Filling the broad gap between man-portable systems and airfield-dependent MALE platforms, tactical UAVs are an increasingly vital part of many militaries' frontline situational awareness toolkit. By Beth Stevenson

A UAV with a significant payload capacity and operating range that can be quickly deployed is something that many land and naval forces have become used to having at their disposal, and there is a key group of manufacturers offering this type of system to the market.

The role of tactical UAVs (TUAVs) has been evident for some years, with US forces notably ramping up their use in the early 2000s during operations in Iraq and Afghanistan.

Platforms capable of quick collection of ISR data that require only a relatively low logistical support footprint are not just suited to this type of conflict, however, and have been seen in plenty of other scenarios since.

‘This absolutely remains an enduring requirement,’ Dave Funkhouser, business development executive at Insitu, told UV. ‘No matter what type of operation it is, someone in the chain of command is going to want to observe it remotely in order to better understand the situation and facilitate his or her decision cycle.

‘The ability to provide real-time sensor data, not just at the tactical level, to the boots on the ground with a remote video terminal that are directly engaged with whatever is happening, but also the ability to broadcast that data back to the next higher echelon, so it can become part of the bigger picture [is important]. I think that will be an enduring requirement in perpetuity.’

Geography lessons
The same key players in Europe, Israel and the US seem to dominate the market for this type of system and a number of developments are being made to keep in-service UAS designs relevant, with new models appearing.

Developers in these three locations are offering a number of TUAVs to the international market, ranging from launcher-enabled systems to runway-dependent types.

Arguably the most prolific source of TUAVs is the US, with products including the Textron Unmanned Systems Shadow range and Insitu’s ScanEagle and RQ-21A Blackjack/Integrator series.

The two US families vary in the way they are recovered, but both have been used by domestic and foreign military customers for some time now to provide ISR to ground and naval forces.

One recent development in this field was the official launch of Textron’s Nightwarden, a modified version of the SATCOM-enabled Shadow M2. The
rollout took place during the Paris Air Show in June 2017 and the manufacturer is anticipating the first contract for the type later this year, Bill Irby, Textron Unmanned Systems’ senior VP and GM, told UV.

'We have submitted two additional proposals since Paris, so we have three customers now that are getting very close to awards,' he said. ‘One of those we’re in negotiations with at this point, so I am hopeful we will have our first contract during the fall time period. Things are moving pretty well on all three of those proposals.’

Irby noted that one potential customer is a US operator that already flies the Shadow UAV — the system is in service with the USN, USMC and US Army — and there is interest in both replacing ageing Shadow systems with the new variant, as well as adding extra capability that Nightwarden can bring to expand operations.

Additionally, there are two further export customers interested in Nightwarden that do not currently operate the Shadow, and all potential buyers of the type have carried out an assessment through some sort of competition, Irby noted.

‘With the baseline Shadow V2 system, it has been very reliable for the US Army and international customers over time,’ Irby added. ‘It is able to operate on unapproved airstrips, so it doesn’t need a fully proven runway, and it has a set of arresting gear that you can do a short-field capture with, as well as a launcher to launch it, so that you don’t need a longer airstrip.

‘With the Nightwarden, the concept is similar. If you are going to launch and land it on an airstrip without a launcher, you can do that. There is also the capability of using an arresting gear and a launcher if you want to go more expeditionary.’

Alongside the SATCOM option, Nightwarden also benefits from a multi-sensor capability, and has a 340kg maximum take-off weight, some 90kg more than the Shadow V2, allowing for more payload capacity. Internally it can carry around 50kg of payload while externally on each wing it can carry 16kg. By comparison, the V2 can carry 20kg internally and 11kg on each wing.

Irby said that a lot of payload testing has been carried out using Nightwarden, not only with EO/IR and full-motion video, but also with different packages, including electronic attack, communications intelligence and relay, SIGINT and weapons.

**Fire and fury**

Textron’s Fury glide weapon was previously tested on the Shadow UAV in M2 configuration, and the pylon design used for this will also be available on Nightwarden.

Fury is a semi-active laser-guided munition, which has been developed alongside partner Thales to be dropped from a UAV without the need for propulsion, resulting in a round that weighs just 6kg.

In October 2016, the weapon was tested from the Shadow at Yuma Proving Ground in Arizona, where it was fired against a series of targets including moving vehicles, and successfully engaged with different types. This testing could lead to integration of the weapon on Nightwarden.

‘The aircraft is ready to go and we are going through a normal process of continued flights and testing,’ Irby noted. ‘We’re getting ready to go into another series of ground runs and flights to qualify the production engine and the fuel system changes. All of that is tracking through a normal schedule and is just to build additional confidence prior to contract awards.’

Some 400h of testing have been carried out across the M2/Nightwarden programme, both at Yuma and abroad for customer demonstrations.

Export markets the company is targeting are primarily in Asia-Pacific, Europe and the Middle East, and Irby noted that since its official release in June, Nightwarden is gaining more interest for export sales than the V2.

