UNMANNED AERIAL VEHICLES

AN ARMADA INTERNATIONAL COMPENDIUM SUPPLEMENT

2019/20

ARMADA INTERNATIONAL : THE TRUSTED SOURCE FOR DEFENCE TECHNOLOGY ANALYSIS

MUM-T OPERATIONS

At Paris Air Show 2019, France, please visit us in hall 4 at booth #B37.

Manned Unmanned Teaming

LEVEL 5 INTEROPERABILITY

CAMCOPTER® S-100
UNMANNED AIR SYSTEM

MartinUAV

V-BAT is a small vertical takeoff-and-land (VTOL) unmanned aerial vehicle (UAV) from MartinUAV.

UNMANNED COMES OF AGE

The maturity of unmanned systems now means that first adopters are replacing their 'start up' systems with next generation capability.

Peter Donaldson

Once a fringe technology regarded with suspicion by much of the military, UAV systems have proved their growing value in recent wars and civil emergencies, and embedded themselves in the consciousness of defence planners the world over. Today they are maturing rapidly into reliable military tools that are increasingly straightforward to operate with the progress of automation in take-off and landing, as well as the ability of ground control systems to manage several vehicles at once – including vehicles of different types – thereby reducing the number of people required to run them. These factors are contributing to a robust market, even though they are not being bought in the very large numbers that they were at the height of the wars in Iraq and Afghanistan.

In its latest forecast, which covers 2019 to 2024 , Research and Markets predicts a compound annual growth Rate (CAGR) of 10 percent over the period, mostly driven by the commercial sector, although for now the military still provides most of the revenue. Furthermore, the dominant missions focus on Intelligence, Surveillance and Reconnaissance (ISR), target recognition and electronic warfare. The analysis notes that growing defence budgets and political tensions in the Asia-Pacific and Middle East regions have been driving procurement in the military market, with Asia Pacific expected lead the world in terms of the growth rate, although North America remains the largest market.

In industrial terms, Boeing, BAE Systems, General Atomics Aeronautical Systems, Israel Aerospace Industries and Elbit Systems remain, unsurprisingly, among the most

The French Army will receive a total of 14 Safran Patroller UAS, 10 for operational use and four for training.

Safran

prominent players in the military market, and the High Altitude Long Endurance (HALE), Medium Altitude Long Endurance (MALE), and tactical vehicle segments are growing strongly in procurement terms.

WATCHING SHADOW REPLACEMENT

Operators around the world will be watching the US Army's efforts to replace its fleet of conventional take-off and landing (CTOL) Textron RQ-7 Shadow 200 tactical UAVs with a new vertical take-off and landing (VTOL) capable type under the Future Tactical UAS (FTUAS) programme. The two contenders are AAI Textron's Aerosonde HQ and Martin UAV's V-Bat.

AAI Textron describes Aerosonde HQ as a runway independent hybrid quad-rotor. Based on the fixed-wing Aerosonde, which features a twin boom, inverted V-tail, it adds four electric motors for VTOL and transitional flight to the Lycoming EL-005 heavy fuel engine that drives the pusher propeller for cruise flight.

NEED FOR VTOL

VTOL capability enables confined area launch and recovery without pre-positioned equipment. The aircraft transitions to and from wing-borne flight at 15-45 metres (50-150 feet) above the ground, which the company says gives it a 'near zero' footprint that eases tactical deployment. V-Bat cruises at speeds between 45-65 knots (83-120 kilometres per hour) and can fly for up to eight hours with a 4.5 kilogram (10 pound) payload and can operate at a density altitude of up to 3,000m (10,000ft) density altitude.

The aircraft also has the capacity and on-board power required to run day/night cameras, communications relay, signals intelligence and an optional extra mission-specific payload simultaneously, the company emphasises.

Martin UAV's V-Bat does VTOL differently, taking off and landing in a tail sitting position and propelled by a ducted fan driven either by a 183cc fuel-injected two-stroke running an 80:1 fuel to oil ratio, a heavy fuel engine or an electric motor. Measuring 2.4m (8ft) long and 2.7m (9ft) in wingspan, it takes off and lands automatically and can do so in winds of up to 25kts, (46km/h) transitioning to horizontal flight to conduct its mission, in which attitude it can dash at up to 90kts (166km/h). With 3.6kg (8lb) of payload capacity, it has 500W on-board electrical power to run its sensors and communication systems.

In early April, the US Army awarded contracts valued at up to $99.5 million for non-developmental TUAV systems to AAI Textron and Martin UAV under FTUAS following a competitive fly-off at Dugway Proving Ground, Utah involving 11 potential candidates. The Army stressed that they needed to enable what it calls multi-domain capabilities for brigade air-ground operations via significant improvements in operational capability, survivability, reliability, availability, maintainability and mobility.

"By understanding the operational needs statements, we need better acoustics, runway independence, and better transportability," said Brigadier General Walter Rugen, the director of the Army's Future Vertical Lift Cross-Functional Team.

FRENCH PATROLLERS

In a major upgrade to their capabilities, the French forces are due to receive the first of their new Safran Patroller tactical UAVs this year under an order for 14 of them agreed

A pair of MQ-4C Triton Unmanned Air System vehicles, now in service with the US Navy.

in 2016, beating Thales' lighter Watchkeeper system to the punch. Significantly lager than the aircraft competing for the US FTUAS programme, Patroller is derived from a manned Stemme S15 motor glider and offers an endurance of 20 hours at up to 6,000m (20,000ft) with a payload of up to 250kg (550lb). Equipped with an automatic take-off and landing system it can operate from small airfields without demanding any changes to facilities on the ground.

Safran also offers Patroller as a maritime asset equipped with a dedicated surface search radar, an Automatic Identification System (AIS) receiver to monitor ships equipped with the transmitters, and a Safran Euroflir 410 stabilised electro-optical infra-red (EO/IR) pod.

This illustrates another important direction for UAV systems as a complementary asset to manned maritime patrol aircraft, ships and ground-based coastal surveillance networks. The UKs Watchkeeper has demonstrated its value in naval exercises, and future development of the RAF's new General Atomics Protector RG Mk1 MALE UAS could include a maritime patrol version to supplement and work with the Boeing P8 Poseidons as they mature in service.

Last summer saw the Northrop Grumman MQ4-C Triton enter service with the US Navy equipped with powerful radar and electro-optical sensors and an Electronic Support Measures (ESM) system, but the Navy plans to upgrade it with a SIGINT system that will enable it to gather detailed intelligence on adversary radar systems to update the databases essential to tactical electronic warfare systems of all kinds, as well as a sense-and-avoid radar system.

UNTAPPED POTENTIAL

That sense-and-avoid radar illustrates one factor still holding UAVs back; integration with other traffic in both civil and military airspace, although sense-and-avoid technologies are gradually evolving along with the procedures required to assimilate them as industry, regulators and operators work to bring them along. This one major capability could be the key to unlocking UAV systems' full potential.

AERONAUTICS LTD

AEROSTAR

Length: 4.5m
Span: 8.7m
Maximum take-off weight: 230kg
Range: 250km
Speed: 110kts
Endurance: 12hr
Altitude: NA
Payload: 50kg
Options include stabilised EO/IR sensors, laser designation, synthetic aperture radars with ground moving target indication, ELINT and COMINT systems. Customers include: Israel, General Dynamics, CIS, the Netherlands & Poland.
Powerplant: Zanzottera fuel injected 2-str twin, 38hp
Launch/Recovery: conv/conv

DOMINATOR

Length: 8.55m
Span: 13.5m
Maximum take-off weight: 1,910kg
Range: LOS 300km, BLOS satcom unlimited
Speed: 150kts
Endurance: > 20hr
Altitude: 18,000ft
Payload: 373kg

Options include EO/IR and hyper-spectral sensors with laser pointer and designator, maritime radar, SAR\GMTI radars, communications relays, COMINT, ELINT, MAD etc. Operators include Mexico & Turkey.
Powerplant: 2x170hp Austro AE300 jet fuel piston engines
Launch/Recovery: conv/conv

Orbiter 1K

Length: 1m approx
Span: 2.2m
Maximum take-off weight: 11kg
Range: 100km
Speed: 40-60kts loiter
Endurance: 2.5hrs
Altitude: 18,000ft
Payload: > 2.6kg
Payloads include a stabilised mini dual EO\IR camera, 2.2kg blast fragmentation warhead.
Powerplant: Electric motor driving pusher propeller
Launch/Recovery: cat/precision net or expendable

Orbiter 2

Length: 1m
Span: 3m
Maximum take-off weight: 10.3kg
Range: 100km
Speed: 70kts
Endurance: 4hr
Altitude: NA
Payload: 1.5kg
Controp stabilised payloads including D-STAMP day EO, UZ-STAMP night, M-STAMP: dual day and night and Rafael HD-Lite photogrammetric mapping & 3D modelling sensor. In service in Israel and export customers inc Finland.
Powerplant: Electric motor driving pusher propeller
Launch/Recovery: cat/para

Orbiter 3

Length: NA
Span: 4.4m
Maximum take-off weight: 30kg
Range: line of sight up to 150km
Speed: 70kts
Endurance: 7hr 100km from base
Altitude: NA
Payload: 5.5kg
Payloads include: Controp T-STAMP tri-sensor stabilised EO system, D-STAMP day turret, UZ-STAMP night, M-STAMP dual day and night, and Rafael HD-Lite photogrammetric mapping sensor. In service with Israel & export customers.
Powerplant: Propeller driven by an electric motor
Launch/Recovery: Cat/net

IAI ADDS ASW CAPABILITY TO THE MARITIME HERON

Addressing the increasing role of unmanned aerial systems (UAS) in maritime operations, Israel Aerospace Industries (IAI) has added new capabilities to the Heron family of UAS, preparing the drone to assume anti-submarine warfare (ASW) missions. The newly-developed anti-submarine warfare capability now includes two new payloads – a Sonobuoy dispensing system for submarine detection and a Magnetic Anomaly Detector (MAD) The combination of the two sensors enable simultaneous detection and tracking of submarines in shallow and deep waters. The use of UAV-mounted ASW capabilities offers significant advantages over conventional, manned aircraft, including longer mission time (dozens of hours on air), persistent monitoring of sonobuoys, and centralized operation of surveillance over very large areas.

