Military and Homeland Security Missions

- ISTAR
- Artillery Mode (fire management, BDA)
- 'Sensor to shooter' (guided weapons)

Description:

According to the manufacturer [83]:

The Orbiter 3 Small Tactical Unmanned Aerial System (STUAS) is a compact and lightweight system for military and homeland security missions. The system is designed for field deployment, launched from a catapult and recovered vertically by opening a parachute & an airbag. The Orbiter 3 can perform any ISTAR mission, including target designation. The systems' enhanced performance makes it equally capable of performing missions of much larger and heavier UAS.

Specifications:

	Orbiter I	Orbiter II	Orbiter III
Wingspan (m)	2.2	3	3.6
MTO Weight (kg)	7	9.5	20
Payload (kg)			5.5
Range (km)	30	80	100+
Speed (kts)	30-70	30-70	30-70
Service Ceiling (m)	5486	5486	5486
Endurance (hrs.)	3	4	7

Payload:

- Tri-sensor fully stabilized payload (day/night/laser designator)
- Advanced accurate avionics package (GPS + INS)
- Long range digital data link system
- Low acoustic signature (covert operation)

Diagrams:

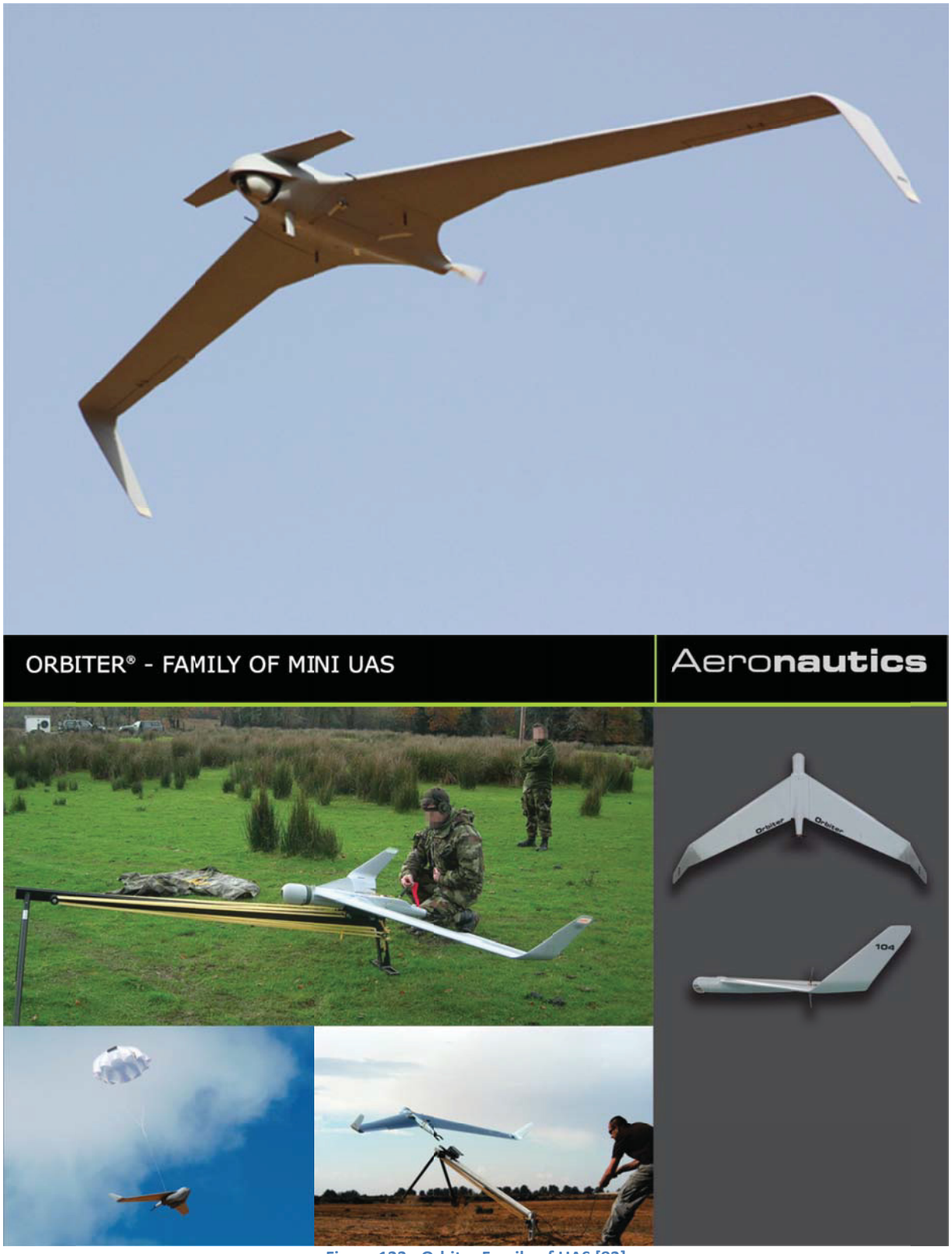


Figure 123 - Orbiter Family of UAS [83]

Panther

Manufacturer: IAI
Country: Israel
Application(s): Military, civilian and homeland security missions

Typical Missions [84]:

- Covert special operation missions
- Intelligence, Surveillance, Target Acquisition and Reconnaissance Missions (ISTAR)
- Silent Observation and Stakeout Missions
- Convoy escort and protection
- Border and Coastal Surveillance Missions
- Law enforcement Missions
- Emergency Response and Support Missions

Description:

According to the manufacturer [84]:

The Panther is a uniquely designed Fixed Wing AVTOL UAV System with a tilt rotor capability that provides a remarkable solution to a wide variety of tasks when pin-point automatic takeoff and landing is a requirement.

The system can be utilized in military, civilian and homeland security (HLS) operations providing high level of operational flexibility and a small logistical footprint

Main Features and Capabilities

- Automatic Vertical Take Off & Landing Capability
- Ship Deck Operation
- Mission Versatility
- Quick & Easy Assembly
- Simple to Operate & Deploy
- Silent Electrical Propulsion
- High Quality EO/IR/LP Imagery
- Fuel Cell Technology
- Low Acoustic Signature
- Unique Tilt Rotor Technology
- Small Logistical Footprint

Specifications:

Wingspan (m)	8
MTO Weight (kg)	65
Payload (kg)	10
Speed (kts)	40
Endurance (hrs.)	6
Operational Range (km)	60
Operational Altitude (m)	1524

Diagrams:

Figure 124 - Panther UAV [84]

Pelicano

Manufacturer: Indra Systems
Country: Spain
Application(s): Maritime surveillance and security

Description:

According to the manufacturer [139]:

Pelicano's capacity of take-off and vertical landing (AVTOL) and small size make this UAV a perfect solution to support any kind of naval operation. It has been designed to support surveillance tasks, maritime traffic control, frontiers control, fight against activities of illegal immigration, drugs trafficking, arms traffic, piracy and for rescue operations, deploying from a naval platform or a ground base. Likewise, it will be prepared to be used, both in intelligence missions and emergencies management, like natural or environmental disasters, implying tracking, surveillance and reconnaissance of wide areas, avoiding any human lost.

Indra has based the system in a medium size helicopter from the Swedish company CybAero and will incorporate the most advanced technological systems to adapt it to military and civilian operational necessities. Among the sensors to be integrated in the platform are electro-optical/infrared systems, able to obtain high resolution images from a high height. It will be prepared to integrate a light radar, just as electronically surveillance systems and CBRN sensors.

Specifications:

Length (m)	4
Width (m)	0.96
Height (m)	1.2
Main Rotor Diameter (m)	3.3
MTO Weight (kg)	200
Payload (kg)	30
Max Speed (km/h)	185
Cruise Speed (km/h)	90
Endurance (hrs.)	6
Operational Range (km)	100
Operational Altitude (m)	3600

Diagrams:

Figure 125 - Pelicano UAV [139]

RemoH-C100

Manufacturer: UCONSYSTEM Co. Ltd.
Country: South Korea
Application(s): Agricultural and Surveillance

Descriptions:

According to the manufacturer [85]:

T/O & Landing: Autonomous VTOL
Flight Mode: Full Autonomous Flight, Pre-programmed Flight, Auto-Homing, Hovering, Waypoint-Navigation.
Payload: CCD/IR Camera
Others: Flight Modes Changeable during Mission Flight, Target Position Displayed on Video Screen

Specifications:

Rotor Diameter (m)	3.2
Length (m)	3.5
Width (m)	0.66
Height (m)	1.05
Empty Weight (kg)	60
Payload (kg)	40
MTO Weight (kg)	100
Max Speed (km/h)	60
Mission Speed (km/h)	20
Endurance (hrs.)	1

Diagrams:

Figure 126 - RemoH C100 UAV [85]

RemoH-M100

Manufacturer: UCONSYSTEM Co. Ltd.
Country: South Korea
Application(s): Security and Defense

Descriptions:

According to the manufacturer [86]:

T/O & Landing: Autonomous VTOL
Flight Mode: Full Autonomous Flight, Pre-programmed Flight, Auto-Homing, Hovering, Waypoint-Navigation.
Payload: CCD/IR Camera
Others: Flight Modes Changeable during Mission Flight, Target Position Displayed on Video Screen

Specifications:

Rotor Diameter (m)	3
Length (m)	3.2
Width (m)	0.56
MTO Weight (kg)	100

Diagrams:

Figure 127 - RemoH-M100 UAV [86]

R-IHA (Sivrisinek or Mosquito)

Manufacturer: Turkish Aerospace Industries (TAI)
Country: Turkey
Application(s): Military and civilian missions

- Target Detection, Recognition and Identification
- Damage Assessment
- Signals Intelligence
- Fire Adjustment Support

Description:

According to the manufacturer [92]:

Capabilities

- Fully autonomous flight, including automatic take-off and landing
- Pre-programmed mission plan which can be updated during flight
- Ground Control Station capable of controlling multiple air vehicles

According to [130], an armed version of this UAV is in development with different specifications.

Specifications:

	Baseline	Armed
MTO Weight (kg)	320	300
Payload (kg)	80	120
Endurance (hrs.)	3-4	1.5
Cruise Speed (kts)	72	-
Ceiling (m)	3048	-
Range (km)	-	8

Diagrams:

Figure 128 - R-IAH UAV [92]

Figure 129 - R-IAH UAV [92]

RPH-2A VTOL

Manufacturer: Fuji Heavy Industries Ltd.
Country: Japan
Application(s): Surveillance

Specifications:

According to RUVSA [87]:

Length (m)	5.3
Height (m)	1.8
MTO Weight (kg)	330
Payload Capacity (kg)	100
Endurance (hrs.)	1
Ceiling (m)	2000

Diagrams:

Figure 130 - RPH 2A UAV [87]

RPAC Condor

Manufacturer: Innovaciones y Desarrollos Aeronauticos (INDA)
Country: Spain
Application(s): S

Specifications:

According to the manufacturer [140]:

Length (m)	3.92
Height (m)	1.3
Width (m)	0.9
Main Rotor Diameter (m)	3.22
Tail Rotor Diameter (m)	0.68
Cruise Velocity (km/h)	50
Max Velocity (km/h)	110
MTO Weight (kg)	73
Payload Capacity (kg)	20
Endurance (hrs.)	1.5
Available Power (W)	750

Diagrams:

Figure 131 - RPAS Condor UAV [140]

SA-200 Weasel

Manufacturer: Scion UAS
Country: USA
Application(s): Security and Surveillance

Description:

According to the manufacturer [88]:

For longer endurance and heavier payloads, the Weasel [unmanned helicopter system] is ready. Designed so that two systems fit comfortably in the back of a long-bed pickup truck, the Weasel remains portable by standard equipment. Able to fly farther, faster, and longer, Weasel is highly customizable for a wide variety of operations.

