UNMANNED AERIAL VEHICLES

AN ARMADA INTERNATIONAL SUPPLEMENT

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General Atomics, Northrop Grumman and Lockheed Martin won a DARPA contract to design an armed air-launched UAV called LongShot.

LOYAL WINGMEN AND SWARMS

The concept of an unmanned loyal wingman is being turned into reality and a variety of countries are investing in swarming development too.

David Oliver

The concept of a 'loyal wingman' unmanned fighter aircraft is to fly alongside or slightly ahead of a manned military combat aircraft and to work in conjunction with that aircraft to undertake various tasks, such as surveillance , electronic warfare, laser guiding weapons onto targets, or even to carry out air-to-air or air-to-ground strikes.

General Atomics, Northrop Grumman and Lockheed Martin have won a $22 million contract from the US Defense Advanced Research Projects Agency (DARPA) to design an air-launched unmanned aerial vehicle (UAV) called LongShot, that will be able to fire multiple advanced air-launched weapons. The UAV could be launched either from an external hardpoint on a fighter aircraft or the internal bay on a bomber and released before reaching the battleground, to open the way and engage with the first enemy targets, thereby protecting higher valued manned aircraft. DARPA announced it wanted to explore multi-modal propulsion systems, to allow the UAV to reach a greater range, using slower and more fuel-efficient engines while retaining a capacity to quickly strike, using another propulsion system.

In later phases of the programme, the LongShot team will construct and fly a full-scale air-launched demonstration system capable of controlled flight, before, during, and after weapon ejection under operational conditions. Both the US Air Force and US Navy could be potential future customers for the small Loyal Wingman system.

Last year General Nick Carter Chief of Defence Staff in the UK armed forces spoke at a virtual IISS event about the future of Royal Air Force (RAF) tactical formations and declared that by 2030, it could be composed of two manned fighter aircraft, 10 Mosquito unmanned fighter aircraft and 100 Alvino unmanned aerial vehicles. Air Chief Marshal Mike Wigston, Chief of the Air Staff said: "We're taking a revolutionary approach, looking at a game-changing mix of swarming drones and unmanned fighter aircraft like Mosquito, alongside piloted fighters like Tempest, that will transform the combat battlespace in a way not seen since the advent of the jet age."

Spirit AeroSystems based in Belfast, Northern Ireland, has been selected to lead Team Mosquito which includes Grumman UK and Intrepid Minds in the next phase of the project. Utilising ground-breaking engineering techniques, the team will further develop the RAF's Lightweight Affordable Novel Combat Aircraft (LANCA) concept, with a full-scale vehicle flight-test programme expected by the end of 2023.

SCHIEBEL

MULTI-ROLE MULTI-DOMAIN

CAMCOPTER® S-100 UNMANNED AIR SYSTEM

CAMCOPTER® S-100
UNMANNED AIR SYSTEM

Team Mosquito is developing the Royal Air Force's first Loyal Wingman unmanned fighter aircraft.

The UK Ministry of Defence (MoD) Defence Science and Technology Laboratory (Dstl) provides the project management and is the MoD's technical authority for the $42 million (£30 million) Project Mosquito on behalf of the RAF Rapid Capabilities Office.

SWARMING IS BUZZING

Following two earlier phases of the UK's Alvina programme, a $2.8 million (£2.5 million) contract for Phase 3 was awarded in January 2019 for an Integrated Concept Evaluation activity to explore the technical feasibility and military utility of a swarm of UAVs operating collaboratively. This was awarded to an industry team led by Blue Bear Systems Research including Airbus, DTS, IQHQ, Plextek and Durham University to develop a system to allow very complex low-cost autonomous swarm-based missions to be performed simultaneously against single or multiple targets. The project will deploy next generation autonomy, machine learning, and artificial intelligence (AI) to reduce the number of operators required, the time it takes to train them, and the cognitive burden on any operator during active operations. On 1 April 2020, No 216 Squadron reformed at RAF Waddington, tasked with the testing of future UAV swarming technology and to take on the operating role of the fleet of network-enabled swarming UAVs.

At the end of 2020 a swarm of 20 small fixed-wing UAVs including Blue Bear's iStart and Redkite completed the largest collaborative, military focused evaluation of swarming UAVs in the UK. The exercise was part of the Alvina programme and the culmination of the DSTL's 'Many Drones Make Light Work' competition, funded under the UK Science and Technology Portfolio through the Defence and Security Accelerator.

The swarm consisted of five different types and sizes of fixed wing UAVs, with different operational capabilities, together with six different payload types, flying representative tasks at RAF Spadeadam, located in Cumbria, the only electronic warfare tactics facility in Europe where aircrews can practise manoeuvres and tactics against a variety of threats and targets that they face in contemporary warfare. Three operators in Blue Bear's Mobile Command and Control System managed the entire swarm while simultaneously handling different, collaborative payload analysis tasks.

They flew simultaneous Beyond Visual Line Of Sight (BVLOS) cooperative tasks, with Blue Bear collaborative autonomy ensuring they all contributed to overall mission goals. During the two week trial, more than 220 sorties were undertaken.

In March 2021 US conglomerate KBR received a contract from the UK MoD to deliver nano-UAS to support technological experimentations, informing the British Army and the Future Capability Group (FCG) at Defence Equipment & Support (DE&S) on how UAS technology can benefit defence. Focused on expanding its solutions integration capabilities and collaborative relationships with UK and global subject matter experts, KBR is working with UK-based Evolve Dynamics, an engineering company specialising in UAS, to ensure timely delivery of systems for use by Ministry of Defence (MoD) personnel in the UK and overseas, and across a wide range of environments.

France's national defence procurement agency Direction Générale de l'Armement (DGA) has selected Parrot UAS to supply the country's armed forces with its ANAFI USA micro-UAS developed in France and produced in the United States. The DGA announced that the French company Parrot has been awarded a five year contract to manufacture 150 UAS and 300 related small drones for the French Armed Forces beginning in 2021. The 500-gram ANAFI USA has a flight duration of 32 minutes, and is capable of day and night observation and features two 21-megapixel cameras that can detect 'person-sized' targets at distances of up to two kilometres (1.2 miles).

Parrot UAS is already a supplier to the Swiss Armed forces under its Mini-UAV programme, and the US Army under its Blue sUAS programme which is a spin-off of the Short-Range Reconnaissance (SRR) programme launched by the Army and Defense Innovation Unit (DIU) in April 2019. The Blue sUAS drone development was organised in response to increased government-wide demand for secure and ultraportable UAVs that could be used for a variety of military applications.

Earlier this year the French UAS manufacturer launched its swarm concept that would transform military operations

Blue Bear's Mobile Command and Control System managed the largest military focused evaluation of swarming uncrewed aerial vehicles in the UK.

by responding to emergency situations through the use of swarms of up to 50 autonomous UAVs. Icarus claimed that the use of its small commercial quadrotor UAVs makes the technology particularly affordable and could therefore be replicated and used in large numbers.

The Spanish company Escribano Mechanical & Engineering (EME) was awarded a contract from the Directorate General of Armament and Material (DGAM) of the Spanish Ministry of Defence in January 2021 for the development of an autonomous, and multi-platform swarm system for Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) missions as part of Phase II of the Spanish RAPAZ programme with the aim of evaluating Class 1 UAS with a maximum take-off weight of less than 150kg (330lb) for future acquisitions by the Armed Forces.

The contract involves the development of software for an experimental swarm system of autonomous UAVs to carry out different types of experimental missions, mainly ISTAR, SAR and loitering for targets of opportunity. The UAVs could be launched from the Army' future combat vehicles, from which they would operate in a range of 5-10km (3-6 miles) and could incorporate loitering or attack capabilities against ground targets.

Equipped with EME's cutting-edge artificial intelligence, Long Range Intelligent Security System (LISS), it is the only drone swarm system that provides individual and group intelligence for the development of missions autonomously. The swarm is operated by a single operator and its behaviour will be autonomous and can be adapted to the events of the mission. It has a very high level of intelligence, for example if a drone is damaged, the rest of the swarm immediately reorganises themselves to carry out the mission as planned taking over its tasks.

Further afield, South Africa's Paramount Advanced Technologies (PAT) has launched a long-range, precision strike UAV system, N-Raven featuring next generation swarm technologies to accomplish attack missions with pinpoint precision. The N-Raven addresses a multitude of mission requirements, including future warfighter engagements where intelligent 'swarming technologies' combined with multiple munition loitering and attack operations have been proven to ensure mission survivability.

The 41kg (90lb) N-Raven operates with a covert, low signature in contested environments offering a cruise speed of approximately 97 knots (180km/hr) and a loitering endurance time of approximately two hours. N-Raven swarm loitering munitions offer a variety of sensors with each being capable of carrying a 10-15kg (22-33lb) payload up to a range of 250km (155 miles). It is designed to saturate a battlespace with EO/IR, semi-active laser sensor-driven target identification and tracking technologies.

Once the technologies are refined, the advantages of de-centralised approaches will allow UAV swarms to spread out to search a wide area, or de-conflict to ensure they do not all attack the same target.

It is anticipated that many more countries will opt to adopt swarming technologies for their armed forces rather than the much more expensive and challenging Loyal Wingman fleets. A

ADCOM

United 40

Span: 17.53m
Maximum take-off weight: 1,000kg
Speed: 108kt
Endurance: 25h
Ceiling: 26,000ft
Payload: 100kg. Retractable EO/ir sensor
Powerplant: Twin hybrid turbine-electric engines
Launch/recovery: conv/conv
Remarks: UAE manufactured MALE sold to Algeria.

AERONAUTICS

Orbiter 4

Span: 5.4m Maximum take-off weight: 50kg
Range: Line of sight up to 150km comms range Speed: 70kts
Endurance: up to 24hrAltitude: 18,000ft Payload capacity: 12kg.
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: Catapult and compact, foldable net
Remarks: Designed for shipboard and land-based applications including ISTAR, fire control electronic warfare, comms relay & ship self-defence.