This capability employs some of the Heron's key performance parameters – operations from remote locations; fly long missions at extended range, employing satellite data link, the ability to operate simultaneously with multiple sensors. The ability to operate from a mission control center ashore, or vessels at sea, by handing-off control to a maritime station is another unique function the Heron supports. With these capabilities Heron UAS offers significant benefits over aerial maritime surveillance and ASW patrols, enabling rapid deployment and re-tasking, at a speed of 140 – 220 knots and a much slower loitering speed, at high, low and very low altitude, enabling longer time on station and extended patrol missions. A few teams of operators are tasked in shifts with extended missions, maintaining operators fresh and in optimal performance.

Carrying a full set of sensors – radar, EO and SIGINT, and the new ASW kit requires significant weightlifting, reserved only for large, Medium-Altitude, Long Endurance (MALE) drones such as the Heron. Based on IAI's Over 40 years of experience as the world pioneer in unmanned aerial systems, the Heron represents IAI's leading family of UAS, with platforms maximum takeoff weight ranging from 600 to 5,700 kg, capable of lifting payloads from 180 kg to more than a ton.

IAI was the first UAS manufacturer to deploy drones on maritime surveillance missions, on these missions the Heron carries a combined set of sensors comprising an advanced, lightweight maritime search radar, providing surface search and air/air search capability over hundreds of miles at sea. The radar operates alongside an Electronic Support Measures (ESM), Communications Intelligence (COMINT) and stabilized electro-optical / Infra-red (EO/IR) sensors.

IAI Elta Systems' ELM-2022U maritime radar provides the primary surveillance sensor on the platform. A lightweight derivative of Elta's 2022 radar used on board numerous maritime surveillance aircraft worldwide. From a cruising altitude of 20,000 ft. This radar can see across 150 nm to the horizon. The high sensitivity of the radar enables detection and identification of all types of targets encountered at sea, from large vessels classified from a distance using inverse-SAR, to illusive targets having extremely low radar cross-section, such as rubber boats or submarines. ESM and COMINT sensors scan the electromagnetic spectrum to spot suspicious activities indicating the presence of vessels and human activity. Visual observation performed by EO/IR enables operators to identify and verify the identity of vessels and investigate suspicious activities and unidentified targets.

Supporting the anti-submarine mission, the ELM-2022U can spot submarine periscopes and snorkels from a great distance.

Extending its ASW capability, IAI integrated additional sensors including a Magnetic Anomaly Detection system and a payload that carries and releases acoustic sonobuoys. After dropping its payload, the Heron loiters over the area to receive and processes the acoustic signal from those sonobuoys, providing a full situational picture based on acoustic, magnetic, radar, SIGINT and visual sensor indications and tracks. This picture is transmitted to a coastal mission control center or a task force at sea, using the Heron's integral satellite and line-of-sight links.

The Heron gradually evolved to offer a robust, efficient and flexible maritime operation from shore and at sea. Centrally commanded to take off and land from remote shores, Herons extend missions over thousands of kilometers over blue water, using satellite links and handing over control to the operators at sea. Mission control modules are fully integrated onboard naval vessels, including stabilized directional antennae and satellite communications terminals, enabling ships at sea to fully exploit the Heron as part of their sensor suite. With a dedicated mission package and performance capabilities unmatched by other MALE UAS, the Heron now supports both maritime and ASW mission capabilities an order of magnitude improved over conventional ASW solutions utilizing fixed and rotary wing manned platforms.


Orbiter 4

Length: NA
Span: 5.4m
Maximum take-off weight: 50kg
Range: Line of sight up to 150km comms range
Speed: 70kts
Endurance: up to 24hr
Altitude: 18,000ft
Payload: 12kg
Payloads include: Stabilised pod with day, night (cooled IR) sensors, laser designator, COMINT, ELINT, VISINT, photogrammetric mapping (HDLite), synthetic aperture radar, maritime patrol radar, LiDAR, Automatic Identification System
Powerplant: Spark ignition multi-fuel engine
Launch/Recovery: Cat/parachute & airbags

AIRBUS


Atlante

Length: 5.47m
Span: 8.0m
Maximum take-off weight: 570kg
Range: 200km on datalink
Speed: 108kt
Endurance: > 10hr
Altitude: 20,000ft
Payload: 100kg
Retractable HD EO/IR turret as standard, SAR/GMTI, maritime radar, environmental sensors including releasable types are options.
Powerplant: 1 x internal combustion engine
Launch/recovery: conv/conv or cat/para


Harfang

Length: 9.3m
Span: 16.6m
Maximum take-off weight: 1,250kg
Range: 1,000km
Speed: 110kts
Endurance: 12hr at 550nm (1,019km) from base
Altitude: 25,000ft
Payload: 250kg
Synthetic aperture radar with 1m resolution, Wide-Area Surveillance (WAS) & spot modes, EO/IR turret also with WAS & spot modes, NATO-STANAG-3875-compliant laser designator, panoramic pilot assistance camera. Ex-French systems acquired by Royal Moroccan Air Force.
Powerplant: 115hp turbocharged Rotax 914 piston engine
Launch/recovery: conv/conv


KZO

Length: 2.25m
Span: 3.42m
Maximum take-off weight: 161kg
Range: 140km (on data link
Speed: 220kph (118.8kt)
Endurance: 5.5hr
Altitude: 11,500ft
Payload: 35kg
Thermal imager system (8–12µm or 3–5µm), 3 x fixed-focus TV cameras (6 FoV). Principal operator is the German Army.
Powerplant: 24kW 2-str engine
Launch/recovery: rato, cat/para


Zephyr S

Length: 7.5m est
Span: 25m
Maximum take-off weight: < 75kg
Range: > 18,500km est
Speed: approx 30kts
Endurance: > 30 days
Altitude: > 65,000ft
Payload: 5kg
HD Optical / IR Video, AIS, Narrowband mobile comms (e.g. Tetra), 100Mpbs broadcast
Powerplant: Solar powered electric motors
Launch/recovery: conv/conv

Zephyr T

Length: 6m est
Span: > 32m
Maximum take-off weight: 140kg
Range: > 18,500km est
Speed: approx 30kts
Endurance: > 45 days
Altitude: > 65,000ft
Payload: 20kg
RADAR, LIDAR, ESM/ELINT, Broadband Comms
Powerplant: solar powered electric motors
Launch/recovery: conv/conv

AEROVIRONMENT

Blackwing

Length: 0.508m
Span: 0.69m est
Maximum take-off weight: 1.8kg
Range: 10 to 45km
Speed: 87kts
Endurance: 1hr est
Altitude: < 500ft AGL
Payload: NA
Front and side look day/night cameras, tactical data relay.
Major order from the US Navy reported in October 2017 with final deliveries due in November 2018.
Powerplant: battery electric
Launch/recovery: Underwater-to-air delivery canister, multi-pack

Puma 3AE

Length: 1.4m
Span: 2.8m
Maximum take-off weight: 6.8kg
Range: 20km or 60km with long range comms antenna
Speed: 25-45kts
Endurance: 2.5hr with an LE battery
Altitude: 300-500ft
Payload: > 0.85kg
Mantis i45 Gimbaled payload with dual 15mp EO cameras, 50xf zoom, IR camera and low light camera for night operations, and high power illuminator
Poweplant: battery electric
Launch/recovery: hand or rail/autonomous or manual deep stall landing

Raven B

Length: 0.91m
Span: 1.37m
Maximum take-off weight: 1.9kg
Range: 10km comms range
Speed: 17-44kts
Endurance: Up to 1.5hr
Altitude: 14,000ft MSL launch
Poweplant: battery electric
Payload: 0.17kg
Dual forward and side-looking EO or IR camera nose with electronic pan-tilt-zoom & stabilisation.
Most are operated by the US, but foreign customers have included Australia, Estonia, Italy, Denmark, Spain and the Czech Republic.
Launch/recovery: hand/deep stall landing

Snipe Nano

Length: < 200mm est
Maximum take-off weight: 0.14kg
Span: < 300mm est
Range: > 1km
Speed: 19kts
Powerplant: battery electric
Endurance: > 15min
Altitude: > 30m
Payload: NA
EO/IR camera
Launch/recovery: VTOL

Switchblade loitering munition

Length: < 0.6m est
Span: < 0.925m est
Maximum take-off weight: < 2.5kg
Range: 10-45km
Endurance: > 15min
Speed: 55-85kts
Altitude: < 500ft AGL, > 15,000ft MSL
Payload: NA
Dual front and side look EO cameras and IR nose camera. Stabilised electronic pan-tilt-zoom, Orbital ATK advanced munition warhead. US Army and USMC are the primary users.
Powerplant: battery electric
Launch/recovery: tube/NA

Wasp AE

Length: 0.76m
Span: 1.02m
Maximum take-off weight: 1.3kg
Range: 5 km LOS, more with DDL relay
Speed: 20 to 45kt
Endurance: 50 min
Altitude: 500 ft AGL
Payload: NA
Gimbaled payload with pan and tilt stabilized high resolution EO & IR camera in a compact aerodynamic modular payload. Serves with US Army and export customers including Australia.
Powerplant: battery electric
Launch/recovery: hand, remote/deep stall landing in confined area

ARCTURUS

Jump 20

Length: 18ft 6in (5.64m)
Span: 9ft 5in (2.87m)
Maximum take-off weight: 95.25kg
Range: 125km
Speed: 72kt
Endurance: 9 to 16hr
Altitude: 15,000ft
Payload: 27.2kg inc fuel
Cloud Cap Technologies 200 and 400 Series EO/IR are standard options. 3-D mapping, SAR, LIDAR, communications relay, COMINT, and SIGINT systems are available.
Poweplant: 1 x 190cc 4-str engine & 4 x electric motors and props for VTOL
Launch/recovery: VTOL, cat launch option