Specifications:

Length (m)	2.27
Width (m)	0.058
Height (m)	0.095
Rotor Diameter (m)	0.207
MTO Weight (kg)	68
Payload (kg)	20
Endurance (hrs.)	4
Max. Speed (kts)	100
Ceiling (m)	3050

Diagrams:

Figure 132 - SA-200 Weasel UAV [88]

SA-400 Jackal

Manufacturer: Scion UAS
Country: USA
Application(s): Security and Surveillance

Description:

According to the manufacturer [89]:

Scion UAS announced today that the Naval Research Laboratory awarded a contract valued at up to $3 million for the delivery of multiple SA-400 Jackal unmanned helicopter systems.

Scion UAS was selected as the supplier for the unmanned helicopter systems after a competitive evaluation of several companies. The contract includes delivery of multiple vertical take-off and landing (VTOL) vehicles that are capable of autonomous launch and recovery from a moving ship. The vehicles will be utilized in the development and demonstration of emerging sensor systems.

The SA-400 Jackal is a turbine powered VTOL optionally-piloted vehicle (OPV) that can carry a 100 lb payload for more than 5 hours.

Founded in 2011, Scion UAS, LLC offers a product family of unmanned helicopter systems that range in size from car-transportable to optionally-piloted helicopters. The VTOL UAS provides a simple to use aerial surveillance platform targeted at a wide variety of civilian and military applications including mining, agriculture, and aerial surveys.

Specifications:

Payload (kg)	45

Diagrams:

Figure 133 - Scion UAS Family: SA-400 Jackal (left) [89]

Scorpio 6, Scorpio 30 UAV

Manufacturer: EADS Defense & Security, SurveyCopter
Country: France
Application(s): Special operations

Descriptions:

According to [110],[111]:

The EADS "Scorpio" is a much smaller battlefield helicopter, focused on special operations. It is also of conventional helicopter configuration, with a two-blade main rotor with Hiller-type stabilization paddles, an exposed two-blade tail rotor, and landing skids. The Scorpio features a digital datalink; is capable of autonomous preprogrammed operation; and carries a sensor turret between the landing skids, with interchangeable turrets carrying either an EO or IR imager.

A lightweight helicopter designed for urban operations by military and paramilitary organizations. Scorpio 30 is the larger version of the type and was first released to the market in 2002. Low volume sales have been recorded for the French Army and undisclosed South American customers. One system was acquired by the UK Ministry of Defence for use in the former joint UAV experimentation program.

Specifications:

	Scorpio 6	Scorpio 30
Length (m)	1.7	2
Height (m)	0.75	0.75
Rotor diameter (m)	1.8	2.2
MTO Weight (kg)	13	38
Payload (kg)	6	15
Max Speed (km/h)	35	50
Endurance (hrs.)	1	2
Ceiling (m)	2000	2000

Diagrams:

Figure 134 - Scorpio 6 UAV [110]

Figure 135 - Scorpio 30 UAV [111]

Scorpion

Manufacturer: Freewing Aerial Robotics
Country: USA
Application(s): Reconnaissance and remote sensing

Descriptions:

According to the Wikipedia [90]:

The Freewing Scorpion is a reconnaissance UAV of unusual design developed in the United States in the early 21st century by a company associated with the University of Maryland, College Park, Freewing Aerial Robotics Corporation. Working with well-known small-aircraft designer Burt Rutan, Freewing designed a series of piston-powered short-takeoff-and-landing UAVs, based on a design where the fuselage pivots relative to the wing surfaces. The "freewing" design also allows the UAV to operate as a stable observation platform during turbulent conditions.

The Scorpion will be offered for a US Army short-range UAV requirement, and is being proposed by Matra of France for use on French navy frigates and patrol boats. The Matra version is named "Marvel" and will carry a Matra-designed electro-optical day-night camera system initially, but the **French navy has expressed interest in extending the payload to include** communications relay, **electronic warfare**, and antisubmarine warfare equipment. Freewing is also offering the similar but smaller "Scorpiette", with a payload of up to 6.8 kilograms (15 pounds) for commercial, third-world military, and law enforcement organizations.

Specifications:

According to Stargazer.com [99]:

	60-25	100-60
Length (m)	2	3.6
Wingspan (m)	3.7	4.9
Empty Weight (m)	34	145
Payload (kg)	11	27
Max Airspeed(km/h)	185	222
Max Altitude (m)	1524	4572
Endurance (hrs.)	5	6.5
STOL (m)	75	<100

Diagrams:

Figure 136 - Freewing Tilt-body Scorpion UAV [90]

Scout B1-100 UAV

Manufacturer: Aeroscout GmbH
Country: Switzerland
Application(s): Commercial and industrial

Descriptions:

According to the manufacturer [91]:

GENERAL The autonomous industrial unmanned helicopter Scout B1-100 has been developed for professional airborne applications such as aerial mapping, airborne broadcasting, search & rescue, surveillance and inspection as well as law enforcement.

FEATURES The Scout B1-100 provides easy transportability and maintainability through system modularity, flexible payload options, and a smooth and easy-to-start gasoline engine.

OPERATION The helicopter can either be flown in conventional manual mode with high maneuverability or can be operated with its integrated INS/GPS automated flight control system. This flight control system allows joystick (velocity) mode as well as GPS waypoint (position) mode.

Specifications:

Length (m)	3.3
Width (m)	1
Height (m)	1
Rotor Diameter (m)	3.2
Tail Rotor Diameter (m)	0.65
Payload (kg)	18
MTO Weight (kg)	75
Endurance (hrs.)	1.5

Diagrams:

Figure 137 - Scout B1-100 UAV [91]

Shadowhawk

Manufacturer: Vanguard Defense Industries
Country: USA
Application(s): Reconnaissance, surveillance

Descriptions:

According to the manufacturer [128]:

MK-I: Basic UAS unit with CCD TV optics, standard semi-autonomous flight avionics package and turbine or piston power plant.
MK-II: Upgraded UAS with day CCD TV camera as well as FLIR optics package, fully autonomous avionics package and turbine or piston power-plant.
MK-III: UAS with day CCD, FLIR and thermal cameras, fully autonomous avionics and weaponized with either 40mm, 37mm grenade launcher or 12 gauge shotgun with laser designator (military use only.)
MK-IV: Unavailable to non-military users.

Optics: Sony FCB EX-1020 Electro-Optical Camera with 20X Zoom FLIR Photon 320, FLIR TAU 640
Avionics: Semi/Full autonomous system radio link, Auto Take-off/Land, Pilot Assist Module, 30 hz Laser Altimeter, DGPS system with 2cm accuracy option.
Weapons: (NOT AVAILABLE TO LAW ENFORCEMENT) U.S. Military components have options including single or multiple shot 40mm grenade launcher, 25mm Grenade Launcher, 12g shotgun.

Specifications:

Length (m)	2.13
Height (m)	0.75
Width (m)	0.43
Rotor Diameter (m)	1.93
Dry Weight (kg)	22.2
Payload (kg)	10
Max Speed (km/h)	112.6
Cruise Speed (km/h)	35
Max Range (km)	24
Endurance (hrs) [with piston engine]	3

Diagrams:

Figure 138 - Shadowhawk UAV [128]

SkyAgent I

Manufacturer: BAE Systems
Country: USA
Application(s): Tactical reconnaissance, surveillance, target acquisition, signal intelligence, ordnance and sensor delivery

Specifications:

Height (m)	1.5
Wingspan (m) – [optional]	2.4
Rotor Diameter (m)	0.559
Empty Weight (m)	43.1
MTO Weight (kg)	56.7
Payload (kg)	6.8
Endurance (hrs.)	1 2 w/opt. wings
Operating Ceiling (m)	3000
Operating Radius (km)	40
Electrical Power (W) [optional alternator]	200

Diagrams:

Figure 139 - SkyAgent I UAV [122]

Spinwing

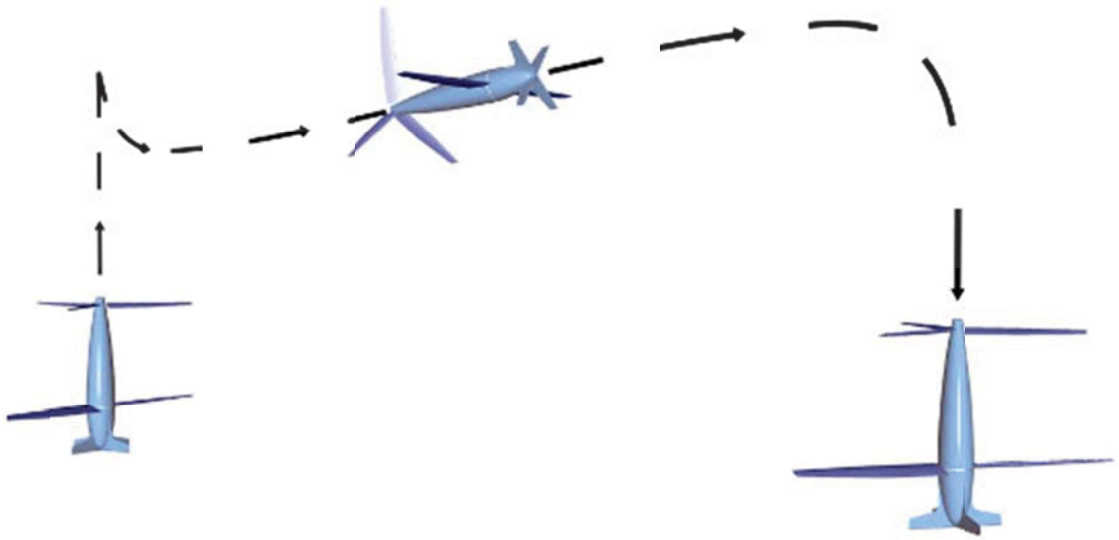
Manufacturer: Thorpe SEEOP Corporation
Country: USA
Application(s): Multi-purpose

- Law Enforcement
- Research
- Resource Management
- Military
- Resource Exploration
- Emergency Response

Descriptions:

According to manufacturer [128], this aircraft is in development and the following description is provided:

The Spinwing flight profile begins in helicopter mode for a vertical take-off. At any point during a single flight of Spinwing it can convert to fly as either a helicopter or an airplane. When Spinwing wants to convert from helicopter to airplane flight mode, the wings and tail fins are feathered and stop rotation by external aerodynamics and with a gentle pull out maneuver leveling out into airplane flight. When the Spinwing wants to convert from airplane to helicopter mode, a gentle push over (done by turning the nose downward) while pitching the wings allowing them to auto-rotate. To land, the Spinwing will be flying in helicopter mode for a typical helicopter landing but with greater control because tail and wing rotors are rotating in opposite directions eliminating the complicating torque common to all helicopters.