Aerostar

Length: 4.5m Span: 8.7m
Maximum take-off weight: 230kg Range: 250km
Speed: 110kts max Endurance: 12hrs
Payload capacity: 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 498i fuel injected 2-str twin, 38 hp
Launch/Recovery: conv/conv
Remarks: Tactical UAS with over 250,000 operational flight hours logged.

Dominator XP

Length: 8.6m Span: 13.5m
Maximum take-off weight: 1,910kg
Range: LOS 300km, BLOS satcom unlimited Speed: 150kts
Endurance: > 20hrs Altitude: > 18,000ft
Payload capacity: 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.
Powerplant: 2 x 170hp Austro AE300 jet fuel piston engines
Launch/Recovery: conv/conv
Remarks: Operators include Mexico & Turkey. Operational in GPS-denied environments.

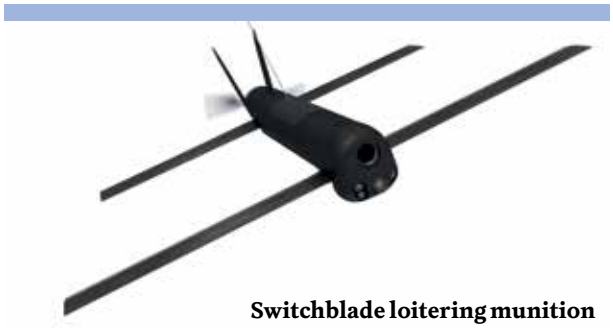
AEROVIRONMENT

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: 2.5hrs with an LE battery Altitude: 300-500ft AGL
Payload capacity: > 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 Remarks: All-environment 3rd generation Puma mini-UAS with new propulsion system making hand launch easier, enhanced sensor suite.

Raven

Length: 0.91m — Span: 1.37m
Maximum take-off weight: 1.9kg — Range: 10km comms range
Speed: 17-44kts — Endurance: Up to 1.5hrs.
Altitude: 500ft AGL, 14,000ft MSL launch
Poweplant: battery electric
Payload capacity: 0.17kg. Dual forward and side-looking EO or IR camera nose with electronic pan-tilt-zoom & stabilisation.
Launch/recovery: hand/deep stall landing
Remarks: Most are operated by the US, but foreign customers have included Australia, Estonia, Italy, Denmark, Spain and the Czech Republic.



Switchblade loitering munition

Length: <0.6m estimate — Span: <0.9m estimate
Maximum take-off weight: < 2.5 kg — Range: 10 km
Endurance: 15 min
Speed: 55 to 85 kts
Altitude: < 500ft AGL, > 15,000ft MSL
Payloads: Dual front and side look EO cameras and IR nose camera. Stabilised electronic pan-tilt-zoom, Orbital ATK advanced munition warhead.
Powerplant: battery electric
Launch/recovery: tube/NA
Remarks: US Army and USMC are the primary users. Ordered by the UK.

AIRBUS

Harfang

Length: 9.3m — Span: 16.6m
Maximum take-off weight: 1,250kg — Range: 1,000km
Speed: 110kts
Endurance: 12hr at 550nm from base — Altitude: 25,000ft
Payload capacity: 250kg. Synthetic aperture radar with 1 m 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.
Powerplant: 115 hp turbocharged Rotax 914 piston engine
Launch/recovery: conv/conv
Remarks: Retired French systems acquired by Royal Moroccan Air Force.

KZO

Length: 2.25m — Span: 3.42m
Maximum take-off weight: 161kg — Range: > 140km (on data link)
Speed: 118.8kts — Endurance: 5.5hrs
Altitude: 11,500ft
Payload capacity: 35kg. Thermal imager system (8–12 µm or 3–5 µm), 3 x fixed-focus TV cameras (6 FoV), all 3-axis stabilised. Principal operator is the German Army.
Powerplant: 24kW 2-str engine
Launch/recovery: rato, cat/para
Remarks: Tactical UAS optimised for high speed reconnaissance missions.

VSR700

Length: 6.2m — Span: 7.2m rotor diameter
Maximum take-off weight: 700kg — Speed: 100kts
Endurance: 8hrs with full tactical payload 80nm from shipAltitude: 19,600ft
Payload capacity: 100kg. Naval-grade EO system, naval tactical radar, AIS, deck finder autoland system.
Powerplant: 155hp diesel and jet fuel engine
Launch/recovery: Automated VTOL
Remarks: Shipborne unmanned helicopter designed to operate alongside other shipborne naval assets.Second prototype ordered in March 2021.

Zephyr T

Length: 6m estimate
Span: > 32m
Maximum take-off weight: 140kg
Range: > 18,500km estimate
Speed: approx 30kts
Endurance: > 45 days
Altitude: > 65,000ft Payload capacity: 20kg. RADAR, LIDAR, ESM/ELINT, Broadband Comms
Powerplant: solar powered electric motors
Launch/recovery: conv/conv
Remarks: Larger variant of Zephyr with greater payload & endurance.

ARCTURUS

Jump 20

Length: 5.64m
Span: 2.87mμ
Maximum take-off weight: 95.25kg
Range: 125km
Speed: 72kts
Endurance: nine to 16hrs
Altitude: 15,000ft
Payload capacity: 27.2kg inc fuel. Cloud Cap Technologies 200 and 400 Series EO/IR are standard options. 3-D mapping, SAR, LIDAR, comms relay, COMINT, SIGINT systems available.
Poweplant: 1 x 190cc 4-str engine & 4 x electric motors, props for VTOL
Launch/recovery: VTOL, cat launch option
Remarks: Arcturus aircraft family are operated by US SOCOM under the Mid-Endurance Unmanned Aircraft Systems III contract. Jump 15 is smaller variant.

BEIHANG UAS TECHNOLOGY COMPANY

BZK-005

Length: 10m
Span: 18m
Maximum take-off weight: 1,250kg
Range: 6,000km (estimate from cruise speed & endurance)
Endurance: 40hrs
Speed: 150 to 180kph cruise
Altitude: 26,200ft
Payload Capacity: 150kg
Payloads: Electro-optical sensor system under fuselage
Powerplant: Single piston engine, pusher propeller
Launch/recovery: Conventional
Remarks: MALE-class reconnaissance UAV in service with the PLA air, land, and naval services

TYW-1

Length: 9.8m
Span: 18m
Maximum take-off weight: 1,500kg
Range: 6,000km (estimate from cruise speed & endurance)
Endurance: 40hrs
Speed: 200kph max level speed
Altitude: 24,600ft
Payload Capacity: 300kg
Powerplant: Single piston engine, pusher propeller
Launch/recovery: Conventional
Remarks: MALE-class armed UAV in development, export derivative of the BZK-005

BLUEBIRD AERO SYSTEMS

WanderB VTOL

Length: 1.79m
Span: 3.1m
Maximum take-off weight: 13kg
Communication range: 50-80km
Speed: 65kts
Endurance: 2.5hours
Best Operational Altitude: up to 3,281ft AGL
Ceiling: 22,000ft ASL
Payload: 1.35kg. Day and IR stabilised cameras, photogrammetric, multi-spectral or radiometric mapping cameras for airborne ISR or Mapping on Demand.
Poweplant: Four battery driven VTOL electric motors and one electric pusher motor for level flight
Launch/recovery: VTOL
Remarks: Mini UAS optimised to facilitate covert, over-the-hill operations or extensive, day-and-night ISR.

ThunderB

Length: 1.9m Span: 4m
Maximum take-off weight: 32kg Communication range: 150km
Speed: 32-72ktsEndurance: Up to 24hrs in standard configuration, up to 12hrs in cargo release configuration, up to 15hrs on station 150km from its ground control position carrying T-STAMP Ceiling: 16,000ft
Payload: up to 4kg nose mounted with full fuel and additional payload under the wings, examples include Controp T-STAMP triple sensor (CCD/cooled IR/laser)
Powerplant: Advanced two stroke engine with electronic fuel injection
Launch/recovery: auto cat/para airbag, VTOL version available
Remarks: Operational in Israel and by international Defence and HLS customers. Continues mission in GPS denied environment

MQ-25 Stingray

Length: 16m
Span: 23m
Range: 500nm
Ceiling: 26,000ft
Payload: 6,800kg of fuel
Powerplant: Rolls-Royce AE 3007N tubofan
Launch/recovery: conv/conv
Remarks: Winner of the US Navy Carrier-Based Aerial-Refueling System (CBARS) program.

BOEING INSITU

ScanEagle 3

Length: 2.3-2.5 m Span: 4m
Maximum take-off weight: 36.3kg
Range: 720nm (estimate based on cruise speed & endurance)
Speed: 40-50kts cruise, 80kts max Endurance: 18hrs
Altitude: 20,000ft
Payload capacity: 9.1kg. Turret houses EO, EO900 (EO camera and EO telescope), MWIR, Dual Image EO and MWIR), 170W onboard power
Powerplant: 1 x 2-str heavy fuel piston engine burning JP-5/JP-8Launch/recovery: cat/SkyHook vertical wire
Remarks: ScanEagle 3's design doubles the aircraft's payload capacity and is compatible with existing ScanEagle payloads.

Blackjack

Length: 2.5m Span: 4.9m
Maximum take-off weight: 61kg Range: 960 nm (estimate based on endurance & cruise speed)
Speed: > 90kts max, 60kts cruise
Endurance: > 16hrs Altitude: > 20,000ft
Payload capacity: 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 reciprocating engine with EFI, burning JP-5, JP-8 heavy fuels
Launch/recovery: cat/SkyHook vertical wire
Remarks: Developed for a US Navy requirement for a small tactical unmanned aircraft system capable of operating from land and sea.