T-20

Length: 2.87m
Span: 5.33m
Maximum take-off weight: 84kg
Range: NA
Speed: 75kt
Endurance: 20hr
Altitude: 15,000ft
Payload: 34kg inc fuel
Cloud Cap Technologies 200 and 400 Series EO/IR are standard options. 3-D mapping, SAR, LIDAR, communications relay, COMINT, and SIGINT systems are available. Operators include the US & Mexican navies & reportedly the Turkish government.
Powerplant: 1 x 190 cc fuel-injected Honda 4-str petrol
Launch/recovery: cat/belly

ARMENIAN ARMED FORCES

Krunk

Length: 3.8m
Span: 5m
Maximum take-off weight: NA
Range
Speed: 82kt
Endurance: 5hr
Altitude: 15,770ft
Payload: 60kg
Operators include the Armenian armed forces, the Republic of Artsakh and Denmark
Powerplant: Internal combustion enging driving pusher propeller
Launch/recovery: conv/conv (wheels)

BLUEBIRD AERO SYSTEMS

BarB

Dimensions: 35 to 65cm (diagonal between motors)
Maximum take-off weight: 2.5kg
Communication range: 5km
Speed: up to 140km/h
Endurance: up to 30min
Ceiling: over 6,700m (22,000 ft) ASL
Payload: up to 500g
Mutli-mission, AI powered drone for Reconnaissance, Payload carrying and interception missions
Powerplant: Four battery driven VTOL electric motors
Launch/recovery: Vertical/ Vertical

MicroB

Length: 1.02m
Span: 1.7m
Maximum take-off weight: 2.2kg
Communication range: 10km
Speed: 75kph (40.5kt) cruise, 120kph (75kt) max
Endurance: up to 2hr
Best Operational Altitude: up to 1,000 m (3,281ft) AGL
Ceiling: over 4,000m (16,000ft) ASL
Payload: up to 0.3kg
Dual sensor (CCD / Uncooled IR) Gimbaled and stabilized surveillance payload
Powerplant: brushless electric motor, rechargeable battery
Launch/recovery: shoulder-fired launcher/para

SpyLite

Length: 1.37m
Span: 2.75m
Maximum take-off weight: 9.5kg
Communication range: 50km (standard), 80km (extended)
Speed: 60-120Km/h (32-65kt)
Endurance: 4hr
Best Operational Altitude: up to 1,000 m (3,281ft) AGL
Ceiling: over 9,000m (30,000ft) ASL
Max Launch altitude: Over 5,000m ASL
Payload: up to 1.5kg
Single HD, dual or triple CCD IR and optional laser pointer gimbaled and stabilized payloads and/or optional high resolution, proprietary RGB/ multi-spectral/radiometric photogrammetric payloads for mapping.
Operational in Israel and by numerous international Defense, HLS and civilian customers.
Powerplant: brushless electric motor, rechargeable battery Launch/recovery: auto cat/para, airbag

ThunderB

Length: 1.9m
Span: 4m
Maximum take-off weight: 32kg
Communication range: 150km
Speed: 60-134Km/h (32-72kt)
Endurance: Up to 24hr in standard configuration, up to 12hr in cargo release configuration
Best Operational Altitude: up to 3,000m (10,000ft) AGL
Ceiling: over 6,400m (21,000ft) ASL
Payload: up to 4kg nose mounted with full fuel and additional payload under the wings
Dual or triple CCD, IR and optional laser gimbaled and stabilized payloads and/or optional high resolution, proprietary RGB/ multi-spectral/radiometric photogrammetric payloads for mapping.
Operational in Israel and by international Defense and HLS customers.
Powerplant: Advanced two stroke engine with electronic fuel injection
Launch/recovery: auto cat/para airbag

ThunderB VTOL

Length: 1.9m
Span: 4m
Maximum take-off weight: 32kg
Communication range: 150km
Speed: 60-134Km/h (32-72kt)
Endurance: 12hours
Best Operational Altitude: up to 3,000m (10,000 ft) AGL
Ceiling: over 6,400 m (21,000ft) ASL
Payload: up to 4kg nose mounted with full fuel
Dual or triple CCD, IR and optional laser gimbaled and stabilized payloads and/or optional high resolution, proprietary RGB/ multi-spectral/radiometric photogrammetric payloads for mapping.
Powerplant: Four battery driven VTOL electric motors and one advanced two stroke engine with electronic fuel injection
Launch/recovery: Vertical/ Vertical

WanderB

Length: 1.32m
Span: 3m
Maximum take-off weight: 13kg
Communication Range: 50km
Speed: 60-120Km/h (32-65kt)
Endurance: 6 or 10hr
Best Operational Altitude: up to 1,000 m (3,281ft) AGL
Payload: up to 1.5kg
Single HD, dual or triple CCD IR and optional laser gimbaled and stabilized payloads and/or optional high resolution, proprietary RGB/ multi-spectral/radiometric photogrammetric payloads for mapping.
Poweplant: battery or fuel cell and electric motor driving propeller
Launch/recovery: cat/para airbag

WanderB VTOL

Length: 1.79m
Span: 3.1m
Maximum take-off weight: 13kg
Communication range: 50-80km
Speed: 0-120Km/h (0-65kt)
Endurance: 2.5hours
Best Operational Altitude: up to 1,000 m (3,281ft) AGL
Ceiling: 22,000Ft ASL
Payload: 1.35kg
Single HD, dual or triple CCD IR and optional laser gimbaled and stabilized payloads and/or optional high resolution, proprietary RGB/ multi-spectral/radiometric photogrammetric payloads for mapping.
Poweplant: Four battery driven VTOL electric motors and one electric pusher motor for level flight
Launch/recovery: Vertical/ Vertical

BOEING INSITU

Blackjack

Length: 2.5m
Span: 4.9m
Maximum take-off weight: 61kg
Range: NA
Speed: > 90kt
Endurance: >16hr
Altitude: > 20,000ft
Payload: 17.7kg
EO imager with 1.1°–25° optical field of view & 4x digital zoom, mid-wave infrared imager with 2°–25° field of view, laser rangefinder, IR marker. Communications relay and AIS also integrated.
Powerplant: 8 HP Orbital ? reciprocating engine with EFI, burning JP-5, JP-8 heavy fuels
Launch/recovery: cat/SkyHook vertical wire

Integrator

Length: 2.5m
Span: 4.8m
Maximum take-off weight: 61.2kg
Range: NA
Speed:> 90kt max, 55 kt cruise
Endurance: >24hr
Altitude: . 19,500ft
Payload: 18kg
Baseline package includes EO imager, mid-wave infrared imager, IR marker laser rangefinder
Powerplant: 2-str heavy fuel piston engine burning JP-5/JP-8
Launch/recovery: cat/SkyHook vertical wire

ScanEagle

Length: 1.6m
Span: 3.1m
Maximum take-off weight: 22kg est
Range: > 100km LOS
Speed: 50 to 60kt cruse, 80kt max
Endurance: > 24hr
Altitude: 19,500ft
Payload: 3.4kg
EO, EO900 (EO camera and EO telescope), MWIR, Dual Imager (EO and MWIR)
Operated by USAF, USMC, USN and numerous export customers.
Powerplant: Obital 2-str heavy fuel (JP-5 or JP 8) 2-str engine or C-10 gasoline engine
Launch/recovery: cat/SkyHook

ScanEagle 2

Length: 1.71m
Span: 3.11m
Maximum take-off weight: 26.5kg
Range: NA
Speed: 50 to 60kt cruise
Endurance: 18hr
Altitude: 19,500ft
Payload: 5kg
Powerplant: Orbital Argon heavy fuel (JP-5 or JP-8) 2-str piston engine
Launch/recovery: cat/SkyHook vertical wire

ScanEagle 3

Length: 2.3 to 2.5m
Span: 4m
Maximum take-off weight: 36.3kg
Range: NA
Speed: 80kt
Endurance: 18hr
Altitude: 20,000ft
Payload: 9.1kg
Turret houses EO, EO900 (EO camera and EO telescope), MWIR, Dual Image EO and MWIR)
Powerplant: 1 x 2-str heavy fuel piston enging burning JP-5/JP-8
Launch/recovery: cat/SkyHook vertical wire

CATIC

ASN209

Length: 4.273m
Span: 7.5m
Maximum take-off weight: 320kg
Range: 200km
Endurance: 10hr
Speed: 97kt
Altitude: 16,000ft
Payload: 50kg
Powerplant: Internal combustion engine driving pusher propeller
Launch/recovery: rocket booster/para

DENEL DYNAMICS

Seeker 400

Length: 5.77m
Span: 10m
Maximum take-off weight: 450kg
Range: 250km
Speed: 81kt
Endurance: 16hr
Altitude: 18,000ft
Payload: 100kg
Powerplant: 1 x 85 hp two-cylinder, air-cooled 4-str engine
Launch/recovery: conv/conv

ELBIT

Hermes 450

Length: 5.7m
Span: 10.5m
Maximum take-off weight: 550kg
Range: 250km
Speed: 95kt
Endurance: 17hr
Altitude: 18,000ft
Payload: 180kg
Options include EO/IR, SAR/GMTI & maritim patrol radars plus AIS, ELINT, EW, COMINT, COMJAM. Forms the basis of the UK/Thales WK450 Watchkeeper system.
Powerplant: 1 x 52 hp UAV Engines R802/902 rotary
Launch/recovery: conv/conv