Specifications:

Length (m)	1.83
Wingspan (m)	3.05
Payload (kg)	27.2

Diagrams:

Figure 140 - Spinwing Stop-Rotor UAV [128]

SR30, SR200, SR500

Manufacturer: Rotomotion
Country: USA
Application(s): Reconnaissance, Surveillance

Specifications:

According to the manufacturer [101]:

	SR30	SR200	SR500
Length (m)	1.638	2.79	3.35
Width (m)	0.355	0.76	0.61
Height (m)	0.622	0.86	1.17
Main Rotor Diameter (m)	1.981	3	3.3
Tail Rotor Diameter	0.337	0.7	0.558
Dry Weight (kg)	7	25	58
MTO Weight (kg)	15.5	47.7	108
Payload (kg)	8.5	22.7	50
Max Speed (km/h)	40	60	60
Endurance (hrs.)	1.5	5	8
Climb Rate (m/min)	122	122	122
Operating Ceiling (m)	-	1500	2400
Available Power (W)	-	800	800

Payload:

According to the manufacturer [101]:

Camera Platform: Pan and tilt with gyro stabilization available – two camera capacity available – control through ground station

Cameras: Numerous options available, including day video, low light and infrared. Zoom available to 20x

Flight Control Software: Fully autonomous flight with auto-takeoff and landing, unlimited number of programmable waypoints, “point and click” waypoints on map overlay, joystick control (See Flight Controller Specifications Below)

Ground Control Software: Included with system and provides command and control and sensor data on screen with audible warning system

Ground Station: Options include standard laptop, ruggedized laptop or self-contained ground station in hardened case.

Weather Resistance: Unit can be weatherized to fly in moderate rain

Diagrams:

Figure 141 - SR30 UAV [101]

Figure 142 - SR 200 UAV [101]

Figure 143 - SR500 UAV [101]

Star-Lite UAV

Manufacturer: Fetters Aerospace
Country: USA
Application(s): Heavy-lift helicopter

Descriptions:

According to Aviation Week [124]:

The SVU-200 was designed for Hunan Sunward Science and Technology Co., LTD., of Changsha China, where Mr. Fetters has been living and building the project for the last 2 years, working hand-in-hand training Sunward engineers in the art of rotorcraft development while manufacturing 100% of the SVU-200 UAV helicopter in China except for some electrical components. Mr. Fetters has stated "after intense training to the stringent demands of the aerospace industry, the high-quality of the workmanship in the SVU-200 can now compare or exceed that of any UAV helicopter anywhere in the world".

Specifications:

	FA-800B	FA-582A (SVU-200)
MTO Weight (kg)	250	-
Payload (kg)	120	200
Max Speed (km/h)	209	209
Range (km)	730	-
Endurance (hrs.)	4.5	-

Diagrams:

Figure 144 - SVU-200 VTUAV [124]

T21 UAV Helicopter

Manufacturer: UAV Vision
Country: Australia
Application(s): Inspection Platform

Descriptions:

According to the Landseer Enterprises [93]:

The T21 helicopter is an intelligent platform capable of full autonomous flight. The machine is powered by the latest in micro jet turbines which provides a vibration free and reliable power train. The helicopter is manufactured from the latest composite materials & aerospace grade aluminum. The platform can be flown semi manual (line of sight) or full autonomous via the ground station.

Specifications:

Rotor Diameter (m)	2.1
Empty Weight (kg)	15
MTO Weight (kg)	30
Payload (kg)	10
Endurance (hrs.)	1-1.5
Cruise Speed (kts)	50

Diagrams:

Figure 145 - T21 UAV [93]

TAG UAV Family

Manufacturer: Tactical Aerospace Group
Country: USA
Application(s): Surveillance

- Military
- law enforcement
- civil defense
- search and rescue
- aerial interdiction
- homeland defense missions

Descriptions:

According to Unmanned [103]:

Tactical Unmanned Aerial Vehicles High performance UAV VTOL technology for advanced applications and payloads. TAG designs and manufactures VTOL Unmanned Aerial Vehicles and develops custom and turnkey solutions by integrating industry and COTS flight control systems, ground control stations, instrumentation and various payload and sensory technologies with our unmanned aircraft.

Specifications:

	M65	M80	M100	M2600	C25	C50	C80	C100	CT100
Length (m)			2.15						
Height (m)			1.04						
Diameter (m)			2.52						
Weight (kg)			17.7						
Payload (kg)	15	21	28	227	12	16	18	24	34
Cruise Speed (km/h)	100	100	116	164	70	76	88	97	102
Endurance (hrs.)	5	7	7	2	0.75	1.17	4	4	0.75
Operating Ceiling (m)	4000	4000	4000	3200	3000	3000	3600	3600	4300

Diagrams:

Figure 146 - TAG UAV [103]

Figure 147 - TAG M100 UAV [104]

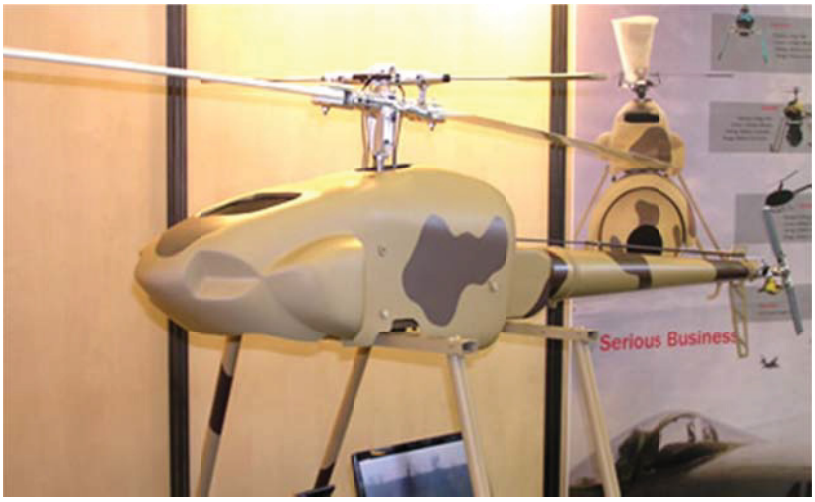


Figure 148 - TAG M65/80 UAV [105]

TU-150 Hybrid VTOL UAV “Emperor”

Manufacturer: Swiss UAV AG
Country: Switzerland
Application(s): Surveillance

Descriptions:

According to the manufacturer [94]:

The TU-150 Hybrid Unmanned Aerial Vehicle combines the capabilities of an aircraft and helicopter to provide a wide range of missions. This innovative design is currently at a concept development phase.

Specifications:

Service Ceiling ASL (m)	6500
Max Airspeed (km/h)	240
Rotor Diameter (m)	3.5
MTO Weight (kg)	150
Payload (kg)	30
Endurance (hrs.)	8
Mission Radius (km)	200

Diagrams:

Figure 149 - TU-150 Hybrid VTOL UAV [94]

U8E VTOL

Manufacturer: China National Aero-Technology Import & Export Corporation (CATIC)
Country: China
Application(s): Surveillance

Descriptions:

According to the manufacturer [112]:

U8E VTOL UAV is light Unmanned System. It is multi-role UAV system for varieties of application. With EO and multi-function payload, U8E can play very important role both in Civil and Military operation. U8E is the best solution for surveillance operation and Anti-terrorism action, etc.

Specifications:

Length (m)	3.74
Height (m)	1.47
Width (m)	1
Rotor diameter (m)	3.86
MTO Weight (kg)	220
Payload (kg)	40
Max Speed (km/h)	150
Cruise speed (km/h)	120
Endurance (hrs.)	4
Ceiling (m)	3,500
Operating Range (km)	150

Diagrams:

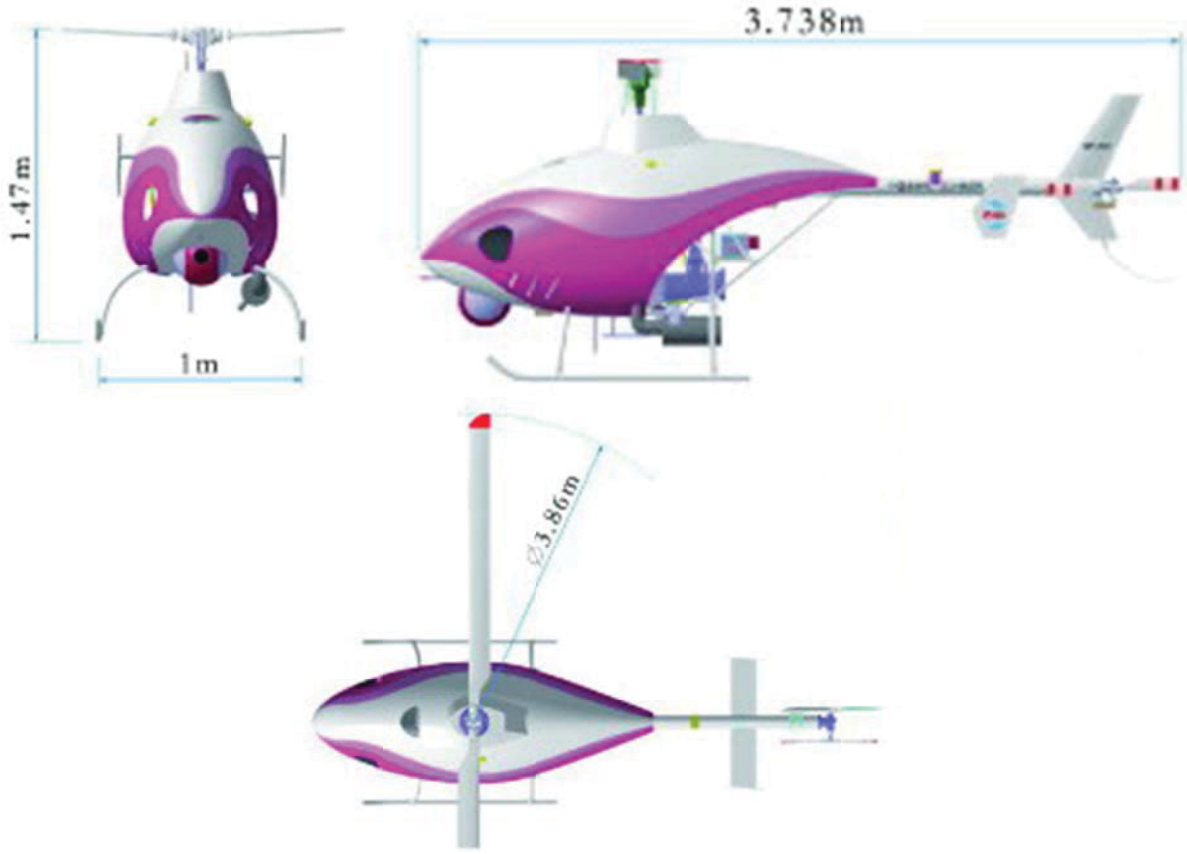


Figure 150 - U8E UAV [112]

UAV35

Manufacturer: Asociación de la Industria Navarra
Country: Spain
Application(s): Industrial Inspection

Descriptions:

According to [137], [138]:

The UAR-35 is an in-house development by the Asociación de la Industria Navarra (AIN).