Integrator

Length: 2.5m Span: 4.8m
Maximum take-off weight: 61.2kg Range: 100km
Speed:> 90kts max, 55kts cruise
Endurance: > 24 hr
Altitude: 19,500ft
Payload capacity: 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
Remarks: Designed as a modular & flexible multi-mission UAV for land and maritime operations.

AVIATION INDUSTRY CORPORATION OF CHINA (AVIC)

Wing Loong I

Length: 9.05m Span: 14m
Maximum take-off weight: 1,100kg Range: 4,000km
Endurance: 20 hrs Speed: 150kts
Altitude: 16,000ft
Payload capacity: 200kg on pylons, 100kg for sensors. Reportedly capable of launching guided bombs including the FT-10, FT-9, FT-7, GB-7 and GB-4, and the BRM1 and AKD-10 guided missiles. In service with China and export customers inc Saudi Arabia and Egypt.
Powerplant: 1 x 100 hp Rotax 914 turbocharged piston engine, pusher propeller Launch/recovery: conventional
Remarks: MALE-class armed reconnaissance UAV in service with the armed forces of China, Egypt, Kazhakstan, Saudi Arabia, Serbia, Turkmenistan, and United Arab Emirates

Wing Loong II

Length: 11m Span: 20.5m
Maximum take-off weight: 4,200kg
Range: 4,500nm (estimate based on 140kts cruise & endurance)
Endurance: 32hrs
Speed: 200kts max, 81kts minAltitude: 32,500ft
Payload capacity: 480kg on external stores. Reportedly capable of launching guided bombs including the FT-10, FT-9, FT-7, GB-7 and GB-4, and the BRM1, AKD-10 and BA-7 guided missiles.
Powerplant: turbocharged piston engine
Launch/recovery: conventional
Remarks: MALE-class armed reconnaissance UAV in service with the armed forces of China, Egypt, Nigeria, Saudi Arabia, and United Arab Emirates

Yunying

Length: 9m
Span: 17.8m
Maximum take-off weight: 3,200kg
Range: N/A
Endurance: 6hrs
Speed: 335kt (ISR), 300kt (strike)
Altitude: 49,000ft (ISR), 46,000ft (strike)
Payload capacity: 200kg (ISR), 400kg (strike)
Powerplant: Single WP-11C turbojet engine
Launch/recovery: Conventional
Remarks: MALE-class armed reconnaissance UAV in development for domestic and export customers

Xianglong

Length: 14.3m Span: 25m
Maximum take-off weight: 10,000-12,000kg (estimate)
Range: 7,000km (estimate)
Endurance: 10hrs (estimate)
Speed: 405kts cruise
Altitude: 59,000ft
Payload Capacity: 650kg (estimate)
Powerplant: Single 43.1kN thrust WP-13 turbojet engine
Launch/recovery: Conventional
Remarks: HALE-class reconnaissance UAV broadly comparable with US Global Hawk, in service with the PLAAF

CHINA AEROSPACE SCIENCE AND TECHNOLOGY CORPORATION (CASC)

Cai Hong 4

Length: 8.5m Span: 18m
Maximum take-off weight: 1,330kg Range: 3,500km
Endurance: 40hrs Speed: 127kts max, 97kts cruise
Altitude: 23,600ft
Payload capacity: 345kg. Compatible armaments include AR-1, AR-1B, AR-2 air-to-surface anti-armour missiles, CS/BBE2 high-explosive bomb, and LS-6-50 small-diameter bomb, and FT-series precision bombs.
Powerplant: 100hp piston engine, pusher propeller
Launch/recovery: ConventionalRemarks: MALE-class armed reconnaissance UAV in service with the armed forces of Algeria, Egypt, Indonesia, Nigeria, Saudi Arabia

Cai Hong 5

Length: 11.3m Span: 21m
Maximum take-off weight: 3,300kg Range: 6,000km
Endurance: 40+hrs Speed: 157kts max, 97kts cruise
Altitude: 23,600+ft
Payload capacity: 1,200 kg (200 kg internal, 1,000kg external). Compatible armaments include AR-1, AR-1B, AR-2 air-to-surface anti-armour missiles, CS/BBE2 high-explosive bomb, and LS-6-50 small-diameter bomb, FT-series precision bombs, undisclosed 100 kg-class laser guided bombs.
Powerplant: 300hp piston engine, pusher propeller
Launch/recovery: Conventional
Remarks: MALE-class armed reconnaissance UAV for domestic and export customers.

Cai Hong 7

Length: 10m
Span: 22m
Maximum take-off weight: 13,000kg
Endurance: 10+hrs
Speed: 500kts max, 400kts cruise
Altitude: 42,650ft
Powerplant: Single turbofan engine
Launch/recovery: Conventional
Remarks: HALE-class low-observable unmanned combat aerial vehicle in development

DENEL DYNAMICS

Seeker 400

Length: 5.77m
Span: 10m
Maximum take-off weight: 450kg
Range: 250km
Speed: 81kts
Endurance: 16hrs
Altitude: 18,000ft
Payload: 100kg. S400 can carry dual imaging EO/IR payloads with gimbal diameters of up to 530mn with day TV, thermal imaging, colour/monochrome spotter camera, night spotter camera. Laser illuminator and LRF, electronic intelligence payload.
Powerplant: 1 x 85hp two-cylinder, air-cooled 4-str engine
Launch/recovery: conv/conv
Remarks: Seeker 400 is an evolution of the battle-proven Seeker II UAS. Operational in Algeria.

ELBIT

Hermes 450

Length: 5.7m
Span: 10.5m
Maximum take-off weight: 550kg
Range: 250km
Speed: 95kts
Endurance: 17hrs
Altitude: 18,000ft
Payload capacity: 180kg. Options include EO/IR, SAR/GMTI & maritime 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
Remarks: Multi-role, high-performance tactical UAS operational worldwide.

Hermes 900

Length: 8.3m
Span: 15m
Maximum take-off weight: 1,180kg
Range: 2,500km estimate
Speed: 119kts max, 60kts cruise
Endurance: 30-36hrs
Altitude: 30,000ft
Payload capacity: 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 × 115hp Rotax 914 4-str engine
Launch/recovery: conv/conv
Remarks: Next-generation MALE UAS equipped with a variety of high-performance sensors to detect ground or maritime targets over a wide spectral range.

Hermes 900 Starliner

Length: 8.8m
Span: 17m
Maximum take-off weight: 1,600kg
Range: 2,500km estimate
Speed: 119kts max, 60kts cruise
Endurance: 36hrs
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. Designed to comply with civilian airspace regulations.
Powerplant: 1 × 115hp Rotax 914 4-str engine
Launch/recovery: conv/convRemarks: Next-generation MALE UAS qualified for flight in and transit through civilian air space.

EMT PENZBURG

Luna NG

Length: 3.0m
Span: 5.3m
Maximum take-off weight: 110kg
Range: > 100km data
linkEndurance: > 12hrs
Speed: 48.5kts
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.
Powerplant: 1 x 10 kW, fuel-injected multi-fuel engine
Launch/recovery: cat/para or net
Remarks: Purchased by the German Army.

Aladin

Length: 1.57m
Span: 1.46m
Maximum take-off weight: < 4kg
Range: > 15km
Endurance: > 1hrs
Speed: 21.5-38kts
Altitude: 98ft AGL minimum, 30-90ft typical, 14,700ft density alt max
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
Remarks: High performance mini UAV in operational service with several NATO countries.

ENICS

Eleron-3SV (T-28 air vehicle)

Length: 0.6m
Span: 1.47m
Maximum take-off weight: 5.5kg
Range: 25km with comms link, 50km off line
Endurance: 1hr 40min
Speed: 30-70kts
Altitude: 16,400ft
Payload: Option 1: 3-axis stabilised turret with a 10x optical magnification-enabled video camera and digital photo camera with minimum 10.2mpix resolution. Option 2: Stabilised turret with 10x thermal imaging and video camera. Digital camera with minimum 10.2Mp resolution.
Powerplant: battery & 1 x electric motor driving pusher propeller
Launch/recovery: cat/para
Remarks: Designed for round-the-clock aerial electro-optical surveillance. Can be supplied with Russian "Acceptance 5" quality standard certification

Eleron-10SV (T-10 air vehicle)

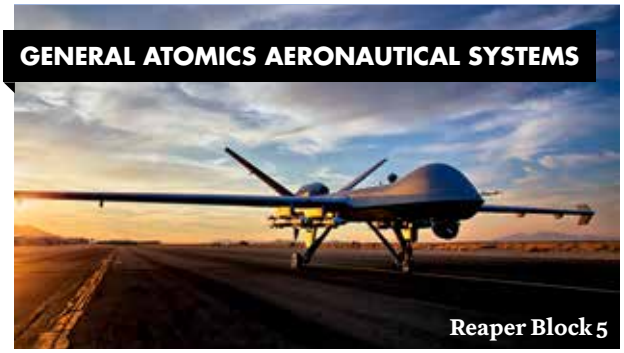
Length: 87cm
Span: 220cm
Maximum take-off weight: 12kg
Range: Up to 30km
Endurance: 2hrs 30min
Speed: 30-70kts
Ceiling: 13,100ft
Payload: Option 1: 3-axis stabilised turret with a 36x optical magnification video camera, plus a 10mpix digital camera. Option 2: 3-axis stabilised turret with an uncooled thermal imager and a video camera, plus a 10mpix digital camera, drop containers optional
Powerplant: battery & electric motor driving pusher propeller
Launch/recovery: cat/para
Remarks: Larger member of Eleron range. Used by Russian Ground Forces for local ISR.