Hermes 900

Length: 8.6m est
Span: 17m
Maximum take-off weight: 1,280kg
Range: 2,500km est
Speed: 119kt max, 60kt cruise
Endurance: 30 to 36hr
Altitude: 30,000ft
Payload: 350kg
Options include Leonardo Gabianno T-200 maritime & SAR/GMTI radar, AIS, Elbit D-CoMPASS EO/IR/Laser turret, AES 210 V – ESM/ELINT, Skyfix / Skyjam – COMINT/DF & optional COMJAM system and a communications relay. Users include the Israeli Air Force, with exports to Brazil and other Latin American countries.
Powerplant: 1 × 115 hp Rotax 914 4-str engine
Launch/recovery: conv/conv

Hermes 900 Starliner

Length: 8.8m est
Span: 17m
Maximum take-off weight: 1,600kg
Range: ?
Speed:
Endurance: 36hr
Altitude: 30,000ft
Payload: 450kg
Options include Leonardo Gabianno T-200 maritime & SAR/GMTI radar, AIS, Elbit D-CoMPASS EO/IR/Laser turret, AES 210 V – ESM/ELINT, Skyfix / Skyjam – COMINT/DF & optional COMJAM system and a communications relay. Users include Switzerland reported.
Powerplant: 1 × 115 hp Rotax 914 4-str engine
Launch/recovery: conv/conv

NOX

Length: NA
Span: NA
Maximum take-off weight: 5kg
Range: 3km
Endurance: 50min
Speed: 0-35KP/H
Altitude: 10 to 1,500ft
Payload: 0.7kg
A a range of EO and high resolution cameras is available
Powerplant: battery & 3 x electric motors driving vertical props
Launch/recovery: VTOL 10 to 1,500ft

Skylark I-LEX

Length: 1.5m est
Span: 3m
Maximum take-off weight: 7.5kg
Range: 40km LOS
Speed: 27-50Kts
Endurance: 3hr
Altitude: 15,000ft
Payload: 1.5kg
Stabilized EO/IR turret, delivering high-quality day and night real-time video. Advanced image processing capabilities include tracker, moving target indicator, geo-registration, and mosaicing.
Powerplant: battery electric
Launch/recovery: hand/stall-airbag

Skylark 3

Length: 2.5m (est)
Span: 4.7m
Maximum take-off weight: 40kg
Range: 100km
Endurance: 5hr
Speed: 45-70Kts
Altitude: 15,000ft
Payload: NA
Dual payload - high resolution EO/IR gimbal is standard, options include ELINT and COMINT
Powerplant: battery electric, two-blade pusher propeller
Launch/recovery: cat/stall, airbag

MODERN DAY MARINE®

SEPTEMBER 17-19, 2019
QUANTICO, VA

Come See The Future!

300+ companies, product demonstrations and industry briefings covering the latest in emerging military equipment, vehicles, technology and training systems.

To showcase your products and services, please contact:

Jaymie Nielsen at 980.328.8801
or jaymie.nielsen@emeraldexpo.com

Bridgette Barr 770.291.5549
or bridgette.barr@emeraldexpo.com

Sponsored by

Marine Corps League

MARINE CORPS ASSOCIATION & FOUNDATION
EST 1913

Register to attend or learn more at marinemilitaryexpos.com

FOLLOW US:

Facebook:
facebook.com/moderndaymarine

Twitter:
@moderndaymarine

Show is not open to the general public. Appropriate attendees include U.S. military, law enforcement, industry and consultant representatives. Foreign military and student organizations are also welcome with prior registration.

THOR

Length: NA
Span: NA
Maximum take-off weight: 12.5kg
Range: 10km
Endurance: 70min
Speed: 0-35kp/h max
Altitude: 10 to 2,000ft
Payload: 2.5kg
Lightweight dual EO/IR stabilised camera turret
Powerplant: battery & 4 x electric motors driving vertical props
Launch/recovery: VTOL

ENICS

Eleron-3SV (T-28 air vehicle)

Length: 0.635m
Span: 1.47m
Maximum take-off weight: 5.5kg
Range: 25 to 50km
Endurance: 1 hr 40min
Speed: 38 to 70kt
Altitude: 16,404ft
Payload: NA
Option 1: 3-axis stabilised turret with a 10x optical magnification-enabled video camera and digital photo camera with minimum 10.2 mpix resolution.
Option 2: Stabilised turret with 10x thermal imaging and video camera. Digital camera with minimum 10.2 Mp resolution.
Powerplant: battery & 1 x electric motor driving pusher propeller
Launch/recovery: cat/para

Eleron-10SV (T-10 air vehicle)

Length: 0.883m
Span: 2.206m
Maximum take-off weight: 15.5kg
Range: 50 to 60km
Endurance: 2 hrs 30min
Speed: 41 to 73kt
Altitude: 13,123ft
Payload: NA
Option 1: 3-axis stabilised turret with a 36x optical magnification video camera, plus a 10 mpix digital camera
Option 2: 3-axis stabilised turret with an uncooled thermal imager and a video camera, plus a 10 mpix digital camera
Powerplant: battery & electric motor driving pusher propeller
Launch/recovery: cat/para

EMT INGENIEURGESELLSCHAFT

Aladin

Length: 1.57m
Span: 1.46m
Maximum take-off weight: < 4kg
Range: > 15km
Endurance: > 1hr
Speed: 22 to 38kt
Altitude: 328 to 984ft AGL, 14,764ft MSL
Payload:
Daylight: 4 x colour CCD video cameras: 1 pilot view, 2 x downward looking, 1 downward looking on left side used in circling mode, plus high-res forward looking zoom camera, 2 x daylight video cameras.
Night: 1 x IR video, 1 x colour video CCD camera
Powerplant: battery & electric motor driving tractor propeller
Launch/recovery: hand or cat/auto

Fancopter

Length: 0.6m
Span: 0.6m (dia)
Maximum take-off weight: 1.5kg
Range: 1,000m
Endurance: 25min (3hr with perching)
Speed: NA
Altitude: NA
Payload:
Day: 2 x PAL resolution colour video CCD cameras, with wide angle and telephoto respectively. Downward looking video camera. Options: High-res stills or video camera. Night: Thermal IR and near-IR with illumination video cameras.
Powerplant: battery & electric motors driving protected counterrotating rotors
Launch/recovery: VTOL

Luna

Length: 2.36m
Span: 4.17m
Maximum take-off weight: 40kg
Range: > 100km comms range
Endurance: 6 to 8hr
Speed: 38kt cruise
Altitude: 16,400ft
Payload: NA
1 x colour video CCD pilot view camera; wing ice monitoring camera, 3-axis stabilized modular sensor platform, downward looking colour video (zoom) CCD cameras as standard. Optional sensors: MWIR imager, near-IR CCD zoom video cameras. Serves with the German Army.
Powerplant: 2 cylinder 2-str internal combustion engine, pusher propeller
Launch/recovery: cat/para or net

Luna NG

Length: 3.0m
Span: 5.3m
Maximum take-off weight: 110kg
Range: > 100km data link
Endurance: > 12hr
Speed: 49kt
Altitude: > 16,400ft
Payload:
Tiltable sensor platform with up to 7 colour and IR zoom video, -hyperspectral, pilot colour video, SAR/GMTI, SIGINT-sensors, ESM, CBRN. Optional sensors: Data link relay for BLOS operations, encryption, GCS hand-off function, transponder. Purchased by the German Army.
Powerplant: 1 x 13.4 hp, fuel-injected multi-fuel engine
Launch/recovery: cat/para or net

FLIR SYSTEMS (PROX DYNAMICS)

Black Hornet

Length: 0.168m
Span: 0.123m
Maximum take-off weight: < 33g
Range: 2km
Endurance: 25min
Speed: 12kt
Altitude: > rooftop
Payload:
Day: 2 x EO cameras, 1 video, 1 high-res snapshot. Night: fused thermal and EO.
Serves or has served with the US Army, USMC, British Army, Australian Army, Norwegian Armed Forces, Dutch Army, German Army.
Powerplant: battery & electric motor drivng two-blade main and tail rotors
Launch/recovery: VTOL

GENERAL ATOMICS AERONAUTICAL SYSTEMS INC

Avenger

Length: 13m
Span: 230m
Maximum take-off weight: 8,573255kg
Range: LOS/global
Endurance: 2018hr
Speed: 350 to 400kt
Altitude: 50,000ft
Payload Capacity: 15881,751kg internal, 13602,722kg external
Payloads: EO/IR, Lynx multi-mode radar, SIGINT/ESM, comms relay.
Weapons: Hellfire missiles, GBU-12/49, GBU-31, GBU-32, GBU-38 JDAM, GBU-39, GBU-16/48 guided bombs
Powerplant: Pratt & Whitney PW545B turbofan engine
Launch/recovery: conv/conv

Gray Eagle

Length: 9m
Span: 17m
Maximum take-off weight: 1,633kg
Range: LOS/global
Endurance: 25hr
Speed: 167ktas
Altitude: 29,000ft
Payload Capacity: 261kg internal, 227kg external
Payloads: EO/IR, SAR/GMTI radar, communications relay, 4 x Hellfire missiles. Operated by the US Army.
Powerplant: HFE-160 HP heavy-fuel engine
Launch/recovery: conv/conv

Gray Eagle Extended Range

Length: 9m
Maximum take-off weight: 1,905kg
Endurance: 40+hr
Altitude: 25,000ft
Span: 17m
Range: LOS/global
Speed: 167ktas
Payload Capacity: 227181kg internal, 227kg external
Payloads: EO/IR, SAR/GMTI radar, communications relay.
Features: Open, modular architecture supports integration of three payloads simultaneously, with capacity for growth
Powerplant: HFE-180 HP heavy-fuel engine
Launch/recovery: conv/conv

Predator XP

Length: 8m
Maximum take-off weight: 1,157kg
Endurance: 35hr
Altitude: 25,000ft
Span: 17m
Range: LOS/global
Speed: 120ktas
Payload Capacity: 147kg
Payloads: EO/IR, Lynx multi-mode radar, comms relay
Features: auto takeoff and landing, optimized fuel mapping
Powerplant: Heavily Modified Rotax 914 Turbo piston engine
Launch/recovery: conv/conv

Reaper Block 5

Length: 11m
Maximum take-off weight: 4,763kg
Endurance: 27hr
Altitude: 50,000ft MSL
Span: 20m
Range: LOS/global
Speed: 240ktas
Payload Capacity: 386kg internal, 1,361kg external
Payloads: MTS-B EO/IR, Lynx multi-mode radar, dual ARC-210 UHF/VHF radios with wing-tip antennas, other customer specific payloads
Weapons: Hellfire missiles, GBU-12, GBU-38, GBU-39 smart bombs
Operated by: USAF, US Homeland Security, Australia, France, Italy, Netherlands, Spain, UK (to be replaced by Protector RG Mk1).
Powerplant: Honeywell TPE331-10 turboprop 3-blade propeller
Launch/recovery: conv/conv

SkyGuardian

Length: 11.7m
Maximum take-off weight: 5,670kg
Endurance: 40hr
Altitude: 40,000+ft
Span: 24m
Range: LOS/global
Speed: 210ktas
Payload Capacity: 363kg internal, 1814kg external
Payloads: Raytheon MTS-B EO/IR, GA-ASI Lynx multi-mode radar, VHF/UHF certified radios
Powerplant: Honeywell TPE331-10 turboprop driving pusher propeller
Launch/recovery: conv/conv
Selected by UK (Protector RG Mk1) and Belgium.