The Navarra Industry Association (NIA) presented at the opening of the Uar35 UNVEX 2010, the only unmanned aerial vehicle (UAV) national development, which has been developed within the "Pelican Project" in collaboration with Red Eléctrica of Spain .

According to information provided by the Association, AIN presented last October its latest unmanned aerial vehicle (UAV), an aerial robot system for defect inspection of power lines that transport AIN jointly developed and Electrical of Spain (REE) in recent years.

Currently AIN has built three UAVs, Uar5 models, and Uar35 Uar10 model that is present in the meeting exposure UNVEX 2010.

Specifications:

Length (m)	3.9
Height (m)	1.3
Width (m)	0.9
Rotor diameter (m)	3.2
MTO Weight (kg)	75
Payload (kg)	20
Max Speed (km/h)	50
Cruise speed (km/h)	35
Endurance (hrs.)	1.5
Ceiling (m)	1100
Operating Range (km)	4

Diagrams:

Figure 151 - UAV35 [137]

Figure 152 - UAV35 (Digital Recreation of a Prototype) [138]

V750

Manufacturer: Tianxiang Aerospace Industry Co. Ltd. Qingdao Haili Helicopters Manufacturing Co. Ltd., and China National Aero-Technology Import and Export Corporation
Country: China
Application(s): Surveillance, SAR, military, civilian missions

Descriptions:

According to [108]:

An unmanned helicopter, the largest of its kind in China, successfully completed its first flight in Weifang City of east China's Shandong Province Saturday.

The medium-sized unmanned helicopter, with a maximum takeoff weight of 757 kg, departed from the flight-test center of Weifang Tianxiang Aerospace Industry Co. Ltd in the morning. It hovered for ten minutes and performed a few maneuvers before finishing with a stable landing.

The helicopter, model number "V750", has a load capacity of over 80 kg. It can fly a maximum speed of 161 km per hour with a cruising duration of over four hours. The aircraft can be controlled remotely within a distance of over 150 km or automatically flown following inputs from its program.

Specifications:

Rotor diameter (m)	7.24
MTO Weight (kg)	757
Payload (kg)	80
Max Speed (km/h)	161
Endurance (hrs.)	4
Ceiling (m)	3000
Range (km)	150

Diagrams:

Figure 153 - V750 UAV [108]

Vantage (Dragon Warrior)

Manufacturer: Naval Research Lab
Country: USA
Application(s): Reconnaissance, Surveillance & Target Acquisition

Descriptions:

According to [100]:

The Vantage UAV was developed by the Naval Research Laboratory and the Marine Corps Warfighting Laboratory (MCWL) in the 2002/2004 time frame to fulfill the Marine Corps' "Dragon Warrior" requirement. The UAV itself was originally also referred to as Dragon Warrior, and the name was possibly changed to avoid confusion with other UAV designs for the same requirement (e.g. the Sikorsky Cypher II). "Dragon Warrior" called for an HMMWV-transportable VTOL vehicle for RSTA (Reconnaissance, Surveillance & Target Acquisition) and communications relay missions. Flight tests of the first full-scale NRL prototype began in June 2003.

The USMC has since cancelled the Dragon Warrior program because of development problems with the UAV. It is unclear if the NRL's Vantage UAV will be used for further work related to payload and/or vehicle development.

Specifications:

Length (m)	2.13
Rotor Diameter (m)	2.44
MTO Weight (kg)	160
Max Speed (km/h)	185
Payload (kg)	16
Endurance (hrs.)	5

Diagrams:

Figure 154 - Vantage (Dragon Warrior) UAV [100]

Velocity Raptor

Manufacturer: Challis Heliplane UAV Inc. - a division of Challis Helicopters Inc.
Country: Canada
Application(s): Military and civilian missions

Specifications:

Length (m)	9.9
Width (m)	1.4
Height (m)	2.65
Rotor Diameter (m)	8.05
Tail Rotor (m)	1.37
Base Weight (kg)	748
Fuel Weight (kg)	613
MTO Weight (kg)	1361
Max Speed (kts)	234
Cruise Sped (kts)	174

Diagrams:

Figure 155 - Velocity Raptor UAV [95]

Vigilante 496, Vigilante 502

Manufacturer: SAIC/A
Country: USA
Application(s): Reconnaissance, Surveillance

Descriptions:

According to FAS [102]:

Vigilante is a SAIC-developed family of Optionally Piloted and Unmanned Aerial Vehicles (UAV) based on the commercially available Ultrasport 496 sport helicopter. This fully capable UAV system includes air vehicle and ground support systems. It is easily transported via trailer towed by auto/truck/van. It is reconfigurable for variety of datalinks and payloads. It can be operated by as few as two people.

There are two variants of Vigilante. Both have a maximum gross weight of 1,100 pounds, a main rotor diameter of 23 feet, an overall length of 26 feet and a main rotor height of about 8 feet. They both have a shrouded tail rotor and the rotating tail rotor drive shaft enclosed in tailboom for safety.

The Vigilante 496 OPV is either optionally piloted or an autonomously UAV. It is capable of a maximum true air speed of 75 knots and ceiling of 12,000 feet. It has 12 cu ft interior volume and a 300-lb. payload capacity with its full fuel capacity of 18 gallons. With its Hirth engine it has about 5 hours of endurance.

The Vigilante 502 is a UAV only aircraft. It is capable of a maximum true air speed of 117 knots and ceiling of 13,000 feet. It has 5 cu ft interior volume, a 150-lb. payload capacity with its full 36-gallon fuel capacity in a crashworthy fuel system and less drag for improved aerodynamic performance. It has a Rotax 914 turbo engine.

Specifications:

	496	502
Length (m)	8	8
Width (m)	2.4	1.7
Height (m)	2.3	2.4
Main Rotor Diameter (m)	7	7
Empty Weight (m)	275	318
MTO Weight (kg)	500	500
Payload (kg)	136	68
Max Speed (km/h)	138	216.7
Endurance (hrs.)	5	-
Operating Ceiling (m)	3657	3962

Diagrams:

Figure 156 - Vigilante 496 UAV [102]

Figure 157 - Vigilante 502 firing a missile (right) [102]

Vindicator II

Manufacturer: Meggitt Training Systems Canada
Country: Canada
Application(s): Threat Simulation

Description:

According to manufacturer [96]:

The Vindicator II™ is a cost effective, recoverable, remotely piloted, basic training target. Designed to simulate the threat of missiles and aircraft for air defence systems, the Vindicator II™ was developed by a team with extensive experience in the design of remotely piloted vehicle systems. The high performance Meggitt Flight Control System provides the reliable and stable characteristics that are successfully used with the Canadian Forces, US Navy and other international customers.

Specifications:

Length (m)	2.72
Height (m)	0.51
Wingspan (m)	2.59
Wing Area (m^2)	1.7
Payload (kg)	9.1
MTO Weight (kg)	84
Endurance (hrs.)	3
Range (km)	>35
Max Altitude (m)	4572

Diagrams:

Figure 158 - Vindicator II UAV [96]

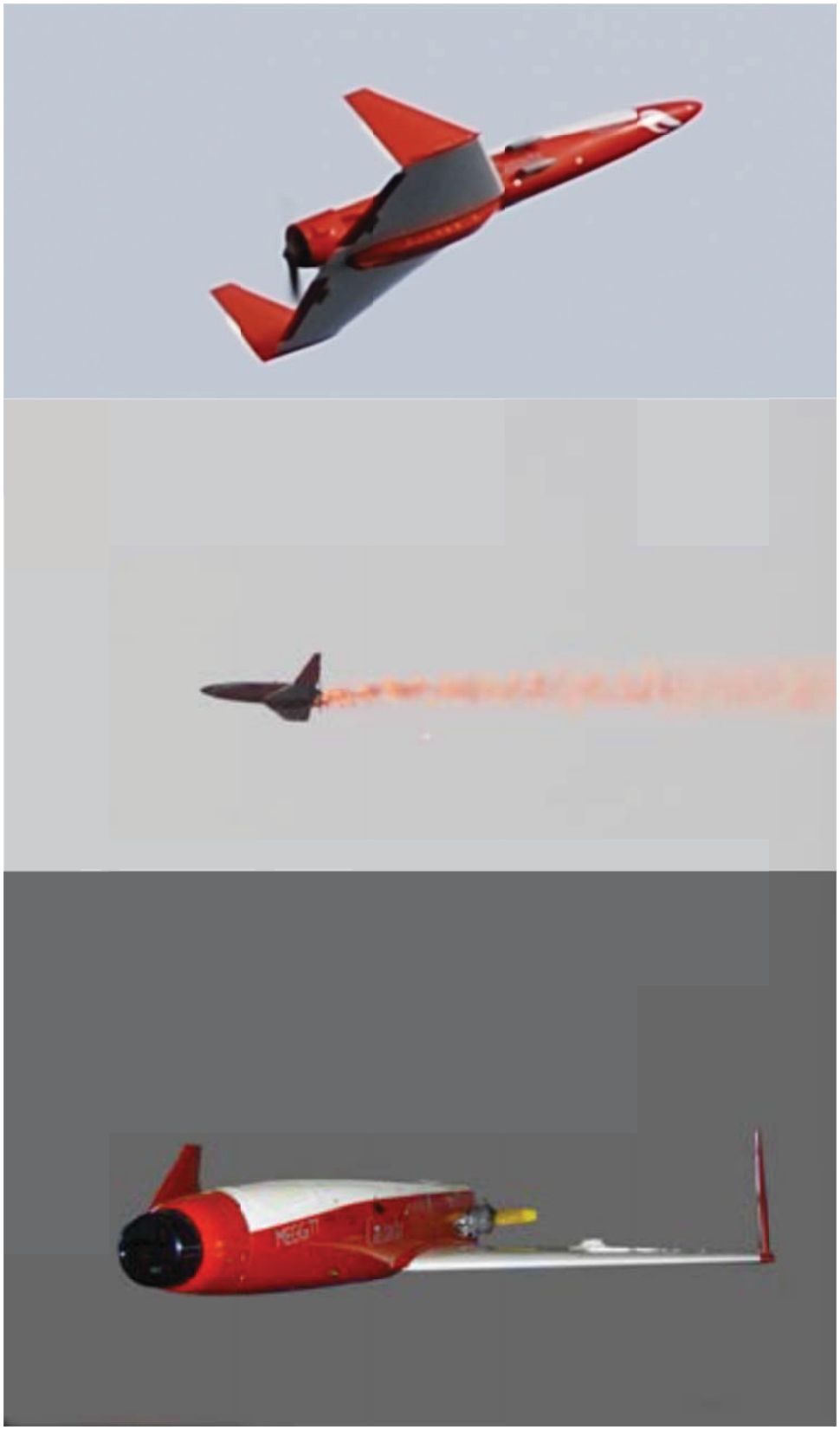


Figure 159 - Vindicator II UAV [96]

X-13

Manufacturer: EMT
Country: Germany
Application(s): C4ISR (Maritime)

Descriptions:

According to the manufacturer [97]:

- Land and ship based operation through take-off from pneumatic catapult and net landing with automatic approach control
- All-weather capability with EO/IR/SAR sensory
- Reconnaissance, identification and location in real-time
- Capability as relay-UAV für greater range and low altitude missions
- Designed for flights in military and civil controlled airspace
- Control-station available for vehicles, ships and aircraft
- Completion of mission flights even under icing conditions
- Modular payload system for a wide range of sensors