FLIR SYSTEMS

Black Hornet PRS/VRS

Length: 12cm
Rotor diameter: 12cm
Maximum take-off weight: < 33g
Range: 2km
Endurance: 25min
Speed: 12kts
Altitude: > rooftop
Payload: Day: 2 x EO cameras, 1 video, 1 high-res snapshot. Night: fused thermal and EO.
Powerplant: battery & electric motor driving two-blade main and tail rotors
Launch/recovery: VTOL
Remarks: Personal/vehicle reconnaissance system. Vehicle launch unit mounts externally and fully integrates within vehicle.

GENERAL ATOMICS AERONAUTICAL SYSTEMS



Reaper Block 5

Length: 11m
Span: 20m
Maximum take-off weight: 4,763kg
Range: LOS/global
Endurance: 27hrs
Speed: 240kts max
Altitude: 50,000ft MSL
Payload Capacity: 1,701kg (386kg internal, 1,361kg external, not simultaneous)
Payloads: MTS-B EO/IR, Lynx multi-mode radar, maritime radar, SIGINT/ESM system, Automatic Identification System (AIS), comms relay, dual ARC-210 UHF/VHF radios, other customer specific payloads.
Weapons: Hellfire missiles, GBU-12, GBU-38, GBU-49 smart bombs
Powerplant: Honeywell TPE331-10 turboprop 3-blade propeller
Launch/recovery: conv/conv
Remarks: Operated by: USAF, US Homeland Security, Australia, France, Italy, Netherlands, Spain, UK to be replaced by Protector RG Mk1.Ordered by India.

Gray Eagle Extended Range

Length: 9m
Span: 17m
Maximum take-off weight: 1,905kg
Range: LOS/global (comms)
Endurance: 42hrs
Speed: 167kts
Altitude: 29,000ft
Payload Capacity: 261kg internal, 227kg external. EO/IR, SAR/GMTI radar, communications relay.
Powerplant: HFE-180 HP heavy-fuel engine
Launch/recovery: conv/conv
Remarks: Open, modular architecture supports integration of three payloads simultaneously, with capacity for growth.

SkyGuardian

Length: 11.7m
Span: 24m
Maximum take-off weight: 5,670kg
Range: LOS/global
Endurance: 40hrs
Speed: 210kts
Altitude: 40,000+ft
Payload Capacity: 363kg internal, 1814kg external. 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
Remarks: Selected by UK as Protector RG Mk1, and Belgium.

HESA

Ababil-3

Length: 3.5m
Span: 5m
Maximum take-off weight: 83kg
Speed: 108kt
Endurance: 4h
Ceiling: 16.500ft
Payload : 40kg
Powerplant: 25hp WAE-342 twin-cylinder piston engine
Launch/recovery: conv/conv
Remarks: Iranian tactical UAV.

Shahed-129

Length: 8m
Span: 16m
Speed: 81kt
Endurance: 24h
Ceiling: 24,000ft
Payload : 400kg including Oghab-6 EO/IR sensor
Powerplant: Rotax 914 Twin piston engine.
Launch/recovery: conv/conv
Remarks: Iranian armed MALE. The naval version is called Simorgh.

IAI

Heron Mk2

Length: 8.5m
Span: 16.6m
Maximum take-off weight: 1,350kg
Range: > 1000km
Endurance: 45hrs
Speed: 140kts max, 60-80kts loiter
Altitude: > 35,000ft
Payload capacity: 470kg
Payloads: New configuration include long-range EO systems and radars plus a wide range of additional payloads: ELINT/COMINT/ESM, communication relay, special etc
Powerplant: 1 x 135 HP Rotax 915ls B Certified electronic-controlled fuel injection engine
Launch/recovery: conventional runway automatic take-off and landing system
Remarks: Updated version of Heron enabling new configurations with long-range observation sensors and radars.

Heron TP

Length: 14m
Span: 26m
Maximum take-off weight: 5,670kg
Range: BLOS
Endurance: > 30hrs
Speed: 220 kts
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: 1,200hp Pratt & Whitney Canada PT6 Turboprop driving pusher propeller
Launch/recovery: conv/conv, automatic takeoff and landing system (ATOL)
Remarks: Turbine-powered MALE UAV with large internal volume for a variety of payloads, certified to STANAG 4671 and compatible with NATO standards.

Searcher Mk III

Length: 5.85m
Span: 8.55m
Maximum take-off weight: 450kg
Range: 350km
Endurance: 20hrs
Speed: 110kts max, 60-80 kts loiter
Altitude: 21,000ft service ceiling
Payload: 120kg. EO/IR or SAR/GMTI or SIGINT, aerial data relay
Powerplant: Jabiru 4-str "silent" piston engine
Launch/recovery: conv/conv
Remarks: Offers multiple operational configurations, operates in extreme weather, fully redundant avionics.

INDRA

Pelicano

Length: 3.4m
Span: 3.3m rotor dia
Maximum take-off weight: 200kg
Range: 100km
Endurance: 4-6hrs
Speed: 100kts
Altitude: 11,811ft
Payload: 30kg
Gyro-Stabilised MMP EO/thermal camera, Automatic Identification System (AIS)
Powerplant: Heavy fuel engine burning JP5
Launch/recovery: VTOL
Remarks: Maritime unmanned helicopter designed to support surveillance and law enforcement tasks from a ship or a ground base.

IRAN AVIATION INDUSTRIES ORGANISATION

Fotros

Length: 9m
Span: 21m
Maximum take-off weight: 1,000kg
Speed: 117kt
Endurance: 30h
Ceiling: 45,000ft
Payload : 200kg EO/IR sensor
Launch/recovery: conv/conv
Remarks: The largest Iranian armed MALE UAV.

Yasir

Length: 1.19m
Span: 3.05m
Maximum take-off weight: 26.5kg
Speed: 65ktA
Endurance: 8h
Ceiling: 15,000ft
Payload:10kg EO/IR sensor
Powerplant: Two-bladed propeller piston engine
Launch/recovery: cat/sky-net
Remarks: Iranian copy of the Insitu Scan Eagle.

KRONSTADT GROUP

Orion-E

Span: 16m
Maximum take-off weight: 1,000kg
Speed: 65kt
Endurance: 24h
Ceiling: 24,600ft
Payload : 200kg including an optoelectronic station with two thermal imagers, a wide-angle TV camera and a laser rangefinder/target designator
Launch/recovery: conv/conv
Remarks: First Russian armed MALE UAV, undertook combat evaluation in Syria.

LEONARDO

AWHero

Length: 3.7m
Rotor diamter: 4m
Maximum take-off weight: 200g class
Endurance: 6hrs with 35kg payload
Speed: 90kts max cruise
Altitude: 14,000ft service ceiling
Useful load: 85kg (payload + fuel)
Payloads: Options include EO/IR turret, maritime radar, synthetic aperture radar, ESM, ADS-B, IFF, LiDAR, AIS
Powerplant: Heavy fuel engine burning JP5, JP8, Jet A1
Launch/recovery: Automated TOL
Remarks: Maritime rotorcraft UAS that took part in a successful maritime surveillance capability demonstration in the European OCEAN 2020 initiative in the Mediterranean in late 2019. Shortlisted for Australia's SEA129-5 Programme.

Falco

Length: 5.25m
Span: 7.2m
Maximum take-off weight: 490kg
Range: > 200km
Endurance: 8-14hrs
Speed: 117kts
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: 65hp gasoline engine
Launch/recovery: conv/conv
Remarks: Medium altitude, medium endurance tactical UAV intended for surveillance missions.

Falco Xplorer

Length: 9m
Span: 18.5m
Maximum take-off weight: 1,300kg
Range: comms range unlimited (satcom)
Endurance: > 24hrs
Altitude: > 30,000ft service ceiling
Payload capacity: 350kg
Payloads: Gabbiano T80UL multimode synthetic aperture radar mapping, ground moving target indication. EO turret up to 20-in diameter, visual/IR/laser rangefinder, laser marker and optional laser designator, ELINT or COMINT suite, AIS
Launch/recovery: conv/conv
Remarks: Large UAV to be offered as both an integrated platform and as a fully-managed information-superiority service to military and civil customers, designed for civil certification First flight 15 January 2020.

LOCKHEED MARTIN

Desert Hawk III

Span; 1.5m
Maximum take-off weight: 3.72kg
Range:
Endurance: 1.5hrs
Speed: 50kts
Altitude: 11,000ft
Payload: 0.9kg. Includes 360-degree colour EO and IR video camera systems, plus other interchangeable, snap-on "Plug and Playloads"
Powerplant: battery & electric motor driving tractor propeller
Launch/recovery: hand/conv skid
Remarks: Small UAS that provides day and night support to small unit ISTAR and related operations.

Stalker XE

Span: 3.66m
Maximum take-off weight: 10.9kg
Range: 370 km (aircraft), 93km comms
Endurance: > 8hrs
Speed: 30.4kts cruise, 39kts dash
Altitude: 12,000ft max launch alt
Payload capacity: 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
Remarks: VTOL capability provided by four electric motors driving vertical propellers mounted in pairs mid-span

RQ-170 Sentinel

Length: 4.5m
Span: 19.99m
Maximum take-off weight: 3,850kg
Speed: 108kt
Endurance: 25h
Ceiling: 15,000ft
Payload: 100kg including an EO/IR sensor and possibly an AESA radar
Powerplant: Garrett TFE731 turbofan engine
Launch/recovery: conv/conv
Remarks: Classified stealthy HALE UAV

LUCH

Korsar

Length: 4.2m
Span: 6.5m
Maximum take-off weight: 400kg
Speed: 81kt
Endurance: 12h
Ceiling: 6,600ft
Payload: Components based on the mission requirement
Powerplant: 70hp piston engine
Launch/recovery: conv/conv
Remarks: Russian medium weight tactical UAV.