IAI

Birdeye 400

Length: 0.8m
Maximum take-off weight: 5.6kg
Endurance: 1 hr 30min
Altitude: 1,500ft
Span: 2.2m
Range; 20km
Speed: 60kt max
Payload: 1.2kg
Colour TV/IR camera under belly for optimal coverage, stabilized picture with high-resolution imagery
Powerplant: Battery & electric motor
Launch/recovery: hand or cat/flip-over & parachute

Expodefensa 2019

Feria Internacional de Defensa y Seguridad
International Defense and Security Trade Fair

2nd TO 4th DECEMBER
BOGOTA-COLOMBIA

BOGOTA, CENTER OF INNOVATION FOR SECURITY AND DEFENSE

ATTEND THE LEADING HUB FOR DEFENSE AND SECURITY IN LATIN AMERICA WITH THE NEWEST TECHNOLOGY IN LAND, AIR AND NAVAL DOMAINS.



www.expodefensa.com.co

Supported by:

La seguridad es de todos — Mindefensa

CODALTEC
CORPORACIÓN DE ALTA TECNOLOGÍA

Organized by:

COGES

corferias
Generadores de Oportunidades y Progreso

Birdeye 650

Length: 1m
Span: 3m
Maximum take-off weight: 11kg
Range: 40km
Endurance: > 4hr
Speed: 70kt
Altitude: 1,500ft AGL
Payload: 1.2kg
Wide coverage, stabilized day/night payload and moving target tracker
Powerplant: battery & electric motor, pusher propeller
Launch/recovery: cat/flip-over & parachute

Birdeye 650D

Length: 1.1m
Span: 4m
Maximum take-off weight: 30kg
Range: > 150km
Endurance: > 15hr
Speed: 80kt
Altitude: 15,000ft
Payload: 5.5kg
Wide coverage, stabilized day/night payload and moving target tracker
Powerplant: Gasoline fuelled reciprocating engine
Launch/recovery: cat/parachute, flip over & airbag

Heron

Length: 9.7m
Span: 16.6m
Maximum take-off weight: 1,270kg
Range: 350km LOS, >1500km BLOS
Endurance: >45hr
Speed: 140kt
Altitude: 35,000ft
Payload: 470kg
Multi Sensor Mission: EO/IR with LRF & designator, SAR, COMINT, ESM, comms relay etc
Remote operation: landing, takeoff and additional capabilities by Satellite Communication (SATCOM)
Powerplant: 1 x 135 HP Rotax 915ls B Certified electronic-controlled fuel injection engine
Launch/recovery: conv/conv, automatic takeoff and landing system (ATOL)

Heron TP

Length: 14m
Span: 26m
Maximum take-off weight: 5,670kg
Range: BLOS
Endurance: > 30hr
Speed: 220kt
Altitude: 45,000ft
Payload: 2,700kg
EO/IR/LRF/LD, synthetic aperture and maritime patrol radar, ELINT/COMINT, ESM and additional capabilities of payloads.
Powerplant: 1,200 hp Pratt & Whitney Canada PT6 Turboprop driving pusher propeller
Launch/recovery: conv/conv, automatic takeoff and landing system (ATOL)

Maritime Heron

Length: 9.7m
Span: 16.6m
Maximum take-off weight: 1,270kg
Range: 350km LOS, >1500km BLOS
Endurance: >45hr
Speed: 140kt
Altitude: 35,000ft
Payload: 470kg
Multi Sensor Mission: EO/IR with LRF & designator, MPR (Maritime Patrol Radar) / SAR, Sonobuoy (acoustic detector), MAD (Magnetic Anomaly Detector), COMINT, ESM, comms relay etc.
Remote operation: landing, takeoff and additional capabilities by Satellite communication (SATCOM)
Powerplant: 1 x 135 HP Rotax 915ls B Certified electronic-controlled fuel injection engine
Launch/recovery: conv/conv, automatic takeoff and landing system (ATOL)

Panther

Length: 3m
Maximum take-off weight: 71kg
Endurance: > 6hr
Altitude: 3,000ft
Span: 8m
Range: 130km
Speed: 50kt
Payload: 8.5kg
Mini POP EO/IR/laser pointer turret
Powerplant: Hybrid system with internal combustion cruise engine and tilting electric motors and props
Launch/recovery: VTOL

Searcher Mk III

Length: 5.85m
Maximum take-off weight: 450kg
Endurance: 20hr
Altitude: 23,000ft
Span: 8.55m
Range: 350km
Speed: 110kt
Payload: 120kg
EO/IR or SAR/GMTI or SIGINT, aerial data relay
Powerplant: Jabiru 4-str "silent" piston engine
Launch/recovery: conv/conv

Tactical Heron

Length: 7.3m
Maximum take-off weight: 600kg
Endurance: 24hr
Altitude: 23,000ft
Span: 10.6m
Range: 300km LOS, >1500km BLOS
Speed: 120kt
Payload: 180kg
Multi Sensor Mission: EO/IR with LRF & designator, maritime patrol radar (MPR)/ SAR, COMINT, ESM, comms relay etc. Up to 4 payloads simultaneously
Remote operation: landing, takeoff and additional capabilities by Satellite communication (SATCOM)
Powerplant: Rotax 912 ISC Sport certified electronic-controlled fuel injection engine
Launch/recovery: conv/conv, automatic takeoff and landing system (ATOL)

IDS

IA-3 Colibri

Length: 0.98m
Maximum take-off weight: 7,4kg
Endurance: 50min
Altitude: 3.000m
height: 0.4m
Range: > 5km
Speed: ≤ 65km/h
Payload: 1.5kg
Stabilised reconnaissance sensors: IR thermal camera with a 640 × 512 resolution, 7.5 – 13.5 micron spectral band, EO FULL HD camera 20.4 megapixel with 30X optical zoom and 2X digital zoom.
Powerplant: 4 x 240 Kv electric motors

IA-17

Length: 1.27m
Maximum take-off weight: > 25kg
Endurance: > 5hr
Altitude: 14,764ft
Span: 2.8m
Range: 80km LOS
Speed: 160kph
Payload: 2.5kg
Gyro-stabilized turret with 15x zoom CMOS day camera and 4x thermal imager for night operations
Powerplant: 2-str gasoline engine
Launch/recovery: cat/para

INDRA

Pelicano

Length: 3.4m
Span: 3.3m rotor dia
Maximum take-off weight: 200kg
Range: 100km
Endurance: 4 to 6hr
Speed: 100kt
Altitude: 11,811ft
Payload: 30kg
Gyro-stabilized MMP EO/thermal camera, Automatic Identification System (AIS)
Powerplant: Heavy fuel engine burning JP5
Launch/recovery: VTOL

KOREA AEROSPACE INDUSTRIES

RQ-101

Length: 4.7m
Span: 6.4m
Maximum take-off weight: 300kg
Range: 80km radius
Endurance: 6hr
Speed: 100kt
Altitude: 14,764ft
Payload: 85kg (inc fuel)
Dual sensor day TV & thermal imaging turret
Powerplant: Rotary internal combustion engine driving pusher propeller
Launch/recovery: cat/para or conv

L-3

Apex

Length: 1.85m
Span: 4.3m
Maximum take-off weight: NA
Range: > 100km
Endurance: > 6hr
Altitude: 18,000ft
Speed: 60kt
Payload: ?
EO, IR, EO/IR turrets from Controp's Stamp range, 3D imaging/ mapping
Powerplant: battery & electric motor driving pusher propeller
Launch/recovery: cat/para

LEONARDO

Crex-B

Length: 0.45m
Span: 1.7m
Maximum take-off weight: < 2.1kg (±5%)
Range: 10km Line of Sight (LOS)
Endurance: > 70minutes
Speed: 110km/h (max); 36km/h (cruise)
Altitude: 3100m ASL (30-500m (AGL) operational)
Payload:
3 stabilised payload modules for real-time monitoring: Two 'Colour TV' modules, One 'Infra Red' module, Digital links, Built-in video enhancement features (stabilisation, visual tracking, mosaicing, target locking)
In service with the Italian Armed Forces
Powerplant: Electrical propulsion
Launch/recovery: Hand release