Specifications:

MTO Weight (kg)	130
Max Speed (km/h)	180
Ceiling (m)	3048
Endurance (hrs.)	6
System Range (km)	200
Take-off / Landing	Up to sea state 5

Diagrams:

Figure 160 - X-13 UAV [97]

X200 Unmanned Helicopters

Manufacturer: Yotaisc Technologies
Country: China
Application(s): Multi-role

Military	**Civilian**
Reconnaissance and surveillance	Power line inspection
Communications Relay	Agricultural spraying and agricultural condition monitoring
Electronic interference	Border patrol
Target drone	Disaster monitoring and assessment
Biochemical detection	Surveying and mapping and geophysical prospecting
Leaflets placement	

Descriptions:

According to the manufacturer [113]:

X200 series of unmanned helicopter adopts self-developed HeliAP flight control system and has two flight control modes: autonomous navigation and manual remote control. The two modes can switch via remote commands. Autonomous navigation mode has the capacity of fully autonomous flight, including autonomous take-off, autonomous flight, autonomous hover and autonomous landing. Autonomous navigation flight automatically completes the full-route flight according to the preset three-dimensional path (longitude, latitude and elevation) without human intervention. The automatic spot hover can keep the longitude, latitude, elevation and the direction the helicopter faces. The manual remote control mode stabilizes the pose of helicopters through flight control system. The helicopters fly according to the instructions given by the operator. Such flight mode is one of human-computer interaction. With simple operations, the helicopter can complete complex missions

Under the circumstances that the gross weight of the helicopter equals to the disk payload, the coaxial helicopter uses two rotors so that the disk area of one rotor is reduced. As the tail rotor is not in need, the mutual interference of the tail rotor and main rotor can be disregarded. Therefore, the fuselage can be relatively short. This feature is particularly suitable for the compact design of unmanned helicopter. The compact helicopter is favorable for taking off and landing in narrow areas including ships.

Specifications:

Length (m)	1.76
Height (m)	3.16
Rotor Diameter (m)	3.2
MTO Weight (kg)	220
Payload (kg)	100
Max Speed (km/h)	220
Cruise speed (km/h)	150
Endurance (hrs.)	5
Operational Ceiling (m)	5000

Diagrams:

Figure 161 - X200 UAV [113]

X-Copter

Manufacturer: Oneseen Skytech
Country: South Korea
Application(s): Industrial

Specifications:

Specifications according to [135]:

Length (m)	3.645
Width (m)	0.74
Height (m)	1.18
Main Rotor Diameter (m)	3.135
Tail Rotor Diameter (m)	0.544
Empty Weight (kg)	83
Payload (kg)	30
Available Power	12V, 8A
Endurance (hr)	1.5

Diagrams:

Figure 162 - X-Copter UAV [136]

Z-2, Z-3

Manufacturer: NRIST
Country: China
Application(s):

According to UAVDATA [109]:

Land planning, forestry fire, battlefield assessment, border patrol, aerial mapping, oil and energy inspection, electrical inspection, environmental monitoring, atmospheric monitoring, explosive drive, nuclear monitoring, disaster relief and emergency command and other applications.

Specifications:

	Z-2	Z-3
Length (m)		2.7
Rotor Diameter (m)		3.2
Tail Rotor Diameter (m)		0.55
MTO Weight (kg)	35	130
Payload (kg)	10	30
Max Speed (km/h)	108	
Endurance (hrs.)	1	4
Range (km)		100

Diagrams:

Figure 163 - Z-3 UAV [109]

Figure 164 - Z-3 UAV [109]

Other Surveyed UAV Platforms

Name	Manufacturer	Country	Type	Unmet Requirement(s)
CANA Guardian	Argentine Navy	Argentina	FW	Limited information available
Flamingo	Silvertone Australia	Australia	FW	Requires runway for takeoff/landing
Mupod	Entecho	Australia	SRW	Endurance limited to 0.5 hour
KamerDrohne HD35	KameraDrohne HD35	Austria	RW	No information found
FlyingCam III E Sarah	Flying-Cam	Belgium	RW	Endurance limited to 0.5 hour
JP-1	JP Engineering	Belgium	RW	No information found
FS-03 Starcopter	Flight Solutions	Brazil	RW	No information found
Scout	Aeryon Labs	Canada	RW	Miniature UAV with maximum payload of 250 g.
DF-SAVS	Draganfly Innovations	Canada	RW	Remote controlled quad rotor (toy). 12-15 min flight time and weighs ~540g
DF-TSU	Draganfly Innovations	Canada	RW	No information found
Draganflyer X4	Draganfly	Canada	RW	0.7 kg max payload capacity
Draganflyer X6	Draganfly	Canada	RW	0.5 kg max payload capacity
Draganflyer X8	Draganfly	Canada	RW	0.8 kg max payload capacity
DX-PRO	Draganfly Innovations	Canada	RW	No information found
MP-Trainer	Micropilot	Canada	FW	2 lbs max payload capacity
MP-Vision	Micropilot	Canada	FW	1 lb max payload capacity
Sherpa Family	MMIST	Canada	Prf	GPS-guided (parachute) aerial delivery systems.
Mentor	Advanced Subsonics	Canada	RW	No information found
AI-solo	Aerial Insights	Canada	FW	Payload less than 4.5 kg
AI-multi	Aerial Insights	Canada	FW	Payload less than 4.5k g
AI-extended	Aerial Insights	Canada	FW	Payload less than 4.5k g
WZ-5 ChangHon-1	Beijing Institute of Aeronautics	China	FW	Jet-powered reconnaissance aerial vehicle (URAV) based on the US AQM-34N Firebee. Appears to be air-launched.
ASN-211	ASN Technology Group	China	FW	Flapping wing UAV with a MTO weight of 220 g
EJ-1B Mozart	Efigenia Aerospace Robotics	Columbia	RW	MTO Weight 8 kg - likely unable to carry minimum payload of 4.5 kg.
360 UAV	Fly-n-Sense	France	RW	Endurance limited to 0.5 hour

Name	Manufacturer	Country	Type	Unmet Requirement(s)
Aerodrone	Aérodrone / EURO MC	France	RW	Diameter is 70 cm , mass of 1800 g including 300 g of payload, 30min endurance
ScanCopter X4	Fly-n-Sense	France	RW	Payload limited to 500 g
ScanCopter X6	Fly-n-Sense	France	RW	Payload limited to 1.2 kg
Seeker 1300	Fly-n-Sense	France	FW	Payload limited to 500 g
Coleo 224	RFTronic	France	SRW	No information found
Coleo 380	RFTronic	France	SRW	No information found
Coleo 700	RFTronic	France	SRW	No information found
DVF2000/CARD	SurveyCopter	France	RW	Max payload is 1.1 kg
DRAC/TRACKER	SurveyCopter	France	RW	Max payload is 1 kg
Flying Roboter	Institude for Termographie	Germany	RW	No information found
Veriocopter	Institude for Termographie	Germany	RW	No information found
Black Eagle 50	Steadicopter	Israel	RW	3 kg max payload capacity
Boomerang	BlueBird Aero Systems	Israel	FW	Payload limited to 2.5 kg
Hermes 900	Elbit Systems	Israel	FW	Cannot be launched or recovered from a frigate
Shoval Maritime Heron 1	IAI	Israel	FW	Take of distance ~1km – not intended for frigates.
SkyLiteB	BlueBird Aero Systems	Israel	FW	Payload limited to 1 kg
Koliber	ITWL	Poland	FW	< 3 kg max payload capacity
Ezycopter UAV	YoShine Helicopters	Taiwan ROC	RW	No specific details found other than a max payload of 200 kg.
A-10 Phoenix	Scientifically Industrial Systems Ltd. (DB "VZLET")	Ukraine	FW	2-passenger airplane requires runway for takeoff/landing
A 160	Scientifically Industrial Systems Ltd. (DB "VZLET")	Ukraine	RW	This UAV appears to be an early design of the A-6 Golden Eagle, which has been included in the survey.
AV Wasp III	AeroVironment	USA	FW	Micro UAV – limited payload capacity
BMQ-74E	Northrop Grumman	USA	FW	Subsonic missile target drone
Coyote	BAE	USA	FW	0.9 kg max payload
D-1 HP	Dara Aviation	USA	FW	Requires 200 m paved runway for takeoff.
Echo Hawk	Aerocross Systems	USA	FW	175 m required takeoff distance

Name	Manufacturer	Country	Type	Unmet Requirement(s)
Flexrotor	Aerovel	USA	FW	0.9 kg max payload
Insect (LEAPP Type II)	Atair	USA	Prf	Paraglider UAV - takeoff requires a towing vehicle over a distance of 30-60 ft.
LEAPP Type 1	Atair	USA	Prf	Paraglider UAV - takeoff requires a towing vehicle over a distance of 50-100 ft.
MALD	Raytheon	USA	FW	Air-launched decoy.
Micro LEAPP (Type III)	Atair	USA	Prf	Paraglider UAV - takeoff requires a towing vehicle over a distance of 5-10 ft.
MQ-8C Fire-X	Northrop Grumman / Bell Helicopter	USA	Prf	Full size helicopter platform
MQ-9B Guardian	General Atomic	USA	FW	Cannot be launched or recovered from a frigate
RQ-11 Raven	AeroVironment	USA	FW	Limited payload capacity
RQ-20 Puma AE	AeroVironment	USA	FW	Although the U.S. Navy recently conducted sea trials with the Puma with the goal to provide ISR capability to non-helicopter equipped ships [68], the limited available payload capacity of the Puma makes it unsuitable for the purpose of this study.
SA-100 Mink	Scion UAS	USA	RW	1.36 kg maximum payload
Sentry UAS	DRS Defense Solutions	USA	FW	Requires a paved runway for takeoff.
Silver Fox	BAE Systems	USA	FW	4 lbs maximum payload
Stop-Rotor Rotary Wing Aircraft UAV	U.S. Naval Research Laboratory	USA	RW	Early stages of development with expected commercialization in 3-5 years. System is expected to carry up to 25 lbs of payload.
Switchblade Lethal Aerial Munition (LAM)	AeroVironment	USA	FW	Expendable UAV which can be equipped with a 3 lb warhead, limited duration of 15-min loiter.