NORTHROP GRUMMAN

MQ-8C Fire Scout

Length: 12.6m
Span: 10.7m dia
Maximum take-off weight: 2,722 kg
Range: 278km radius from ship, 2,556km) estimate based on endurance & cruise speed
Endurance: 12hrs
Speed: 135kts max, 115kts cruise
Altitude: 16,000ft
Payload capacity: 318kg
Payloads: 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: automatic VTOL
Remarks: US Navy declared the MQ-8C mission capable and ready to deploy aboard Littoral Combat Ships in 2021

Global Hawk

Length: 14.5m
Span: 39.8m
Maximum take-off weight: 14,628kg
Range: 22,780km (ferry)
Endurance: > 34hrs
Speed: 310 kts loiter
Altitude: 60,000ft
Payload capacity: 1,360kg
Payloads: 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: Rolls-Royce AE3007 turbofan generating up to 3,856 kg thrust
Launch/recovery: conventional runway, automatic
Remarks: HALE UAV in service with USAF since 2001. Gathers near-real-time, high-resolution imagery of large areas of land, 24/7. EQ-4B version carries the Battlefield Airborne Communications Node (BACN) payload.

Triton

Length: 14.5m
Span: 39.9m
Maximum take-off weight: 14,630kg
Range: 15,186km (ferry)
Endurance: 30hrs
Speed: 320kts
Altitude: 56,500ft
Payload capacity: 1,452kg max internal, 1,089kg external
Payloads: Multi-Function Active Sensor Active Electronically Steered Array (MFAS AESA) radar, MTS-B multi-spectral targeting system
Powerplant: Rolls-Royce AE3007 turbofan generating up to 8,500 lbs thrust
Launch/recovery: conventional runway
Remarks: Developed under the US Navy's Broad Area Maritime Surveillance programme, Triton's role is to provide ISR over vast ocean and coastal regions, conduct search and rescue missions, and to complement the P-8 Poseidon MPA.

NOSTROMO DEFENSA

Yarara

Length: 2.465m
Span: 3.98m
Maximum take-off weight: 35kg
Range: > 50 km LOS link range
Endurance; 6hrs
Speed: 90kts max
Altitude: 9,843ft
Payload capacity: 5.5kg
Payloads: IAI MicroPOP EO/IR turret
Powerplant: 1 x 8hp Cubewano Sonic 35 multi-fuel rotary engine driving 3-blade pusher propeller mounted above the wing.
Launch/recovery: conventional, unprepared runway
Remarks: Operated by the Argentinian Air Force, system comprises three UAVs, GCS and support equipment in three boxes weighting less than 250kg.

PIAGGIO AEROSPACE

Hammerhead

Length: 14.4m
Span: 15.6m
Maximum take-off weight: 6,600kg
Range: 7,038km
Endurance: 15hrs max with 227kg payload, 9.5hrs 1,500km from base
Speed: 395kts max, 320kts cruise, 135kts loiter
Altitude: 45,000ft service ceiling Payload capacity: 227kg standard
Payloads: 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 × 850shp Pratt & Whitney Canada PT6A-66B pusher turboprops
Launch/recovery: conventional runway
Remarks: Based on P180 Avanti manned business aircraft. UAE launch order cancelled. Italian government has pledged continued support for certification.

QODS

Mohajer-4B

Length: 3.75m
Span: 6.5m
Maximum take-off weight: 242kg
Speed: 110kt
Endurance: 6h
Ceiling: 15,000ft
Payload : 20kg including a gimbal-mounted EO/IR sensor
Powerplant: 50hp Limbach L550E piston engine
Launch/recovery: cat/para
Remarks: Iranian tactical UAV.

SAFRAN

Patroller

Length: 8.5m
Span: 18m
Maximum take-off weight
Range: 200 m LOS
Endurance: 20hr
Speed: 110kts max
Altitude: 20,000ft
Payload capacity: 250kg
Payloads: Safran Euroflir 410 EO/IR turret plus COMINT, SIGINT, radar and other sensors.
Powerplant: 1 x 115hp Rotax 914F 4-cyl turbocharged liquid cooled engine
Launch/recovery: conv/conv
Remarks: The French Army has 14 on order, was due to receive the first 5 at the end of 2019, 14 in 2020 and two more in 2024. No deliveries yet reported.

SCHIEBEL

Camcopter S-100

Length: 3.11m
Span: 3.4m rotor diameter
Maximum take-off weight: 200kg
Range: 50, 100 or 200km data link range
Endurance: > 6hrs with 34kg payload, > 10hrs with external fuel
Speed: 120kts dash, 55kts estimate endurance
Altitude: 18,000ft
Payload capacity: 50kg
Payloads: 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.
Powerplant: 50hp rotary engine
Launch/recovery: VTOL
Remarks: Delivered to 35 customers worldwide.

SPECIAL TECHNOLOGIES CENTER

Orlan-10

Length: 1.8m
Span: 3.1m
Maximum take-off weight: 18.7kg
Speed: 92kt
Endurance: 4h
Ceiling: 16,404ft
Payload: 6kg
Powerplant: Piston engine
Launch/recovery: cat/para
Remarks: Russian Ground Force's standard multirole tactical UAV.

STM

KARGU

Technical Features
Range: < 10 km (LoS)
Endurance: < 30 minutes
Mission Altitude: < 500 meters
Maximum Altitude: 3.300 meters (MSL)
Cruise Speed: 72 kmh
Dimensions: 600mm x 600mm x 430mm
Weight : 7.060 grams
Operating Temperature: -20 / + 50 °C
Remarks: KARGU is a Rotary Wing Mini UAV system designed for Tactical ISR and Precision Strike missions. The system is man-packable and can be operated by a single personnel. The KARGU platform can be navigated both autonomously and in manual modes by the operator. The platform also has the capability to detect and track multiple types of targets through image processing algorithms. For precision strike missions, KARGU employs the man-in-the-loop principle, through which the operator selects the target and approves a potential strike mission through the Ground Control Station.

ALPAGU

Technical Features
Operational Range: < 10 km
Mission Endurance: 10 minutes
Mission Altitude: 400 ft (AGL)
Cruise Speed: 50 knots
Maximum Speed: 65 knots
Wight: 1.9 kg
Operating Temperature: -20 / + 50 °C
Power: LiPo Battery
Deployment Time: Maximum 1 minute
Remarks: ALPAGU Fixed-Wing Autonomous Tactical Attack UAV is designed for both reconnaissance and surveillance and for striking targets outside the line of sight with high accuracy, can be carried by a single soldier, and can operate autonomously or with remote control.

TOGAN

Technical Features
Range: 5 km
Endurance: 45 minutes
Mission Altitude: 500 meters (AGL)
Maximum Altitude: 3.300 meters (MSL)
Maximum Speed: 72 km/hour
Weight : < 7.000 grams
Operating Temperature: -20 / + 50 °C
Power: Li-ion Battery
Deployment Time: 45 seconds
Remarks: TOGAN is a autonomous multi-rotor reconnaissance UAS solution engineered for general-purpose reconnaissance and surveillance missions with indigenous mission planning software, autonomous intelligence, and operational capabilities. It can be controlled autonomously or via remote control, and be deployed and operated by a single personnel.

SUKHOI

S-70 Okhotnik-B

Length: 14m
Span: 20m
Maximum take-off weight: 20,000kg
Speed: 432kt
Range: 5,000km
Payload: 2,000kg weapons carried in internal weapons bay
Powerplant: Saturn AL-31F turbofan
Launch/recovery: conv/conv
Remarks: Russian advanced strike UAV.

SURVEY COPTER

Aliaca

Length: 1.85m
Maximum take-off weight: 12kg
Speed: 52kts
Altitude: 9,843ft
Payload capacity: 1.1kg
Payload: T120 gyrostabilised EO/IR turret
Powerplant: battery & 1 electric motor driving a single tractor propeller
Launch/recovery: cat/belly
Remarks: Developed for ISR, protection & monitoring missions in military and civil applications. Currently deployed by the French Army and Navy, overseas land & naval forces, SOF, police & gendarmerie.
Span: 3m
Range: 50km
Endurance: 3hrs

Tracker 120

Length: 1.54m
Maximum take-off weight: 8.7kg
Speed: 17 to 25 m/sec
Altitude: 985ft cruise, 8,200ft max
Payload capacity: 1.1kg
Payloads: T120 gyrostabilised EO/IR turret
Powerplant: battery & 2 x electric motors driving twin tractor propellers
Launch/recovery: hand/belly landing
Remarks: Designed for ISR, coastal surveillance, convoy protection, monitoring of sensitive areas
Span: 3.3m
Range: 25km
Endurance: 90 mins

DFV 2000 ER

Length: 2.27m
Maximum take-off weight: 22.5kg
Speed: 65kts
Altitude: 32,300ft
Payload capacity: 2kg
Payload: Survey-Copter's own T120 gyrostabilised EO/IR turret
Powerplant: 1 x fuel-injected 2-str engine
Launch/recovery: cat/conv
Remarks: Designed for military and civilian intelligence, surveillance and inspection missions
Span: 3.3m
Range: > 50km
Endurance: 7hrs

TURKISH AEROSPACE

Aksungur

Length: 8.6 m
Maximum take-off weight: 1,700 kg
Endurance: 30+ Hours @ Mission Altitude
Altitude: 30,000 ft (MSL)
Payloads: EO/IR/LD/LRF Camera, SAR/GMTI-ISAR Radar, Wide Area Surveillance Camera, ESM/ EA, ComJam, Precision Guided Bombs, Laser Guided Rockets, Anti-Tank Missiles, Wideband SATCOM up to 20 Mbps, PLS, VHF/UHF Radio Communication & Relay, Digital Data Recorder, IFF, MALD
Powerplant: Heavy Fuel Engine
Launch/recovery: Conventional Runway, Automatic Takeoff and Landing System (ATOL)
Remarks: More than 30 in service with Turkish Air Force, Navy and Ministry of Interior. Ordered by Tunisia.
Span: 17.5 m
Range: 250+ km
Speed: 120 kts
Payload capacity: 350+ kg