Falco

Length: 5.25m
Span: 7.2m
Maximum take-off weight: 490kg
Range: > 200km
Endurance: 8 to 14hr
Speed: 117kt
Altitude: > 16,404ft
Payload: 70kg
EO/IR turret with laser designator, SAR/GMTI radar, multi-mode surveillance radar, AIS, ESM/COMINT, comms relay, hyperspectral imager.
Delivered to Pakistan Air Force. 5 customers total, including deployment on behalf of the United Nations (UN) MONUSCO peacekeeping operations in the Democratic Republic of Congo (DRC).
Powerplant: 65 hp gasoline engine
Launch/recovery: conv/conv

Falco Evo

Length: 6.2m
Span: 12.5m
Maximum take-off weight: 650kg
Range: > 200km
Endurance: > 20hr
Speed: NA
Altitude: 19,685ft
Payload: > 100kg
EO/IR with laser designator, laser marker, SAR/GMTI radar, multi-mode surveillance radar, AIS, ESM, COMINT, comms relay, hyperspectral sensor
Delivery to the first of two Middle-East/Gulf customers, thought to be Jordan and Saudi Arabia, in January 2018. Deployed as part of the European Frontex surveillance research programme.
Powerplant: 80 hp gasoline engine
Launch/recovery: conv/conv

LOCKHEED MARTIN

Desert Hawk III

Length: NA
Span; 1.5m
Maximum take-off weight: 3.72kg
Range: NA
Endurance: 1.5hr
Speed: 50kt
Altitude: 11,000ft
Payload: 0.9kg
360-degree colour EO and IR video camera systems, plus other interchangeable, snap-on "Plug and Playloads"
Powerplant: battery & elecric motor driving tractor propeller
Launch/recovery: hand/conv skid

Indago

Length: 0.81m
Span: 0.81m
Maximum take-off weight: 2.3kg
Range: 2 to 10km comms range
Endurance: 50min
Speed: NA
Altitude: 500ft AGL
Payload: 0.2kg
Multiple hot-swappable payload options for ISR, search & rescue etc
Powerplant: battery & 4 x electric motors driving vertical propellers
Launch/recovery: VTOL

Kmax

Length: 15.83m
Span: 14.71m dia
Maximum take-off weight: 3,175kg
Range: 1,852km est
Endurance: > 12hr
Speed: 100kt
Altitude: > 20,000ft
Payload: 3,109kg
Can carry up to 2,722 kg externally on cargo hook
Powerplant: Honeywell T53-17 turboshaft driving intermeshing rotors, no tail rotor
Launch/recovery: VTOL

Stalker XE

Length: NA
Span: 3.66m
Maximum take-off weight: 10.9kg
Range: 370km (aircraft), 93km comms
Endurance: 8hr
Speed: 45kt
Altitude: 12,000ft max launch alt
Payload: 2.5kg
EO/IR with cursor-on-target, integrated tracker with scene lock moving target tracking, auto-track and follow navigation
Powerplant: solid oxide propane fuel cell & electric motor driving tractor propeller
Launch/recovery: cat/conv glide, VTOL option

Vector Hawk

Length: 0.9m
Span: 1.5m
Maximum take-off weight: 2.72kg
Range: NA
Endurance: 2.5hr
Speed: 25 to 70kt
Altitude: NA
Payload: 0.9kg
High quality EO/IR sensors
Powerplant: smart battery & elecric motor driving tractor propeller, 100 percent waterproof
Launch/recovery: hand or canister/water or ground deep stall landing

LUCH

Sokil 2

Length: 1.39m (tube)
Span: NA
Maximum take-off weight: 5kg
Range: 20km
Endurance: 2hr
Speed: 65kt
Altitude
Payload: 1kg
Video camera and radio link to send target imagery back to armoured vehicle
Powerplant: battery & electric motor driving pusher propeller
Launch/recovery: tube/NA

NORTHROP GRUMMAN

Global Hawk Block 30

Length: 14.5m
Span: 39.9m
Maximum take-off weight: 14,628kg
Range: 22,780km (ferry)
Endurance: 24hr @ 2,222km
Speed: 310kt loiter
Altitude: 60,000ft
Payload: 1,360kg
All-weather synthetic aperture, radar/moving target indicator, high-resolution electro-optical (EO) digital camera, and a third-generation infrared (IR) sensor working through common signal processor
Powerplant: Rollls-Royce AE3007 turbofan generating up to 8,500 lb thrust
Launch/recovery: conv/conv,automatic

MQ-8B Fire Scout

Length: 7.3m
Span: 8.4m dia
Maximum take-off weight: 1,429kg
Range: 1,104km
Endurance: 5 to 8hr
Speed: 115kt
Altitude: 20,000ft
Payload: 272kg
EO/IR/LRF, mine detector, comms relay, maritime radar, AIS
Powerplant: 1 x Rolls-Royce 250 turboshaft engine driving main and tail rotors
Launch/recovery: VTOL

MQ-8C Fire Scout

Length: 12.6m
Span: 10.7m dia
Maximum take-off weight: 2,722kg
Range: 2,272km
Endurance: 12hr
Speed: 135kt
Altitude: 16,000ft
Payload: 300 to 500lb
EO/IR/LRF, comm relay, AIS, maritime radar (future), COBRA mine detector (future). Multiple payloads and configuration available
Powerplant: Rolls-Royce 250-C47E turboshaft engine driving main and tail rotors
Launch/recovery: VTOL

Triton

Length: 14.5m
Span: 39.9m
Maximum take-off weight: 14,628kg
Range: 15,186km (ferry)
Endurance: > 24hr
Speed: 331kt
Altitude: 56,500ft
Payload: 1,452kg max internal
The above figure is for internal payload. The MQ-4C Triton can also carry 1,089 kg externally. Sensors: Multi-Function Active Sensor Active Electronically Steered Array (MFAS AESA) radar, MTS-B multi-spectral targeting system
Powerplant: Rollls-Royce AE3007 turbofan generating up to 8,500 lb thrust
Launch/recovery: conv/conv

NOSTROMO DEFENSA

Yarara

Length: NA
Span: 4m
Maximum take-off weight: 22.5kg
Range: 50km
Endurance; 6hr
Speed: 79kt
Altitude: 9,843ft
Payload: 5kg
IAI MicroPOP EO/IR turret
Powerplant: 1 x 8 hp Cubewano Sonic 35 multi-fuel rotary engine driving 3-blade pusher propeller mounted above the wing. Principal operator is the Argentinian Air Force.
Launch/recovery: conv/conv

PIAGGIO AEROSPACE

Hammerhead

Length: 14.4
Span: 15.6m
Maximum take-off weight: 6,146kg
Range: 8,149km
Endurance: 16hr
Speed: 395kt
Altitude: 45,000ft
Payload: 227kg
Quoted payload weight allows 16 hr endurance. SkyISTAR mission system with sensors including FLIR Systems StarSafire 380HD EO/IR turret, Leonardo Seaspray 7300 E Radar. The Italian defence ministry has reportedly requested purchase of 20 aircraft.
Powerplant: 2 × 850 shp Pratt & Whitney Canada PT6A-66B pusher turboprops
Launch/recovery: conv/conv

SAFRAN

Patroller

Length: 8.5m
Span: 18m
Maximum take-off weight
Range: 200km LOS
Endurance: 20hr
Speed: 110kt
Altitude: 20,000ft
Payload: 250kg
Safran Euroflir 410 EO/IR turret plus COMINT, SIGINT, radar and other sensors.
The French Army is due to receive Patroller systems in 2019.
Powerplant: 1 x 115 hp Rotax 914F 4-cyl turbocharged liquid cooled engine
Launch/recovery: conv/conv

Sperwer Mk II

Length: 3.5m
Span: 4.2m
Maximum take-off weight:
Range: 200km
Endurance: > 6hr
Speed: 90kt
Altitude: 15,000ft
Payload: 50kg
Safran Euroflir 350 day/night gyrostabilized optronic sensor (EO/IR). Principal operator is the French Army.
Powerplant: 1 x 70 hp Rotax 582 2-str engine
Launch/recovery: cat/para

SCHIEBEL

Camcopter S-100

Length: 3.11m
Span: 3.4m
Maximum take-off weight: 200kg
Range: 200km
Endurance: > 6 to > 10hr
Speed: 120kg
Altitude: 18,000ft
Payload: 50kg
EO/IR gimbals standard, with wide area search sensors, Synthetic Aperture Radar (SAR), Light Detection and Ranging (LIDAR) scanners, Signal Intelligence (SIGINT) & Communication Intelligence (COMINT), communications relays, loudspeakers, transponders, dropping containers and under-slung loads as options.
Initial orders came from the UAE and 3 undisclosed nations, and Camcopter has been either ordered or tested by many more.
Powerplant: 50 hp rotary engine
Launch/recovery: VTOL

SURVEY COPTER

Aliaca

Length: 1.85m
Span: 3m
Maximum take-off weight: 12kg
Range: 10 to 50km
Speed: 52kt
Endurance: 3hr
Altitude: 9,843ft
Payload: 1.1kg
T120 gyrostabilised EO/IR turret
Powerplant: battery & 1 electric motor driving a single tractor propeller
Launch/recovery: cat/belly

DFV 2000 ER

Length: 2.27m
Span: 3.3m
Maximum take-off weight: 22.5kg
Range: 50km
Speed: 65kt
Endurance: 7hr
Altitude: 9,843m
Payload: 2kg
T120 gyrostabilised EO/IR turret
Powerplant: 1 x fuel-injected 2-str engine
Launch/recovery: cat/conv

Tracker 120

Length: 1.54m
Span: 3.3m
Maximum take-off weight: 8.7kg
Range: 25km
Speed: 48.6kt
Endurance: 1.5hr
Altitude: 8,202ft
Payload: 1.1kg
T120 gyrostabilised EO/IR turret
Powerplant: battery & 2 x electric motors driving twin tractor propellers
Launch/recovery: hand/belly landing

TAI ANKA

Anka

Length: 8m
Span: 17.3m
Maximum take-off weight: 1,600kg
Range: 200km
Endurance: 24hr
Speed: 117kt
Altitude: 30,000ft
Payload: 200kg
EO/IR laser designator and rangefinder, plus SAR/ISAR/GMTI sensors
Powerplant: 1 x 155 hp Thielert Centurion heavy fuel engine
Launch/recovery: conv/conv