Name	Manufacturer	Country	Type	Unmet Requirement(s)
Tactically Exploited Reconnaissance Node (TERN) UAS	DARPA	USA	FW	In March 2013, DARPA announced the Tactically Exploited Reconnaissance Node (TERN), a program designed to deploy a fixed-wing, medium-altitude, long-endurance (MALE) unmanned aerial system at sea from small U.S. Navy combatants. DARPA intends to develop TERN over a forty month period.
T-Hawk	Honeywell Aerospace	USA	SRW	Micro UAV – payload certainly under 4.5 kg
Unmanned Little Bird	Boeing Rotorcraft Systems	USA	RW	Full size, dual mode manned/unmanned helicopter
E15	Autocopter Corporation	USA	RW	Max endurance limited to 20 min
OAV	BAE Systems	USA	SRW	"OAV" line item 1091 from 1012 RPAS Yearbook - no information found. Possibly the same system as IAV1 and/or IAV2 by BAE Systems
Shrouded Rotor	BAE Systems	USA	SRW	"Shrouded Rotor" is a type of rotary wing. Web search did not find any info on this specific system.
DP-4XT	Dragonfly Pictures	USA	RW	Not listed on manufacturer's website. Some online reference found but no spec available.
DP-5	Dragonfly Pictures	USA	RW	Not listed on manufacturer's website. Some online reference found but no spec available.
DP-5T	Dragonfly Pictures	USA	RW	Not listed on manufacturer's website. Some online reference found but no spec available.
Condor B	Emmen Aerospace	USA	RW	Emmen Aerospace is now BOSH Technologies (July 2012). BOSH website only provides specs for Condor Helicopter with MTOW of 7.7 kg. Unlikely that the system can carry minimum payload requirement.
Condor T	Emmen Aerospace	USA	RW	Emmen Aerospace is now BOSH Technologies (July 2012). BOSH website only provides specs for Condor Helicopter with MTOW of 7.7 kg. Unlikely that the system can carry minimum payload requirement.

Name	Manufacturer	Country	Type	Unmet Requirement(s)
Heliplane	Groen Brothers Aviation	USA	RW	Company website lists ArrowHawk and ShadowHawk, both manned gyrolanes. Website mentions unmanned application but no specifics are provided.
SiCX 300V	Guided Systems Technologies Inc.	USA	RW	Max payload is 2.25 kg.
SiCX 10E	Guided Systems Technologies Inc.	USA	RW	Max endurance with 5 lb payload is 25 min
SiCX 250/290	Guided Systems Technologies Inc.	USA	RW	UAV conversion kit for Mosquito FX and FX3 manned helicopter
Falcon	Falcon UAV	USA	FW	Hand launched UAV with a MTOW of 9.5 lbs and fixed payload sensors
Iron Bay	Fatboy	USA	RW	Air launched cargo delivery system.
Crystal Sun	Naval Reseach Lab	USA	RW	No information found
Eager	Naval Reseach Lab	USA	RW	From 1995 to 1997, the Naval Research Lab (NRL) developed and flight-tested the Eager Electric Preferential Acquisition Decoy vehicle. Eager was a tethered, electric-powered rotary-wing electronic countermeasures UAV. The UAV was permanently connected to the ground by a tether, which contained the power supply for the motors and payload as well as fiber-optic cables for datalinks.
Air Guard	Piasecki Aircraft Corp.	USA	RW	In 2005, Piasecki entered the Air Guard autogyro UAV in the Class III UAV system as part of the US Army's Future Combat Systems program. In 2007, US Army indicated that Class II and Class III programs were not slated for deployment. No information found on system specifications.
Air Scout	Piasecki Aircraft Corp.	USA	SRW	In 2005, Piasecki entered the Air Scout in the Class II UAV system as part of the US Army's Future Combat Systems program. In 2007, US Army indicated that Class II and Class III programs were not slated for deployment. No information found on system specifications.

Name	Manufacturer	Country	Type	Unmet Requirement(s)
X-Pro Quadrotor	Veratech	USA	RW	No information found

List of Abbreviations

ALaRS	Automatic Launch and Recovery System
ASV	Autonomous Surface Vehicle
ASUW	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
ATFP	Anti-Terror
AUV	Autonomous Underwater Vehicle
AVTOL	Automatic (or Autonomous) Vertical Takeoff and Landing
BDA	Battle Damage Assessment
C2	Command and Control
C4IRS	Command and control, communications, computers, intelligence, surveillance, and reconnaissance
CBRN	Chemical, Biological, Radiological and Nuclear
CCD	Charged Couple Device
COMINT	Communications Intelligence
COTS	Commercial Off-the-Shelf
EA	Electronic Attack
EMC	Electromagnetic Compatibility
EP	Electronic Protection
EO	Electro-Optical
ELINT	Electronic Intelligence
EW	Electronic Warfare
FAC	Fast Attack Craft
FIAC	Fast Inshore Attack Craft
FLIR	Forward-Looking Infrared
FW	Fixed Wing
GCS	Ground Control Station
GMTI	Ground Moving Target Indicator
GNC	Guidance, Navigation and Control
GPS	Global Positioning System
GTD	Ground Target Designator
HVTOL	Horizontal or Vertical Takeoff and Landing
Hyb	Hybrid Fixed/Rotary Wing
INS	Inertial Navigation System
IR	Infrared
ISR	Intelligence, Surveillance, Reconnaissance
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance
LALE	Low Altitude and Long Endurance
LAR	Launch and Recovery
LOS	Line-of-Sight
MALE	Medium Altitude and Long Endurance
MAME	Medium Altitude and Medium Endurance
MASINT	Measurement and Signature Intelligence
MDI	Missed Distance Indicator
MCM	Mine Countermeasure

MIO	Maritime Interdiction Operation
MIW	Mine Warfare
MS	Maritime Security
MTOW	Maximum Takeoff Weight
OPV	Optionally-Piloted Vehicle
OTH	Over-the-Horizon
PTZ	Pan-Tilt-Zoom
PRF	Parafoil
RC	Remote-Controlled
RF	Radio Frequency
RHIB	Rigid Hull Inflatable Boat
RIB	Rigid Inflatable Boat
ROV	Remotely Operated Vehicle
RW	Rotary Wing
SAR	Search and Rescue
SOF	Special Operations Forces
SPIES	Scanning Projectile Impact Evaluation System
SRW	Shrouded Rotary Wing
STOL	Short Takeoff and Landing
STUAS	Small Tactical Unmanned Aircraft System
SUW	Surface Warfare
SWAT	Small Weapon Attack Trainer
TB	Tilt-body
TR	Tilt-rotor
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
UHF	Ultra High Frequency
USV	Unmanned Surface Vehicle
UTCS	Universal Target Control Station
UUV	Unmanned Underwater Vehicle
VHF	Very High Frequency
VSTOL	Very Short Takeoff and Landing
VTOL	Vertical Takeoff and Landing
TUAS	Tactical Unmanned Aircraft System

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Appendix A – USV Platform Specifications

Name	Company	Country	Length (m)	Beam (m)	Height (m)	Weight (kg)	Payload (kg)	Endurance (hrs)	Max Speed (kts)	Range (nm)	Power Available
Barracuda	Meggitt Training Systems Canada	Canada	7.23	2.75		2074	227	36	15	300	
Hammerhead	Meggitt Training Systems Canada	Canada	5.2	1.4		900	227	12	35		
Kingfisher M200	Clearpath Robotics	Canada	1.3	0.94	0.34	29	10		3.9		14.4 V, 40 Ah
SARPAL	International Submarine Engineering	Canada	4.9	2.06	2.08	1089	907	24	5		
Tianxiang One	Shenyang Shin Kong Corporation	China	6.5					480		200	
XG-2	Shenyang Shin Kong Corporation	China									
Inspector Mk 1	ECA Robotics	France	7.1	2.5		2100		15	35	10	
Inspector Mk 2	ECA Robotics	France	8.4	2.95		4700		20	25		
Rodeur	Sirehna (a DCNS company)	France	9.2				1360		50		
Protector MK II	Rafael Advanced Defense Systems Ltd.	Israel	11								
Protector MK I	Rafael Advanced Defense Systems Ltd.	Israel	9	3.5	4.5				50		
Seastar	Aeronautics Defense Systems Ltd.	Israel	7	2.6		2200	1500		27	125	
Seastar	Aeronautics Defense Systems Ltd.	Israel	11	3.5	2.3	6000	2500	10	45	300	
Silver Marlin	Elbit Systems Ltd.	Israel	10.67			4000	2500	24	45	500	
Stingray	Elbit Systems Ltd.	Israel	3.2				250	8	45		
U-Ranger	Calzoni (a L-3 Communications Corp. company)	Italy							40		
Venus-11	Signapore Technologies Electronics Ltd.	Singapore	11								

Name	Company	Country	Length (m)	Beam (m)	Height (m)	Weight (kg)	Payload (kg)	Endurance (hrs)	Max Speed (kts)	Range (nm)	Power Available
Venus-16	Signapore Technologies Electronics Ltd.	Singapore	16								
Venus-9	Signapore Technologies Electronics Ltd.	Singapore	9	2.8	5		1000	8	50		
Vigilant IUSV	Zycraft Ltd.	Singapore	16.5	3.6		13000	7000	720	30	2000	
Piraya USV	Kockums AB (a part of ThyssenKrupp Marine Systems)	Sweden	4	1.4		400	100		20	60	
C-CAT 4	Autonomous Surface Vehicles (ASV) Ltd.	UK	4.25	2.9	2.5	750	350	48	6	200	
C-STAT 2	Autonomous Surface Vehicles (ASV) Ltd.	UK	2	2.4		350	20	48	3.5	250	0.2 kW
C-STAT 3.5	Autonomous Surface Vehicles (ASV) Ltd.	UK	3.5	4		650	50	360	4	700	0.2 kW
C-STAT 6	Autonomous Surface Vehicles (ASV) Ltd.	UK	6	5.8		2000	150	720	5	1500	0.5 kW
C-SWEEP	Autonomous Surface Vehicles (ASV) Ltd.	UK	10.8	3.5	2.9	9000	2267			200	
C-Target 13	Autonomous Surface Vehicles (ASV) Ltd.	UK	13	3	3.5	5500			45		
C-Target 3	Autonomous Surface Vehicles (ASV) Ltd.	UK	3.5	1.4	1.3	325			25		
C-Target 5	Autonomous Surface Vehicles (ASV) Ltd.	UK	5	1.7	2	600			32		
C-Target 6	Autonomous Surface Vehicles (ASV) Ltd.	UK	6.5	2.2	2.7	950			35		
C-Target 9	Autonomous Surface Vehicles (ASV) Ltd.	UK	8.95	2.4	3.5	2750			50		
FHPC		UK									
FIAC RT	Atlas Elektronik UK	UK	7	2.5	2.5	2300		4	30	3	
Sentry	Atlas Elektronik UK	UK	3.5	1.25	1.1			6	50	16	
Blackfish	QinetiQ North America	USA	3.22			515	150	1	45	0.56	

Name	Company	Country	Length (m)	Beam (m)	Height (m)	Weight (kg)	Payload (kg)	Endurance (hrs)	Max Speed (kts)	Range (nm)	Power Available
Fleet-Class CUSV	AAI Corp., General Dynamics Robotic Systems, Maritime Applied Physics Corp.	USA	12	3.4		9000	2300	48	35	1200	
Harbor-Class USV	AAI Corp.	USA	7					12	35		
Interceptor	5G Marine International Inc.	USA	6.5	2.44				24	48	1000	
Piranha	Zyvex Marine	USA	16.46			3810	6805			2800	
Sea OWL MK VI	DRS Defense Solutions	USA	3.8	2.16	0.91	672	544	35	40		
SeaFox MkI	Northwind Marine Inc.	USA	4.9	1.75		1020	113.0	24	40	300	
SeaFox MkII	Northwind Marine Inc.	USA	5.2	2.4		1180	227.0	12	35	200	
Sentinel	Accurate Automation Corp.	USA	4.67	1.96		626	454		50	150	
Spartan Scout	U.S. Naval Undersea Warfare Center Advance Concept Technology Concept (supported by Radix Marine, Northrop Grumman, and Raytheon)	USA	7				1361				
Spartan Scout	U.S. Naval Undersea Warfare Center Advance Concept Technology Concept (supported by Radix Marine, Northrop Grumman, and Raytheon)	USA	11				2268				
USSV-HS	NSWC/Maritime Applied Physics	USA	11.9	2.9		9752	2041	11	40	200	
USSV-HTF	NSWC/Maritime Applied Physics	USA	11.9	2.9		8165	1360	19	21		
USV-1000	Sea Robotics Unmanned Systems	USA	1.9			40	80		3.88		
USV-2600	Sea Robotics Unmanned Systems	USA	3	1.1		41			10		
USV-450	Sea Robotics Unmanned Systems	USA	1.9	1.3		40	80		3.88		