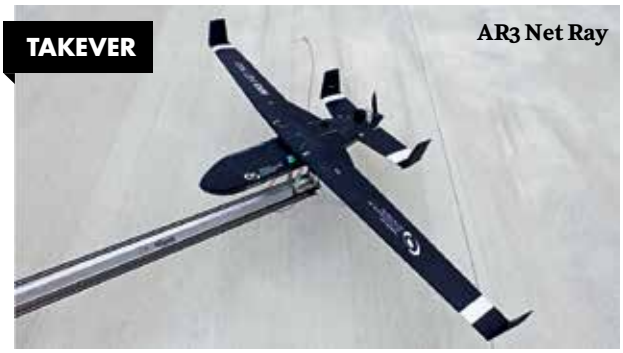
Anka

Length: 12.5 m
Span: 24.2 m
Maximum take-off weight: 3,300 kg
Range: 250+ km
Endurance: 50 Hours
Speed: 153 kts
Altitude: 40,000 ft (MSL)
Payload capacity: 750+ kg
Payloads: EO/IR/LD/LRF Camera, SAR/GMTI-ISAR Radar, Wide Area Surveillance Camera, Automatic Identification System, Sonobuoy Pod, MAD Boom, SATCOM, PLS, V/UHF Radio Relay, Airborne Communications Node Pod, 3 hardpoints on each wing with 500 kg, 300 kg and 150 kg capacities, TEBER-B1, TEBER-B2, L-UMTAS, MAM-L, Cirit, MAM-C, HGK-3, KGK (82), Small Diameter Bomb
Powerplant: PD-170 Dual Turbo Diesel 2*170 HP (SL, ISA)
Launch/recovery: Conventional Runway, Automatic Takeoff and Landing System (ATOL)
Remarks: MALE+ Class UAV System with ISTAR and Strike Capabilities.

Şimşek

Length: 2.3 m
Span: 1.5 m
Maximum take-off weight: 70 kg
Range: 70+ km LOS
Endurance: 45+ Minutes
Speed: 350+ kts at sea level
Altitude: 50-20,000 ft (MSL)
Payload capacity: 750+ kg
Payloads: Radar Cross Section Augmenter (Active or Passive), Miss Distance Indıcator (MDI), Smoke Generator, Radar Altimeter, Hot Nose, Automatic Identification System (AIS)
Powerplant: Turbojet Engine
Launch/recovery: Catapult launched from land or ship's deck
Remarks: Şimşek Target Drone, with its wide variety of payloads and effective flight envelope, can be configured to simulate different type of aircraft and missiles. Operational in Turkey.

TAKEVER



AR3 Net Ray

Length: 1.7m
Span: 3.5m
Maximum take-off weight: 23kg
Speed: 65kt
Endurance: 16h
Payload: 4kg including EO/IR sensor
Powerplant: Piston engine
Launch/recovery: cat/para
Remarks: Portuguese MUAS sold to Nigeria.

TEXTRON UNMANNED SYSTEMS

Aerosonde Hybrid Quadrotor (HQ)

Length: 2.1 m
Span: 3.6 m
Maximum take-off weight: 47kg
Range: 140km comms range
Endurance: 10hrs with multi-INT payload
Speed: 65kts
Altitude: 10,500ft density altitude with multi-INT payload
Payload capacity: 6.8kg
Payloads: Can carry Cloudcap TASE 400 two-axis stabilised turret with EO/MWIR with continuous zoom optics with multiple 3rd bay and laser options, integrated GPS/INS, onboard video processing
Powerplant: Lycoming EL-005 two-stroke Heavy Fuel Engine plus 4 electric vertical rotors
Launch/recovery: VTOL
Remarks: Runway independent development of Aerosonde

Shadow V2

Length: 3.66m
Span: 26.2m
Maximum take-off weight: 212kg
Range: 125km LOS
Endurance: 9hrs
Speed: 62-65kts / Max 98kts dependent on mission profile
Altitude: 18,000ft ceiling, 10,000ft max take-off elevation
Payload capacity: 43kg
Payloads: EO/IR, communications relay, optional laser designation,etc.
Powerplant: UAV Engines model 741 rotary engine
Launch/recovery: cat/conv, arrested
Remarks: Operators of this and earlier versions include the US Army, US Marine Corps, the Australian Army, the Italian Army, and the Swedish Army

THALES

Tactical (Watchkeeper)

Length: approx 5.7m
Span: 10.5m
Maximum take-off weight: 550kg
Range: 200km
Endurance: 16hrs
Speed: 95kts
Altitude: 16,000ft
Payload capacity: 150kg
Payloads: 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 52hp UAV Engines R802/902 rotary
Launch/recovery: conv/conv
Remarks: Based on Elbit Hermes 450, Watchkeeper is British Army tactical UAV system, latest version offered for export by Thales is Watchkeeper X

Spy'Ranger

Length: 1.76m (estimate)
Span: 3.9m
Maximum take-off weight: 14kg
Range: 30km (comms limited)
Endurance: 3hrs
Speed: 49kts
Altitude: 14,764ft (t/o)
Payload: 1.2kg
Powerplant: battery & DC brushless electric motor
Launch/recovery: cat/belly
Remarks: French Army acquired a fleet of 210 Spy'Rangers for reconnaissance and observation missions

UAV FACTORY

Penguin C

Length: 2.3m
Span: 3.3m
Maximum take-off weight: 22.5kg
Speed: 62kt
Endurance: 20h
Ceiling: 16,400ft
Payload : 10kg including Single sensor gyro-stabilized gimbal with Epsilon 135 EO sensor
Powerplant: 28hp EFI piston engine
Launch/recovery: cat/para
Remarks: US/Latvia manufactured long-endurance mini-UAV ordered by the Latvian National Armed Forces.

UMS SKELDAR

V-200

Length: 4.031m
Rotor diameter: 4.6m
Maximum take-off weight: 235kg
Endurance: >5 hr with 20kg payload at ISA
Speed: 81kts
Altitude: 12,000ft
Payloads: Optional payloads: advanced EO/IR turrets, Sentient Vision ViDAR, SAR/GMTI radar, hyper-spectral and multi-spectral cameras, comms relay systems
Powerplant: 1 x 54hp Hirth heavy fuel engine running on Jet A1, JP5 & JP8
Launch/recovery: VTOL
Remarks: Maritime unmanned helicopterwith open interface to battlefield management and C4ISR systems, STANAG 4586 compliance for ease of integration into ships. Bidding for the Polish Navy programme.

UWCA

Forpost

Length: 5.85m
Span: 8.55m
Maximum take-off weight: 450kg
Speed: 80kt
Endurance: 18h
Ceiling: 23,000ft
Payload : 120kg
Powerplant: Limbach L550 piston engine
Launch/recovery: conv/conv
Remarks: Russian license-built IAI Searcher III tactical UAV.

VESTEL DEFENSE INDUSTRY

Karayel

Length: 6.5m
Span: 13m
Maximum take-off weight: 630kg
Speed: 80kt
Endurance: 20h
Ceiling: 18,000ft
Payload : 70kg including EO/IR sensor
Powerplant: 97hp piston engine.
Launch/recovery: conv/conv
Remarks: Turkish armed MALE UAV designed and produced according to STANAG-4671. Is being built under license in Saudi Arabia.

VIETTEL

VT-Patrol

Length: 2.8m
Span: 3.3m
Maximum take-off weight: 26 kg
Range: 50km
Altitude: 14,763ft
Powerplant: Piston engine, pusher propeller
Launch/recovery: Conventional
Remarks: Mini-class reconnaissance UAV in service with the Vietnamese armed forces.

ZHONG TIAN GUIDE CONTROL TECHNOLOGY COMPANY

Fei Long-1

Length: 2.2m estimate
Span: 20m estimate
Maximum take-off weight: 3,200kg
Speed: 125kt
Endurance: 25h
Ceiling: 26,245ft
Payload:1,400kg
Powerplant: Rear-mounted heavy fuel engine.
Launch/recovery: conv/conv
Remarks: Chinese MALE designed to operate in China's high altitude regions for border patrol and SAR missions..

INDIA: DEFENCE RESEARCH AND DEVELOPMENT ORGANISATION (DRDO)

Rustom-2

Length: 9.5m
Span: 20m
Maximum take-off weight: 1,800kg
Endurance: 24hrs (estimate)
Speed: 135kt cruise
Altitude: 35,000ft
Payload Capacity: 350kg
Powerplant: Two 100hp Saturn 36T turboprop engines, tractor propellers
Launch/recovery: Conventional
Remarks: MALE-class reconnaissance UAV being developed for the Indian armed forces.

SOUTH KOREA: KOREAN AIR AEROSPACE DIVISION (KAL-ASD)

KUS-7/RQ-102

Length: 3.7m
Span: 4.5m
Maximum take-off weight: 150kg
Range: N/A
Endurance: 3hrs
Speed: N/A
Altitude: N/A
Payload Capacity: N/A
Powerplant: 35hp rotary engine, pusher propeller
Launch/recovery: Conventional
Remarks: Tactical-class reconnaissance UAV in service with the Republic of Korea Army

KUS-FS/Mid-Altitude UAV (MUAV)

Length: 13m
Span: 25m
Maximum take-off weight: N/A
Range: 1,852km (estimate)
Endurance: 24+hrs
Speed: N/A
Altitude: 42,650ft
Payload Capacity: 150kg
Payloads: Electro-optical sensor system under fuselage
Powerplant: 1,200hp turboprop engine, pusher propeller
Launch/recovery: Conventional
Remarks: MALE-class reconnaissance UAV in development for the Republic of Korea Army Ground Operations Command

TAIWAN: NATIONAL CHUNG-SHAN INSTITUTE OF SCIENCE AND TECHNOLOGY (NCSIST)

Albatross

Length: 5.3m
Span: 8.7m
Maximum take-off weight: 450kg
Range: 120km
Endurance: 10hrs
Speed: 97kts max level speed, 60kt cruise
Altitude: 15,000ft
Payload Capacity: 51kg
Powerplant: Single piston engine, pusher propeller
Launch/recovery: Conventional
Remarks: Tactical-class reconnaissance UAV in service with the Republic of China Army and Navy

Teng Yun (Cloud Rider)

Length: 8m
Span: 18m
Range: 1,000km+
Endurance: 24hrs
Altitude: 25,000ft
Powerplant: Single turboprop engine, pusher propeller
Launch/recovery: Conventional
Remarks: MALE-class reconnaissance UAV in development for the Republic of China Air Force.