TEXTRON UNMANNED SYSTEMS

Aerosonde Small Unmanned Aircraft System

Length: 6.9ft / 2.1m
Span: 13.7ft / 4.2m
Maximum take-off weight: 80lbs / 36.3kg
Range: 140km
Endurance: > 14hr
Speed: 40 – 65kts
Altitude: 15,000ft
Payload: 9.1kg
Carries day/night full-motion video, communications relay, signals intelligence and/or a customer-selected payload simultaneously
Powerplant: Lycoming EL-005 two-stroke Heavy Fuel Engine
Launch/recovery: cat/net

Shadow 200

Length: 3.4m
Span: 6.2m
Maximum take-off weight: 212kg
Range: 125km LOS
Endurance: 9hr
Speed: 110kt
Altitude: 18,000ft
Payload: 43kg
EO/IR, communications relay, optional laser designation, etc. Operators include the US Army, US Marine Corps, the Australian Army, the Italian Army, the Romanian Air Force and the Swedish Army
Powerplant: UAV Engines model 741 rotary engine
Launch/recovery: cat/conv, arrested

Shadow V2

Length: 12.0Ft / 3.66m
Span: 19.8ft / 6.04m
Maximum take-off weight: 467lbs / 212kg
Range: 125km LOS
Endurance: 9hr
Speed: 62 – 65kts / Max 98kt dependent on mission profile
Altitude: 17,500ft / 5334m
Payload: 45 – 80lbs / 20.4 - 36.4kg
EO/IR, communications relay, optional laser designation, etc. Operators include the US Army, US Marine Corps,
the Australian Army, the Italian Army, the and the Swedish Army
Powerplant: UAV Engines model 741 rotary engine
Launch/recovery: cat/conv, arrested

THALES

Fulmar

Length: 1.2m
Span: 3m
Maximum take-off weight: 20kg
Range: 800km
Endurance: 12h
Speed: 54kt
Altitude: 9,843ft
Payload: 8kg
EO/IR camera turret with fusion capability
Powerplant: 1 x gasoline & heavy fuel engine
Launch/recovery: cat/net

Spy'Ranger

Length: NA
Span: 3.9m
Maximum take-off weight: 14kg
Range: 30km
Endurance: 3hr
Speed: 49kt
Altitude: 14,764ft (t/o)
Payload: 1.2kg
Powerplant: battery & DC brushless electric motor
Launch/recovery: cat/belly

Tactical (Watchkeeper)

Length: approx 5.7m
Span: 10.5m
Maximum take-off weight: 550kg
Range: 200km
Endurance: 16hr
Speed: 95kt
Altitude: 16,000ft
Payload: 150kg
Elbit Compass turret with visual, Infra-Red (IR) laser rangefinder and designator, Thales I-Master SAR/GMTI radar, radio relay, COMINT.
Principal operator is the British Army.
Powerplant: Powerplant: 1 x 52 hp UAV Engines R802/902 rotary
Launch/recovery: conv/conv

UMS SKELDAR

R-350

Length: 3.2m
Span: 3.5m (dia)
Maximum take-off weight: 150kg
Endurance: >2hr
Speed: 65kt
Altitude: 8,000ft
Payload: max 30 kg between main and nose payload bays
Nose & fuselage payload bays support options including EO/IR cameras, LiDAR, multi- and hyperspectral imaging systems, chemical sniffers
Powerplant: Turboshaft burning Jet A1, JP8 and powering main and tail rotors
Launch/recovery: VTOL

V-200 Skeldar

Length: 4m
Span: 4,6m (dia)
Maximum take-off weight: 235kg
Endurance: > 5hr with 20kg payload at ISA
Speed: 81kt
Altitude: 12'000ft
Payload: 40kg
Optional payloads: advanced EO/IR turrets, Sentient Vision ViDAR, SAR/GMTI radar, hyper-spectral and multi-spectral cameras, comms relay systems
Powerplant: 1 x 54 hp Hirth heavy fuel engine running on Jet A1, JP5 & JP8
Launch/recovery: VTOL

YUGOIMPORT

Strsljen

Length: 8.75m
Span: 7.63m
Maximum take-off weight: 750kg
Range: 150km
Endurance: 4hr
Speed: 97.2kt
Altitude: 13,123ft
Payload: 350kg inc fuel
EO/IR/laser targeting turret, 12 x small diameter guided missiles or unguided rockets
Powerplant: 1 x Phoenix 180 turboshaft engine
Launch/recovery: VTOL

ZALA AERO GROUP

ZALA 421-08M

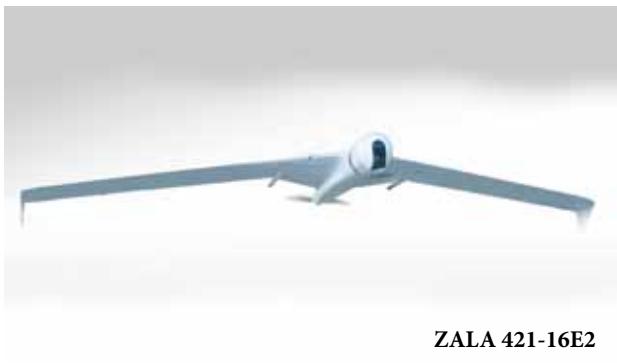
Length: 0.425m
Span: 0.81m
Maximum take-off weight: 2.5kg
Range: 15/30*km
Endurance: > 1.5hr
Speed: 65-130km/h
Payload: 300g
Gyro stabilized EO/IR sensors: HD video, 24 Mp photo, thermal imager.
Powerplant: Electric motor driving pusher propeller
Launch/recovery: hand launch, cat/para

*ultra-long range option

ZALA 421-16EM

Length: 0.86m
Span: 1.81m
Maximum take-off weight: 6.5kg
Range: 25/50*km
Endurance: > 2.5hr
Speed: 65-110km/h
Payload: 1kg
Gyro stabilized EO/IR sensors: HD video, 42 Mp photo, thermal imager, gas detector, dosiemeter
Powerplant: Electric motor driving pusher propeller
Launch/recovery: cat/para

*ultra-long range option



ZALA 421-16E2

Length: 1.10m
Span: 2.80m
Maximum take-off weight: 7.5kg
Range: 30/60*km
Endurance: >4hr
Speed: 65-110km/h
Payload: 1.5kg
Gyro stabilized EO/IR sensors: HD video with 60-x optical zoom, 42 Mp photo, thermal imager, gas detector, dosiemeter
Powerplant: Electric motor driving pusher propeller
Launch/recovery: cat/para

*ultra-long range option

ZALA 421-16E5

Length: 1.85m
Span: 5.30m
Maximum take-off weight: 29.5kg
Range: >100km
Endurance: 6/14hr
Speed: 65-110km
Payload: 5kg
Gyro stabilized EO/IR sensors: HD video with 60-x optical zoom, 42 Mp photo, laser scanner, thermal imager, gas detector, dosiemeter
Powerplant: Electric motor driving pusher propeller/combustion engine
Launch/recovery: cat/para

ZALA 421-16E

Length: 1.18m
Span: 2.815m
Maximum take-off weight: 10.5kg
Range: 70/100*km
Endurance: >4hr
Speed: 65-110km/h
Payload: 1,5kg
Gyro stabilized EO/IR sensors: HD video with 60-x optical zoom, 42 Mp photo, thermal imager, gas detector, dosiemeter
Powerplant: Electric motor driving pusher propeller
Launch/recovery: cat/para

*ultra-long range option

ZALA 421-22

Length: 1.065m
Span: 1.065m
Maximum take-off weight: 8kg
Range: 5km
Endurance: 35min
Speed: 0-30km/h
Payload: 2kg
Gyro stabilised EO/IR sensors: HD video with 60-x optical zoom, 42 Mp photo, laser scanner, thermal imager, gas detector, dosiemeter
Powerplant: 2 x 10,000 mAh 7S batteries driving 8 electric motors and vertical propellers (octocopter)
Launch/recovery: VTOL

PROTECTOR IS UK'S NEXT GENERATION UNMANNED ISR

Interview with Wing Commander Iain Hutchinson, Royal Air Force, head of the Protector Combined Test Team

By Peter Donaldson

RAF

Wing Commander Iain Hutchinson, Royal Air Force, Head of the Protector Combined Test Team standing in front of the UK-customised Protector.

Much more than a mere replacement for the General Atomics Aeronautical Systems (GA-ASI) Reaper in UK Royal Air Force (RAF) service, the Protector RG-1 will represent a major leap in capability and flexibility for commanders. This UK-customised variant of MQ-9B SkyGuardian, which is also known as the company's "certifiable Predator B", will be a potent weaponised Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) platform. Ite most important advances will be the ability to fly in all classes of airspace, the fact that it will not need a launch and recovery element, and its use of UK sovereign weapons, as Wing Commander Iain Hutchinson, who heads the Protector Combined Test Team, explainss.

"From an intelligence gathering perspective, the platform has significantly enhanced sensors over Reaper, as well as much longer endurancr. With clean wings without any weapons, the aircraft will comfortably be able to fly for 30-plus hours on a single mission," he explains. He continues that Raytheon UK's Paveway IV laser and GPS guided bomb and MBDA's Brimstone missile will arm Protector instead of the GBU-12 and Hellfire missile used on Reaper.

SMALLER LOGISTICAL FOOTPRINT

The elimination of the need for a dedicated launch and recovery element represents a major reduction of the system's logistical footprint when deployed, which will simply consist of the aircraft and a small team of maintainers. "The aircraft will be started up and taxied, will take-off and fly its mission, then it will be recovered, land and taxi back, all over the satellite link," he says. "The second most significant difference is that it will be certified to fly in civilian airspace, and that is a first for this class of remotely piloted aircraft, and very much at the leading edge of innovation for this class of aircraft."