Name	Company	Country	Length (m)	Beam (m)	Height (m)	Weight (kg)	Payload (kg)	Endurance (hrs)	Max Speed (kts)	Range (nm)	Power Available
USV-5000	Sea Robotics Unmanned Systems	USA	4			100	50		6.8		
USV-600	Sea Robotics Unmanned Systems	USA	3			40	8		9.7		
WAM-V	Marine Advanced Research Inc.	USA	3.7	1.83		68	45		15	43.45	
WAM-V	Marine Advanced Research Inc.	USA	10.1	4.88		1360	454		35	500	
X-Class USV	Program by the U.S. Navy PEO LCS	USA	1.7	0.6		40	14	12	25		0.08kW
Z-Boat 1800	OceanScience	USA	1.8	0.9		23	18.1	2.3	4	0.56	
Z-Boat 1800HS	OceanScience	USA	1.8	0.9		24	13.6	2.67	10	0.56	
Boomeranger	5G Marine International Inc. / Al Seer Marine	USA / UAE	11						50		
Eclipse	5G Marine International Inc. / Al Seer Marine	USA / UAE	11					10	60		
Sea Serpent	5G Marine International Inc. / Al Seer Marine	USA / UAE	3						60		

Appendix B – UAV Platform Specifications

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
Arrow	V-TOL Aerospace	Australia	RW	5						100	8				VTOL	VTOL
G18I Aeolus	UAV Vision	Australia	RW	2		0.63		1.8	14	5	3	100			VTOL	VTOL
T21	UAV Vision	Australia	RW					2.1	30	10	1.5	92.6			VTOL	VTOL
Aerosonde Mk 4.7	Aerosonde	Australia-USA	FW	2.361			3.6		17.5	4.5	10	111.1		75W	Sliding frame launcher	Soft Hands Net
Camcopter S-100	Schieble	Austria	RW	3.11				3.4	200	50	6	222.2		500W @ 28V DC	VTOL	VTOL
CH-160	Challis Heliplane UAV Inc.	Canada	RW	6.55	1.83	2.13		5.94	345	100	4	257.4			VTOL	VTOL
CQ-10B SnowGoose	MMIST	Canada	RW/ Prf							227	24				VTOL	VTOL
E950 UAV	Challis Heliplane UAV Inc.	Canada	RW	1.81		0.65		2.085	35	10	1				VTOL	VTOL
Velocity Raptor	Challis Heliplane UAV Inc.	Canada	RW	9.9	1.4	2.65		8.05	1361	613		234			VTOL	VTOL
Vindicator II	Meggitt Training Systems Canada	Canada	FW	2.72		0.51	2.59		84	9.1	3				catapult	Parachute or Net
ASN 212	ASN Technology	China	FW	2.4			4.2		60	12	5	140	60		catapult	Parachute
ASN 215	ASN Technology	China	FW	3.75			5		220	60	5	200	120		Rocket booster	Parachute or glide landing

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
ASN 216	ASN Technology	China	FW	2.4			3.75		20	6	6	140			catapult	Parachute or glide landing
ASN 229A	ASN Technology	China	FW	5.5			11		800	100	20	180			Rocket booster	Parachute
ASN-105B	CATIC	China	FW						180	40	7	200			Rocket Booster	Parachute
ASN-206	CATIC	China	FW	3.8		1.4	6		220	40	8	210			Rocket Booster	Parachute
ASN-209	CATIC	China	FW	4.273		1.539	7.5		320	50	10	180			Rocket Booster	Parachute
ASN-7	CATIC	China	FW	3.75		1.4	5			10	1	360			Rocket Booster	Parachute
G3	Yotaisc Technologies	China	RW	2.62	0.184	0.711			33	11.5	2				VTOL	VTOL
I-Z	NRIST	China	RW						9		1	100			VTOL	VTOL
M-22	Beijing University of Aeronautics & Astronautics	China	RW						50		1.5				VTOL	VTOL
U8E	CATIC	China	RW	3.74	1	1.47		3.86	220	40	4	150			VTOL	VTOL
V750	Chinese Consortium	China	RW					7.24	757	80	4	161				
VT-UAV Seagull	Beijing University of Aeronautics & Astronautics	China	RW													
X200	Yotaisc Technologies	China	RW	1.76		3.16		3.2	220	100	5	220			VTOL	VTOL
Z-2	NRIST	China	RW						35	10	1	108			VTOL	VTOL

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
Z-3	NRIST	China	RW	2.7				3.2	130	30	4				VTOL	VTOL
Heros	Track System	Czech Republic	RW	4.675	1.775	2.08		4.21	465	120	4	181			VTOL	VTOL
Copter 1B	Survey Copter	France	RW	2				1.8	15	5	0.75	40			VTOL	VTOL
Copter 4	Survey Copter	France	RW	2				2.2	25	10	1	40			VTOL	VTOL
Copter Mosquito	Survey Copter	France	RW	4.9		2.11		5.5	240	70	4	120			VTOL	VTOL
ITI80-5 TH	Infotron	France	RW					1.8	18	5	1.5	90			VTOL	VTOL
Orka 1200	Cassidian	France	RW	6.22				7.2	680	180	8	195			VTOL	VTOL
Scorpio 30	EADS / SurveyCopter	France	RW	2.2		0.75		2.2	38	15	2	50			VTOL	VTOL
Scorpio 6	EADS / SurveyCopter	France	RW	1.7		0.75		1.82	13	6	1	35			VTOL	VTOL
AiD H14	AiDrones GmbH	Germany	RW	2				2.2	19	9	3	12			VTOL	VTOL
AiD H19	AiDrones GmbH	Germany	RW	2				2.2	20	10	3	12			VTOL	VTOL
AiD H32	AiDrones GmbH	Germany	RW	2.3				2.5	32	14	3	12			VTOL	VTOL
AiD H40	AiDrones GmbH	Germany	RW	2.2				2.8	40	20	2	12			VTOL	VTOL
iFF-4.5 FireFox	iMar GmbH	Germany	Hyb	5					400	60	10	500			HVTOL	HVTOL
Luna	EMT	Germany	FW	2.36			4.17		40		6	75			Bungee Catapult	Parachute or Net
Luna NG	EMT	Germany	FW	3		1.1	3		90		12	90			Bungee Catapult	Automatic landing or parachute

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
Museco	EMT	Germany	RW	3.2	0.9	1.1		0.35	125	30	3				VTOL	VTOL
X-13	EMT	Germany	FW						130		6	180			Bungee Catapult	Automatic landing
Nishant	ADE	India	FW	4.6			6.5		350	60	4	180			Mobile hydro-pneumatic short-length launcher	Parachute or Net
Blue Horizon II	E.M.I.T. Aviation Consult. Ltd.	Israel	FW	3.2			6.5		180	37		120	60	1800W	STOL or Catapult	STOL or Parachute or Arresting Hooks
Blueye	BlueBird Aero Systems	Israel	Prf							18	9	65			STOL	STOL
Butterfly	E.M.I.T. Aviation Consult. Ltd.	Israel	Prf	3.2						230	4	55			STOL	STOL
Mule	Urbar Aeronautics	Israel	SRW	6.2					1150	500	5	180			VTOL	VTOL
NRUAV	IAI Malat	Israel	RW	10.17				11.02	2200	220	6	185.2			VTOL	VTOL
Orbiter 3	Aeronautics	Israel	FW				3.6		20	5.5	7	129.6			catapult	parachute or airbag
Panther (K-80)	IAI-Malat	Israel	FW				8		65	10	6		40		VTOL	VTOL
RV-VTOL25 "Explorer"	A2TECH	Italy	RW	2.6				2.5	55	15	2.5	120		12-24V alt.	VTOL	VTOL
Robocopter 300	Kawada Industries	Japan	RW	7.37				8.18	794	294					VTOL	VTOL
RPH-2A UAV	Fuji Heavy Industries Ltd.	Japan	RW	5.3		1.8			330	100	1				VTOL	VTOL

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
GC-201	Geocopter	Netherlands	RW						90	30	2.5	74			VTOL	VTOL
Zala 421-16	Zala Aero	Russia	FW				1.62		18	5	7	210			catapult	Parachute or Net
Remoeye	Uconsystem	S. Korea	RW	2.4				3	120	35	3	120		28V DC	VTOL	VTOL
RemoH-C100	Uconsystem	S. Korea	RW	3.5	0.66	1.05		3.2	100	40	1	60			VTOL	VTOL
RemoH-M100	Uconsystem	S. Korea	RW	3.2	0.56			3	100						VTOL	VTOL
Vulture	Advanced Technologies & Engineering	South Africa	FW	3.1			5.2		150	35	3	180			automatic catapult from vehicle-mounted rail	automatic laser-based approach with capture of air vehicle in energy abs'n device
X-Copter	Oneseen Skytech	South Korea	RW	3.645	0.74	1.18		3.135	113	30	1.5			12V,8A	VTOL	VTOL
HADA	INTA	Spain	RW	9				6	380	100	6	426		5kW	VTOL	VTOL
UAV35	Asociación de la Industria Navarra (AIN).	Spain	RW	3.9	0.9	1.3		3.2	75	20	1.5	50			VTOL	VTOL
Pelicano	Indra	Spain	RW	4	0.96	1.2		3.3	200	30	6	185			VTOL	VTOL
APID 55	Cybaero	Sweden	RW	3.2				3.3	150	55	6	88.9		12-24V alt.	VTOL	VTOL
APID 60	Cybaero	Sweden	RW	4	0.95	1.2		3.3	180	75	8	150		700W	VTOL	Automatic ship deck landing and lock-down
Skeldar V-200	Saab	Sweden	RW	4				4.7	200	40	5	130			VTOL	VTOL