THAILAND: RV CONNEX

RTAF U-1

Span: 6.2m
Range: 100-150km
Endurance: 6hrs
Altitude: 10,000ft
Payload Capacity: 30kg
Powerplant: 25hp piston engine, pusher propeller
Launch/recovery: Conventional
Remarks: Tactical-class reconnaissance UAV in service with the Royal Thai Air Force, derived from Sky Scout UAV.

ZALA AERO GROUP

ZALA 421-16E5G HD

Length: 1.85m
Span: 4.64m
Maximum take-off weight: 29.9kg
Range: 1200+ km
Endurance: 12+ hr
Speed: 65-110 km/h
Altitude: 200-5000 m
Payloads: Interchangeable ZALA payloads
Gyro-stabilized EO/IR HD sensors: Full HD video with 60-x optical zoom, 42Mp photo, HD thermal imager with 8x zoom, LiDAR, gas detector, dosimeter, relay module
Powerplant: Hybrid (buffer storage battery and combustion engine)
Launch: Pneumatic catapult
Recovery: Parachute, airbag
Remarks: ZALA 421-16E5G is a serial hybrid powerplant that provides a guaranteed flight time of more than 12 hours.

ZALA 421-16E HD

Length: 1.18m
Maximum take-off weight: 10.5kg
Endurance: 4+ hr
Altitude: 100-5000 m
Span: 2.815m
Range: 75/100+ km
Speed: 65-110 km/h
Payloads: interchangeable ZALA payloads
Gyro-stabilized EO/IR HD sensors: Full HD video with 60-x optical zoom, 42Mp photo, HD thermal imager with 8x zoom, gas detector, dosimeter, relay module
Powerplant: Electric
Launch: Pneumatic/mechanic catapult
Recovery: Parachute, airbag
Maximum wind speed: 15 m/s
Remarks: Time-proven, the most popular UAV from ZALA product line, with low acoustic, visual, and radar signatures.

ZALA 421-16E2

Length: 1.1m
Maximum take-off weight: 7.5 kg
Endurance: 4+ hr
Altitude: 100-5000 m
Span: 2.8 m
Range: 30/60+ km
Speed: 65-110 km/h
Payloads: interchangeable ZALA payloads
Gyro-stabilized EO/IR HD sensors: Video with 60-x optical zoom, 42Mp photo, thermal imager with 8x zoom, gas detector, dosimeter, relay module
Powerplant: Electric
Launch: Elastic catapult
Recovery: Parachute, airbag
Remarks: Hand-launched tactical UAV with the best payloads with guaranteed 4+ hrs endurance.

ZALA VTOL

Length: 1.18m
Maximum take-off weight: 11.5kg
Endurance: 2+/4+ hr
Altitude: 100-2000 m
Span: 2.815m
Range: 25/75 km
Speed: 0-110 km/h
Payloads: interchangeable ZALA payloads
Gyro-stabilized EO/IR HD sensors: Full HD video with 60-x optical zoom, 42Mp photo, HD thermal imager with 8x zoom, gas detector, dosimeter, relay module
Powerplants: Electric
Launch: Automatic-Vertical/ Pneumatic catapult
Recovery: Automatic-Vertical/Parachute with airbag
Maximum wind speed: 10 m/s
Remarks: Combines the best qualities of an airplane and tiltrotor drones, by changing the wings therefore changing configuration depending on the conditions of the task and provides aerial monitoring of any hard-to-reach places and areal objects.


US Navy

The US Navy's MQ-3C Fire Scout MUAS has yet to find a role.

NAVIES NOW SEEKING MUAS BIDS

There has been a resurgence of interest in unmanned aerial submarine-hunting capabilities as potential underwater threats, especially from Russia and China, continue to grow.

David Oliver

The United States Navy operated the first operational shipborne unmanned vertical take-off and landing (VTOL) aircraft, the Gyrodyne QH-50 Drone Anti-Submarine Helicopter (DASH). More than 500 were delivered to the US Navy and were used in action in the Gulf of Tonkin during the Vietnam War in 1966, and 16 were delivered to the Japanese Maritime Self-Defence Force.

It would be another 40 years before the US Navy took delivery of another VTOL UAV, Northrop Grumman's RQ-8A Fire Scout based on the Schweizer 333 light helicopter. However after a protracted development only small numbers of the later RQ-8Bs were operational and several were lost in accidents including one on 14 August 2020 at Naval Base Ventura County, at Point Mugu and another on 27 April 2021 when it crashed on landing on the USS Charleston in the Pacific. The US Navy switched its focus to the larger Northrop Grumman MQ-8C Fire Scout based on the Bell 407 helicopter which made it first unmanned flight in December 2010. The US Navy has a requirement for 38 MQ-3Cs but it was not until July 2019 that it was declared mission capable although its exact role is still under review.

Martin UAV's V-Bat long-endurance VTOL UAV has been down selected for the

USN's Mi2 Challenge to prototype new UAS capabilities to address the technological requirements of harsh operating environments. Martin UAV was one of 13 respondents to the Mi2 Challenge and was down selected in April 2021 with L3Harris Technologies to compete in a technology demonstration at the Yuma Proving Grounds in Arizona.

At the other end of the scale, the MQ-4C Triton high-altitude, long endurance (HALE) UAV is a maritime version of the Northrop Grumman Global Hawk that has been in US Navy service since 2018.

In August of that year Boeing Defense, Space & Security won the US Navy's Carrier-Based Aerial-Refuelling Systems competition with its MQ-25 Stingray UAV. In partnership with the US Navy, Boeing's MQ-25 T1 flew for more than six hours on a recent test flight, as well as its highest flight to date, to an altitude of 30.000ft (9,100m). In early June the T1 completed the aerial refuelling of an F/A-18 Super Hornet. Under the contract, worth an initial $805.3 million, Boeing will deliver four fully operational MQ-25As by 2024.

In Europe, France is leading proponent of Maritime UAS (MUAS) operations. Naval Group, on behalf of the French Navy accepted four additional Schiebel Camcopter S-100 VTOL UAVs in December 2020 to be deployed on the Mistral-class amphibious helicopter carriers Tonnerre and Mistral. The acquisition came after the successful integration of a Camcopter S-100 on the French Navy Mistral-class Dixmude in 2019 which was the first time in Europe, that a VTOL UAS had been immersed with the combat system of an amphibious helicopter carrier.


Airbus

A second prototype of the Airbus VSR700 VTOL MUAS being developed for the French Navy has been ordered.

In February 2021 Airbus Defence and Space mini-UAS subsidiary Survey Copter signed a contract with French DGA to provide the French Navy with 11 systems each with two air vehicles, of the electrically powered fixed-wing Aliaca MUAS, including training and integrated logistic support with first deliveries expected during this year.


Survey Copter

Eleven Survey Copter Aliaca MUAS have been ordered for the French Navy.

The French Minister of Armed Forces, Florence Parly, announced in April 2021 that the Armament General Directorate (DGA) has signed an order to purchase a second prototype of the Airbus VSR700 is an VTOL MUAS being developed from the Guimbal Cabri light helicopter for the French Navy in partnership with the Naval Group.

The United Kingdom has been on the back foot of MUAS development for the Royal Navy although 700X Naval Air Squadron trains military operators to use Remotely Piloted Air Systems (RPAS) on the frontline and has overseen trials of the Puma AE 2 from the new RN OPV, HMS Tamar in 2020. In January 2021 an Request for Information (RfI) was published for the Royal Navy to study the market for a heavy transport MUAS. The UAV will have to be capable of carrying a 200kg (440lb) payload and be able to conduct BLOS flights. It will have to be resistant to the maritime environment, and have an open architecture so it can be easily modified.

The RN's Future Maritime Aviation Force vision for 2030 includes Project Vixen, a plan for a medium-sized fixed-

Royal Navy

The Royal Navy's 700X Naval Air Squadron has overseen trials of the AeroVironment Puma AE 2 small UAS.

wing Loyal Wingman UAV to work with Lockheed Martin F-35s with the potential to be used in a wide range of roles, including combat air patrols (CAP), reconnaissance (ISTAR), electronic warfare (EW) and acting as a communications relay. It could also be adapted as an air-air refuelling (AAR) tanker to extend the combat radius of the F-35. It is likely that the RAF's Lightweight Affordable Novel Combat Aircraft (LANCA) being developed by Team Mosquito could be carrier capable.

Another European MUAS programme of note is Poland's Albatros project to provide a tactical short-range maritime VTOL UAV for the Polish Navy. The order concerns delivery of two short-range tactical VTOL UASs, including one system procured as a part of the base procurement, and one that may be procured within the scope of the right of option. The UAVs will be used to equip the Polish armed forces with equipment for daytime/night observation in varied environments, including reconnaissance over the sea, coast, the land, and in maritime SAR missions with the use of E/O sensors and SAR radar sensors.

In December 2020 the Polish Armament Inspectorate, announced six bidders participating in programme: UMS Skeldar, WB Electronics, PZL-Świdnik with Leonardo, Schiebel, WORKS 11 with Martin UAV, and Siltec. The bids had to be submitted by 29 January 2021 with the delivery of a system within 15 months.