This combination of capabilities, he says, will make the system much easier to deploy. He anticipates that the aircraft will be able to self-deploy across Europe to the Middle East or Africa and beyond, and at relatively short notice. "That's a much more flexible capability than Reaper currently offers," he notes.

Normally, Reaper vehicles have their wings removed and are loaded into a Boeing C-17 for deployment to an in-theatre operating base, and this will remain an option for Protector. At around 150 knots, Hutchinson says, Protector is not fast. "It takes a while to get anywhere if you are transiting a long way, but self-deployment is still potentially an easier option than taking it to bits and boxing it up."

A fast jet navigator by background, Wg Cdr Hutchinson flew in Tornado F3 fighter interceptors for almost a decade before transitioning to Reaper in 2012, training in the United States before serving as a sensor operator and flight commander on 13 Squadron based at RAF Waddington for three years. Like Reaper, Protector will be operated by a crew of three consisting of a pilot, sensor operator and mis-

sion intelligence coordinator.

He subsequently served as the Chief of Staff in the RAF's ISTAR Force Headquarters at Waddington, which will operate the Protector fleet when it enters service. When this organisation became involved in Protector's development as the launch customer, a need arose for a hands-on presence in the process, he was selected to head up the Combined Test Team in the US. This team includes General Atomics, the RAF and the US Air Force. The USAF is not a Protector customer, but has a watching brief to ensure that the technologies and capabilities being integrated into the system are appropriate to an export customer such as the Us.

"The team's responsibility is to deliver Protector into front line service with an initial operating capability in the early 2020s," he says. "We must provide evidence through testing and evaluation that what we are getting is what we are asking for, that it is fit for purpose, and that it is safe and can be certified to fly in the classes of airspace in which we want to use it."

AIRSPACE INTEGRATION

The plan is for Protector to be cleared to fly in all classes of civilian airspace in the UK and around the world, to which the team is taking an incremental approach in cooperation with the UK Military Aviation Authority (MAA) and the Civil Aviation Authority (CAA) in the UK. Protector will be based at RAF Waddington for training and local operations, a first for the RAF's UAVs as Reaper has never been operated in UK airspace.

"It will come into service with a limited clearance to begin with in terms of airspace, but the systems that we are incorporating, including a detect and avoid system, mean that we will be able to expand that clearance in due course," he says.

What these avionic systems will be is largely down to the regulator, he stresses. "This is an interesting discussion because some of the regulations around using unmanned systems in civilian airspace are still being developed, so there is a parallel process around development work on the regulations, and development work on the systems that will work within them."

Like Reaper, Protector will have daylight and thermal Full Motion Video (FMV) capabilities in addition to Synthetic Aperture Radar/Ground Moving Target Indication (SAR/GMTI), the latter provided by an upgraded version of General Atomics' own Lynx radar.

Asked about electronic warfare capabilities, Hutchinson said that there wasn't much "push" to integrate a defensive aids suite. Pressed on Electronic Support Measures (ESM) and Electronic Intelligence (ELINT), he wouldn't comment on any "additional capabilities" that may be integrated in Protector.

Protector won't be the 'be all and end all' in terms of intelligence gathering, but it will certainly add significantly to the information that is available. Layered with manned platforms and land-based sensors, it will be a key part of providing a good understanding of any battlespace or civilian environment.

The process of standing Protector up is one of turning General Atomics' SkyGuardian export product into a bespoke UK product. Protector is 'SkyGuardian plus', he says, with the UK-specific capabilities including a new satcom system as well as the sovereign weapons.

"We are working very closely with the company on that developmental process of bringing the aircraft into service through a direct commercial sales relationship with General Atomics.


RAF

According to Squadron Leader Ben Laidlaw, a completely redesigned cockpit was required to allow the Protector to fly in civilian airspace.

As far as progress is concerned, the team is now beginning the transition from the baseline work that the manufacturer has done to develop a flyable aircraft and to a process that will create a military capability. The biggest challenge, he says, is certification to fly in civilian airspace. "The regulatory authorities are very interested in how we integrate this kind of aircraft with manned traffic, from airliners to general aviation. "For us as a test team, proving that the aircraft is safe and airworthy is always going to be the hardest part of this process."

In contrast, he expects the weapon system work to be relatively straightforward. "We are integrating already proven weapons, so that makes life a lot easier from a test and evaluation perspective."

THE FUTURE

Protector will be introduced by mid-2024, ensuring maximum operational use of Reaper and a smooth transition to the new platform. Protector is set to continue its evolution after it enters service, something made easier by its open electronic architecture that allows General Atomics to integrate a variety of options and demonstrate them. One option that the MoD is considering, he says, is a maritime optimised role fit.

"The ability to complement the P-8A Poseidon in the maritime patrol role is an aspiration. Although not currently funded, it is something that both the RAF and the Navy are looking at quite closely."

Protector's position is different from those of other UK UAV capabilities, which serve the Army and the Navy as organic assets, he says. "It will certainly be a step forward from Reaper in the sense that it will be much more of a flexible and configurable operational asset that can support any of the services, potentiall, anywhere in the world and could even support other government agencies including disaster relief and humanitarian activities." A

ON THE COVER:
On 7 August 2018, the US Air Force (USAF) completed the first-ever automated landing of an MQ-9 Block 5 Remotely Piloted Aircraft (RPA), followed by the first auto-takeoff on 9 August. *(GA-ASI)*

Unmanned Aerial Vehicles Compendium
Supplement to **ARMADA** Issue 3/2019
Volume 43, Issue 3, June/July 2019

ARMADA
is published bi-monthly by Media Transasia Ltd.

Copyright 2012 by Media Transasia Ltd.
Publishing Office: Media Transasia Ltd.,
1603, 16/F, Island Place Tower, 510 King's Road, Hong Kong

Editor-in-Chief: Andrew Drwiega
Chairman: J.S. Uberoi
President: Egasith Chotpakditrakul
Chief Financial Officer: Gaurav Kumar
General Manager: Jakhongir Djalmetov
International Marketing Manager: Roman Durksen
Digital Manager: David Siriphonphutakun
Sales & Marketing Coordinator: Wajiraprakan Punyajai
Art Director: Hatsada Tirawutsakul
Circulation Assistant: Yupadee Seabea

Advertising Sales Offices
■ FRANCE/SPAIN
Stephane de Remusat, REM International
Tel: (33) 5 3427 0130
E-Mail: sremusat@rem-intl.com
■ GERMANY
Sam Baird, Whitehill Media
Tel: (44-1883) 715 697, Mob: (44-7770) 237 646
E-Mail: sam@whitehillmedia.com
■ TURKEY / EASTERN EUROPE / UK
Zena Coupé
Tel: +44 1923 852537, zena@expomedia.biz
■ NORDIC COUNTRIES/ITALY/SWITZERLAND
Emanuela Castagnetti-Gillberg
Tel: (46) 31 799 9028
E-Mail: emanuela.armada@gmail.com
■ RUSSIA
Alla Butova, NOVO-Media Ltd,
Tel/Fax: (7 3832) 180 885, Mob: (7 960) 783 6653
Email :alla@mediatransasia.com
■ USA (EAST/SOUTH EAST)/CANADA (EAST)
Margie Brown, Blessall Media, LLC.
Tel : (+1 540) 341 7581
Email: margiespub@rcn.com
■ USA (WEST/SOUTH WEST)/BRAZIL/CANADA (WEST)
Diane Obright, Blackrock Media Inc
Tel : (+1 858) 759 3557
Email: blackrockmediainc@icloud.com
■ ALL OTHER COUNTRIES
Jakhongir Djalmetov
Tel: +66 2204 2370, Mob: +66 81 6455654
Email: joha@mediatransasia.com
Roman Durksen, Tel: +66 2204 2370, Mob: +66 83603 7989
E-Mail: roman@mediatransasia.com

Annual subscription rates:
Europe: CHF 222 (including postage)
Rest of the World: USD 222 (including postage)
Controlled circulation: 26,050 (average per issue)
certified by ABC Hong Kong, for the period
ABC 1st January 2018 to 31st December 2018.
Printed by Media Transasia Ltd., 75/8, 14th Floor, Ocean Tower II, Soi Sukhumvit 19, Sukhumvit Road, Bangkok 10110, Thailand.
Tel: 66 (0)-2204 2370, Fax: 66 (0)-2204 2390 -1

Subscription Information: Readers should contact the following address: Subscription Department, Media Transasia Ltd., 75/8, 14th Floor, Ocean Tower II, Soi Sukhumvit 19, Sukhumvit Road, Bangkok 10110, Thailand.
Tel +66 2204 2370 Fax: +66 2204 2387
Email: accounts@mediatransasia.com

www.armadainternational.com

NEW FOR 2019!
Registration is complimentary for military and DoD personnel.

YOUR ACQUISITION STRATEGY

Join military leadership, defense experts and solutions providers to dig into how unmanned and autonomous systems are changing the landscape of military and intelligence operations and what that means for procurement, technology development and inter-agency collaboration.

MARRIOTT WARDMAN PARK
AUGUST 20 – 21, 2019 | WASHINGTON, D.C.

LEARN MORE AT **AUVSI.ORG/USDPS**

AUVSI
UNMANNED SYSTEMS
DEFENSE
PROTECTION
SECURITY

THE WORLD'S BENCHMARK

- Cost-effective, multi-role, multi-domain MALE UAS
- Responsive, persistent and long-range
- Capable of securing Malaysia's vast territory
- Maritime superiority
- Reconfigurable payload options
- Assured networking and interoperability across defence and civil C4ISR networks
- Trusted and proven systems backed by 5.5 million flight hours

ga-asi.com

©2019 GENERAL ATOMICS AERONAUTICAL SYSTEMS, INC.

GENERAL ATOMICS AERONAUTICAL

Leading The Situational Awareness Revolution