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
ATRO-X VTOL	Unmanned Systems Group	Switzerland	RW	4.3				6.2	350	120	2.5	200			VTOL	VTOL
KOAX X-240	Swiss UAV AG	Switzerland	RW					2.4	45	8	1.5	75			VTOL	VTOL
NEO S-300	Swiss UAV AG	Switzerland	RW					3	100	20	2	120			VTOL	VTOL
NEO S-350	Swiss UAV AG	Switzerland	RW					3.5	145	35	5	145			VTOL	VTOL
Scout B1-100	Aeroscout GmbH	Switzerland	RW	3.3	1	1		3.2		18	1.5				VTOL	VTOL
TU-150 Emperor	Swiss UAV AG	Switzerland	Hyb					3.5	150	30	8	240			VTOL	VTOL
R-IAH (Armed)	Turkish Aerospace Industries (TAI)	Turkey	RW						300	120	1.5	72			VTOL	VTOL
R-IAH (Baseline)	Turkish Aerospace Industries (TAI)	Turkey	RW						320	80	4	72			VTOL	VTOL
AT-100	Advanced UAV Technology	UK	RW	1.47	0.51	0.685		3	24	8	2.5	120		150W/ 12V	VTOL	VTOL
AT-1000	Advanced UAV Technology	UK	RW	7.35	1.645	2.27		6.84	650	350	6	160		450W/ 12V	VTOL	VTOL
AT-200	Advanced UAV Technology	UK	RW	2.79	0.76	0.86		3	47.7	22.7	6	160		150W/ 12V	VTOL	VTOL
AT-30	Advanced UAV Technology	UK	RW	1.638	0.355	0.622		1.98	12	5	2.5	80		150W/ 12V	VTOL	VTOL

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
AT-300	Advanced UAV Technology	UK	RW	3.35	0.91	1.17		3.3	108	50	6	160		250W/ 12V	VTOL	VTOL
Gull (SUAV-24)	Warrior (Aero-Marine)	UK	FW				2.4		16	5	5	102			Water take off	Water Landing
Hoder	Aesir Ltd	UK	SRW						1500	1000	8					
Odin	Aesir Ltd	UK	SRW					1		10	1				Coanda Effect (VTOL)	Coanda Effect (VTOL)
A-5 Sea Eagle	Scientifically Industrial Systems Ltd. (DB "VZLET")	Ukraine	FW	1.425			3		28	7	6	125	60		catapult	Parachute
A-6 Golden Eagle	Scientifically Industrial Systems Ltd. (DB "VZLET")	Ukraine	FW	3			5		160	50	6	208	65		catapult	Parachute
A-160T Hummingbird	Boeing	USA	RW	10.7				11	2948	1134	20	305.6			VTOL	VTOL
AD-150	American Dynamics Flight Systems	USA	FW/ TR	4.4		1.45	5.3			454.5		555.6			VTOL	VTOL
AutoCopter	Neural Robotics Inc.	USA	RW	2.18		0.66			20.4	6.8		209			VTOL	VTOL
AutoCopter Gunship	AutoCopter	USA	RW	2.54	0.55	0.73		2.13	47.6	13.6	1	96.6			VTOL	VTOL

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
BAT-12	Northrop Grumman	USA	FW	1.9			3.6		99.8	34	14	181.5	116.7	<750W	pneumatic catapult, air, land or sea-based	Net
C100	Tactical Aerospace Group (TAG)	USA	RW							24	4	97			VTOL	VTOL
C25	Tactical Aerospace Group (TAG)	USA	RW							12	0.75	70			VTOL	VTOL
C50	Tactical Aerospace Group (TAG)	USA	RW							16	1.17	76			VTOL	VTOL
C80	Tactical Aerospace Group (TAG)	USA	RW							18	4	88			VTOL	VTOL
CT100	Tactical Aerospace Group (TAG)	USA	RW							34	0.75	102			VTOL	VTOL
DP-10X Boomerang	Dragonfly Pictures	USA	RW	7.3	0.7	2.29		2.44	861.8	136	23	546.3			VTOL	VTOL
DP-11 Bayonet	Dragonfly Pictures	USA	FW	2.23	1.68	0.4	3.02	1.2	56.7	13.6	9.3	207.4			VTOL	VTOL
DP-12 Rhino	Dragonfly Pictures	USA	RW	3.35				3.2	215	34	5.5	185.2			VTOL	VTOL
DP-4x Dependable	Dragonfly Pictures	USA	RW	2.6	0.61	0.84		2.6	95.25	13.6	3	166.7			VTOL	VTOL
DP-5x Wasp	Dragonfly Pictures	USA	RW	3.35		1.22		3.2	245	56	4.8	203.7			VTOL	VTOL

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
DP-5xt Gator	Dragonfly Pictures	USA	RW	3.81	0.71	1.49		2.5	395.5	97.5	6	300			VTOL	VTOL
DP-6 Whisper	Dragonfly Pictures	USA	RW	1.8	0.49	0.76		2	22.7	11.8	1	130			VTOL	VTOL
DP-7 Bat	Dragonfly Pictures	USA	FW	1.92	0.69	1.64	6.01	1.8	295	45	12	383.4			VTOL	VTOL
Dragonfly	Trek Aerospace Inc.	USA	RW	4	3	1.9			367	204	3	378	137		VTOL	VTOL
Eagle Eye	Bell Helicopter Textron	USA	RW	5.18			4.63	3	1360	453	6	407		11kW	VTOL	VTOL
Excalibur	Aurora Flight Science	USA	FW	7			6.4		2177	272	3	851.9			VTOL	VTOL
Fury 1200	Aeromech Engineering	USA	FW	1.37			3.66		45.4	11.3	27	222.2	111.1	28V bus, 500W on-board gen.	small footprint pneumatic launcher	net or skid landing System
Fury 1500	AME Unmanned Air Systems	USA	FW	1.4			3.7		136	57	15	222.2	176	2000W	launcher deployed	net-captured
G15	Autocopter Corp.	USA	RW	1.57				1.8		6.8	1				VTOL	VTOL
Goldeneye 80	Aurora Flight Science	USA	SRW	1.65					81	11	3	144.8			VTOL	VTOL
HD65	Autocopter Corp.	USA	RW	2.49				2.5		13.6	1				VTOL	VTOL
IAV1	BAE Systems	USA	SRW						34		1	37			VTOL	VTOL
IAV2	BAE Systems	USA	SRW		0.94				56.8	9	4.5	185			VTOL	VTOL

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
Integrator	Insitu	USA	FW	2.2			4.8		61.2	17	24	148	101	350W	Auto. via pneumatic catapult	autovia patented SkyHook wingtip rope-snag or belly landing
Killerbee	Raytheon	USA	FW				3.05			13.6	15		107.4		pneumatic catapult, air, land or sea-based	Net
M100	Tactical Aerospace Group (TAG)	USA	RW	2.15	1.04	2.52			17.7	28	7	116			VTOL	VTOL
M2600	Tactical Aerospace Group (TAG)	USA	RW							227	2	164			VTOL	VTOL
M65	Tactical Aerospace Group (TAG)	USA	RW							15	5	100			VTOL	VTOL
M80	Tactical Aerospace Group (TAG)	USA	RW							21	7	100			VTOL	VTOL
Manta B	BAE Systems	USA	FW						27.2	6.8	6	203.7		14.4V, 15 or 30 AH	pneumatic launcher	net-captured
Model 706 Sea Bat	Orion Industries	USA	Hyb	1.83			3.05		90.72	22.68		333.4			VTOL	VTOL
Neptune	DRS Defense Solutions	USA	FW	1.83			2.13		61.2	9	4	166.7		24V DC	zero-length pneumatic launcher	auto parachute recovery on land or water

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
RQ-8A FireScout	Northrop Grumman	USA	RW	9.2				8.4	1428.8	272.2	8	213		120/208V AC, 3phase 50/60 Hz	VTOL	VTOL
SA-200 Weasal	Scion UAS	USA	RW	2.27	0.058	0.095		0.207	68	20	4	185.2			VTOL	VTOL
SA-400 Jackal	Scion UAS	USA	RW							45					VTOL	VTOL
ScanEagle	Insitu	USA	FW	1.37			3.11		20	6	24	148	89	60W	auto via pneumatic catapult	auto via patented SkyHook wingtip rope-snag or belly landing
ScanEagle Dual Bay	Insitu	USA	FW	1.98			3.11		22	6.9	15	148	93	60W	auto via pneumatic catapult	Auto via patented SkyHook wingtip rope-snag or belly landing
Scorpion 100-60	Freewing Aerial Robotics Corp.	USA	FW/ TB	3.6			4.9		172	27	6.5	222			STOL	STOL
Scorpion 60-25	Freewing Aerial Robotics Corp.	USA	FW/ TB	2			3.7		45	11	5	185			STOL	STOL

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
Shadow 400	AAI	USA	FW	3.81			5.12		211	34	5	203.7	120.4	28V DC	Hydro-pneumatic rail, wheeled or RATO	net or wheeled Structure
Shadowhawk	Vanguard Defense Industries	USA	RW	2.13	0.43	0.75		1.93		10	3	112.6			VTOL	VTOL
SkyAgent I	BAE Systems	USA	SRW			1.5	2.4	0.559	56.7	6.8	2			200W	VTOL	VTOL
Spinwing	Thorpe SEEOP Corp.	USA	Hyb	1.83			3.05			27.2					VTOL	VTOL
SR200	Rotomotion	USA		2.79	0.76	0.86		3	47.7	22.7	5	60		500W, 24V	VTOL	VTOL
SR30	Rotomotion	USA	RW	1.638	0.335	0.622		1.981	15.5	7	1.5	40				
SR500	Rotomotion	USA	RW	3.35	0.61	1.17		3.3	108	58	8	60		800W, 24V	VTOL	VTOL
Star-Lite	Fetters Aerospace	USA	RW						250	120	4.5	209			VTOL	VTOL
SVU-200	Fetters Aerospace	USA	RW							200		209			VTOL	VTOL
T-15	Arcturus UAV	USA	FW	1.83			3.05		22.68	4.5	8	167	83.3	180W	Arcturus modular, pneumatic launcher system	Belly (skid) landing or Arcturus portable, inflatable net recovery system

Name	Company	Country	Type	L (m)	W (m)	H (m)	Wing-span (m)	Rotor Diam. (m)	MTOW (kg)	Payload (kg)	Endu-rance (hrs)	Max Speed (kph)	Loiter Speed (kph)	Power Avail.	Launch	Recovery
T-16XL	Arcturus UAV	USA	FW	2.08			3.94		38.6	13.6	16	148	83.3	180W	Arcturus modular, pneumatic launcher system	Belly (skid) landing or Arcturus portable, inflatable net recovery system
T-20	Arcturus UAV	USA	FW	2.87			5.26		74.8	29.5	18	166	93	500W	Arcturus modular, pneumatic launcher system	Belly (skid) landing or Arcturus portable, inflatable net recovery system
Vantage (Dragon Warrior)	Naval Research Lab	USA	RW	2.13				2.44	160	16	5	185			VTOL	VTOL
V-Bat	MLB	USA	FW	2.4			3		29.5	4.5	5	203.7		100W	VTOL	VTOL
Vigilante 496	SAIC/ATI	USA	RW	8	2.4	2.3		7	499	136	5	138			VTOL	VTOL
Vigilante 502	SAIC/ATI	USA	RW	8	1.7	2.4		7	499	68		216			VTOL	VTOL

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Defence Research & Development Canada – Ottawa conducted a market survey of unmanned platforms (both surface and aerial) for use in naval applications. The study looked at specific characteristics of the platforms such as name, manufacturer, country of origin, dimensions, weight, payload, endurance, loiter speed, maximum speed, available payload power, launch/recovery method, intended application and any other relevant information available on the system. The study excluded systems not fit for naval applications such as fixed wing platforms requiring extended runways for takeoff and landing. Other platform requirements for this study included a payload capacity greater than 4.5 kilograms and endurance greater than 1 hour.

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