One of the bidders, UMS Skeldar announced that its Skeldar V-200 VTOL MUAS successfully accomplished the first automatic take-off and landing (ATOL) of a tactical UAV from a ship in February 2021, and is considered a front rummer for the Albatros programme along with the most successful MUAS, Schiebel's Camcopter S-100. A

UMS Skeldar

The UMS Skeldar V-200 VTOL UAS is one of six bidders for the Polish Navy's Albatros programme.

Skyborg is one of three Vanguard UAV programmes identified in 2019 as part of the US Air Force Science and Technology 2030 initiative.

SKY HIGH FUTURE

The financial rewards of building UAVs to meet a multitude of mission over the next decade is set to sky-rocket.

David Oliver

Unmanned Aerial Vehicles (UAVs) will be one of the most dynamic growth sectors of the world aerospace industry this decade, reported Teal Group analysts in their latest market analysis.

The Group's 2020/2021 UAV market study estimates that military UAV production will increase in value from $5.6 billion annually in 2020 to $14 billion in 2029, for a total of around $95.5 billion in the next decade. Military UAV research and development spending will add another $40 billion over the period with nearly 69 percent of that coming from the United States.

The market is driven by costly high-altitude, long-endurance (HALE) systems, low-cost Chinese exports, demand for armed UAVs, and the development of the next generation of unmanned combat aerial vehicles (UCAV). The United States will lead the world market in demand, followed by Europe in second place and Asia-Pacific close behind in third position.

The study also reflected the rapid growth of interest in the UAV business and reveals the fundamental reshaping of the industrial environment as UAV technology proliferates worldwide. This has been illustrated by recent acquisitions of both successful and failing UAV manufacturers. This year has seen AeroVironment's take over Arcturus UAV, a leading US designer and manufacturer of innovative high-performance VTOL unmanned aircraft systems (UAS), for approximately $405 million. Israeli company Rafael Advanced Defense System reached an exclusive agreement to take over the Bavarian UAV manufacturer EMT which was in the process of bankruptcy despite being an important supplier of reconnaissance UAVs for the German Army.

However, future US military UAV projects include autonomous aerial resupply systems, air-launched armed UAVs and classified unmmaned vehicle programmes.

UNMANNED RESUPPLY

The United States Army has issued a Request for Information (RfI) to industry for UAVs that can deliver supplies to infantry brigade combat teams in the field under a programme called the Joint Tactical Autonomous Aerial Resupply System. The

USAF

The Kratos XQ-58A Valkyrie has been used to release in flight a small Altius-600 UAV from its internal weapons bay.

UAV should be already technologically mature to demonstrate capability, weigh less 1,300 pounds (590 kilograms) and be able to carry up to an 800lb (363kg) payload of supplies. It should also be able to operate in a 160km (110 mile) radius at day or night, and in bad weather conditions, as well as plug into current and future tactical command-and-control systems. Responses from industry were due by 12 February 2021 and the services plan to field the system by 2026.

Skyborg is one of three Vanguard programmes identified in 2019 as part of the US Air Force Science and Technology 2030 initiative by building a transferable autonomy foundation for a family of layered, UAVs. The programmes are designed to rapidly field systems, by pairing technology development under the Air Force Research Laboratory (AFRL) with the acquisitions capabilities found in the Air Force Life Cycle Management Center (AFLCMC).

The aim is to develop a family of attributable aircraft systems with a common artificial intelligence (AI) backbone that can train alongside manned aircraft and fly ahead of them in non-permissive environments, and frustrate adversaries.

In December 2020, the AFCMC awarded more than $76 million to Boeing, General Atomics and Kratos to build Skyborg prototypes and fly them in teaming with manned aircraft by July 2021. AFRL has used the Kratos XQ-58A Valkyrie as an example of what a Skyborg prototype could look like while Boeing may use the Airpower Teaming System (ATS) it is supplying to the Royal Australian Air Force (RAAF) as a template.

In March 2021 AFRL used a XQ-58A to release in flight a small Altius-600 UAV, designed and manufactured in partnership with Kratos and Area- I. The Altius 600 has an endurance of more than four hours and can fly more than 250 nautical miles (463km). The configuration could potentially allow the deployment of multiple small UAS to achieve a cluster munitions effect or for electronic warfare capability.

A team led by Dynetics, that also includes Kratos, designed a UAV for the US Defense Advanced Research Projects Agency (DARPA) Gremlins programme which is focused on demonstrating the concept of a low-cost swarm made up of unmanned aircraft that can be launched and recovered by a mothership aircraft in flight. Although the UAV has been successfully launched from a Lockheed Martin Hercules C-130 aircraft, retrieval remains a challenge.

STARDRIVE ENGINEERING

A secretive new UAS designed by the Lockheed Martin Skunk Works known only as Speed Racer is about to enter flight testing. The design of the unmanned vehicle used an all-new digital engineering process called StarDrive which involves using computer software to construct digital twins of an aircraft from the design to flight stages before the physical aircraft gets ready for take-off. The Speed Racer is reported to be powered by engines supplied by Technical Directions, a small turbojet supplier that was acquired in 2019 by Kratos Defense and Security Solutions,

In Europe, the unmanned elements of the United Kingdom's Team Tempest, the Royal Air Force's next generation combat air system and the parallel Franco-German-Spanish Future Combat Air System (FCAS/SCAF) programme, are at an early stage of their developments. Meanwhile the in April 2021 Germany's Parliament approved a $3.6 billion (€3 billion) contract towards the procurement of the European Medium Altitude Long Endurance Remotely Piloted Aircraft System (EU MALE RPAS) being developed and implemented with France, Italy and Spain. The current German contract does not include weaponising the platform although other partners may chose to. The German Army will receive 21 UAS, 12 ground control stations and four simulators from the joint project with Airbus D&S, Dassault, Leonardo and Space SAU, with delivery expected to start in 2030.

Brazilian aerospace conglomerate Embraer Defense & Security has announced that it is reviving a programme to develop a large UAS for the Brazilian Air Force. After several smaller projects teamed with Elbit and Avibras, Embraer sees the way

Lockheed Martin

The classified Speed Racer project was designed by Lockheed Martin Skunk Works using a new digital engineering process called StarDrive.

forward in advanced unmanned combat aircraft. Jackson Schneider, chief executive of Embraer Defense & Security said that it is also an opportunity for the continuous development of new technologies and products for the Brazilian MoD. "A major challenge for this aerial system will certainly be its integration and joint operation with other systems and aircraft, manned or unmanned."

RUSSIAN UAVS

Despite aspirations of competing with the US, Israel and China in the design, manufacture and export in next generation UAS, Russia has yet to develop an operational UCAV.

The Luch Design Bureau medium-weight piston-engine Korsar is intended to replace the Forpost, a licence-built IAI Searcher intelligence, surveillance, reconnaissance (ISR) UAV for the Russian ground forces but its development has been protracted and none are yet in service.

The Reaper-class Kronstadt Orion is the first Russian made MALE and although one crashed during a test flight in November 2019, three systems have been delivered to the Russian MoD for evaluation and training. During combat evaluation in 2018, an Orion was deployed to Tiyas Air Base in central Syria.

Kronstadt also showed a mockup of the seven-ton Grom Loyal Wingman at the Army 2020 defence exhibition which will be capable of controlling a swarm of 10 small Molniya UAVs and carry the Kh-38M short-range air-to-surface missile. Kronstadt has begun construction of a new plant for the production of its UAVs which is expected to open in November 2021 at a cost of $52 million.

Kronshtadt

Russia's first MALE UAV, the Kronstadt Orion undertook combat evaluation at Tiyas Air Base in central Syria in 2018.

The S-70 Okhotnik heavy stealthy UCAV has been under development by Sukhoi for almost a decade before the prototype made its maiden flight in August 2019. The 20-ton tailless flying-wing deign has a wingspan of 20 metres and a reported maximum speed of 539kts (1,000km/h). The Novosibirsk Chkalov Aviation Plant is now building three more prototypes of the S-70 with advanced systems of onboard radio-electronic equipment and improved structural elements of the airframe. They should begin flight testing in 2022.

The Russian MoD wants to integrate the Okhotnik with the fifth generation Su-57 Felon multirole fighter, assuming that two or three Su-57 squadrons would have a single S-70 which would have the role as a Loyal Wingman.

TURKISH SUCCESS

Turkey has been more successful in penetrating the international market of operational UAS. In 2020 the UK defence secretary Ben Wallace stressed the "game-changing" role of Turkish drones in modern warfare in the Middle East and North Africa.

Turkish TB2 and Anka-S UAVs have been extensively deployed during the recent conflicts in Syria, Libya and Nagorno-Karabakh, exported to Azerbaijan, Morocco and Qatar and are being built in Ukraine. Saudi Arabia's Intra Defense Technologies and Advanced Electronics Company has started producing the Karayel MALE UCAV under license from the Turkish company Vestel Savunma while Tunisia is to become the first foreign customer for the Turkish Aerospace Anka-S armed MALE.

The TB2's manufacturer Baykar Makina successfully completed flight trials of its 20-metre wingspan twin-engine Akinci MALE UCAV in March 2021 and a third prototype has made its maiden flight.

However, the success of Turkish UAV combat operations has come at a price. Canada banned the export of imaging and targeting systems made by Canadian company L3Harris fitted to Bayraktar TB2s following Turkish Air Force incursions into Syria against Kurdish forces in 2019 and during the 2020 Nagorno-Karabakh conflict while the UK company Andair also halted exports to Turkey after its fuel pumps were found in TB2s used in the Nagorno-Karabakh.

UAVs have become a key element of the armed forces across the world, as they are being more extensively deployed in war zones, counter-terrorism operations and for functions such as border patrol, maritime surveillance and search & rescue. A

Russian MoD

The stealthy S-70 Okhotnik UCAV has been developed by Sukhoi to act as a Loyal Wingman for the Russian Air Force's manned Su-57 multirole fighter.

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