Australia is one key market that Textron is eyeing, as its army operates the older variant of Shadow and Canberra is also looking at acquiring a number of new unmanned capabilities. ‘It is fair to say that Australia is looking at a trade-off of different options right now,’ Irby noted. ‘They are very actively looking at options.’

Textron is pitching Nightwarden as a tactical-sized aircraft that performs at the same level as larger systems, so it can be used as a forward-deployed asset, but be operated at a more strategic level.

‘You can operate in a hub-and-spoke environment like they do with larger systems today, so the Nightwarden can be at a forward operating base and I can do all of the control from a fixed base if I choose to do it that way,’ Irby said. ‘That way you keep your forward-fielded footprint much smaller and your main operating location in the rear.’

He added that a VTOL modification to the Shadow that was previously in development has been put on hold, but claimed there...
had been some interest in it and work could resume if a customer required it.

Old eagle, new tricks
The Insitu ScanEagle and its RQ-21 Blackjack/Integrator derivatives are arguably at the forefront ofTUAV development, with the former operated by some 20 countries worldwide.

Recent contracts for ScanEagle have come from the USN, USNOCOM, and USCG, the latter being a new customer that has acquired one system.

‘The US Coast Guard has contracted Insitu to provide contractor-owned, contractor-operated services aboard one National Security Cutter,’ the company told UV. ‘ScanEagle operations have proven so successful the US Coast Guard plans to issue a request for proposal in 2017 to outfit all National Security Cutters with [small] UAS.’

The UAV family uses a pneumatic launcher and the SkyHook recovery system, which allows easy integration onto different types of vessels, with the smallest to date being 18m long.

A new sensor capability for ScanEagle, the Visual Detection and Ranging (VIDAR) system, allows the UAV to scan wide areas of interest while also tracking individual targets, something that a need has arisen for on ship-based operations.

Insitu demonstrated this to the UK Royal Navy, which had previously contracted the ScanEagle during the service’s Unmanned Warrior exercise in October 2016, during which it showed its ability to track targets of interest. VIDAR was also used onboard ScanEagle during a demonstration for the European Maritime Safety Agency earlier in 2017.

The agency is exploring the benefits of using unmanned technology to support the different areas of work it carries out, including pollution monitoring, smuggling and migration control.

Sorties of some 5-6.5h were carried out during the ScanEagle demo, during which VIDAR was used to pick up anomalies in the area of interest. There are now plans for more demonstrations of VIDAR to the USCG and USN, Insitu says.

Additionally, the company has fielded the new Orbital N20 engine on the type, which increases reliability, time between overhauls and power availability for payloads, it says.

A fuel cell-powered electric variant of ScanEagle – the eSE – is also in development, which Insitu says makes for better image quality as a result of a reduced audible signature, as well as offering less onboard vibration and allowing flight closer to targets.

Testing was most recently carried out in April and July 2017, the latter seeing Insitu, Protonex Technologies and Boeing Experimental Systems complete three flights of the eSE, including up to 8,000ft above mean sea level and to a 10,000ft density altitude.

‘We believe this is a world record for Group 1, Group 2 and likely Group 3 fuel cell-powered UAVs,’ Jeff Knapp, chief fuel cell engineer at the company, said.

He added that the fuel cell electric-powered UAV altitude record is currently held by the AeroVironment Helios HP03 at 65,000ft, but noted that this system is a HALE platform with a 75m wingspan developed by NASA for operation above 50,000ft. ‘I think in the small UAS market, eSE now holds the record,’ he added.

Blackjack sticks
Blackjack, meanwhile, achieved full-rate production and deployed with the USMC’s 22nd Marine Expeditionary Unit (MEU) in 2016. That deployment finished in March 2017, and the 15th MEU is expected to host the first West Coast detachment of the type when it rolls out with it this year.

Insitu says that as of May 2017, 14 Blackjack systems had been delivered to the USMC/USN, with a production target of one per month from now on in order to fulfil the contract.

The first export customer for Blackjack will be the Canadian Army, which in 2016 committed to buying a system comprising five air vehicles, two GCS, one pneumatic launcher, one SkyHook recovery system and one air vehicle support equipment kit.

‘We’re planning a roll-out later this year, and they are the first RQ-21 FMS customer,’ Funkhouser said. He added that the UAV’s ability to operate from ships and bases on land without the need for a runway is a major part of its appeal, and the reduced
amount of logistical support it needs makes it suited to expeditionary operations. ‘We also developed, because of the runway independence, a real niche in the maritime market because our systems could operate from just about any aviation-capable ship, and even some that aren’t,’ he said. ‘The hallmark of our platforms has been runway independence and payload modularity.’

Blackjack’s payloads and the aircraft itself are both modular, so as new technologies are rolled out and requirements change, the system can be modified and updated accordingly.

‘If you need to use a different type of radio in the future because of the modular construction of the system, it’s easy to remove the old version, build a new version, and plug it back in, without having to rewire the whole aircraft,’ Funkhouser said.

Blackjack has been upgraded with a new imager – the EOIR4 – which is compatible with digital video architecture, Insitu says. It has also introduced two other turret options that it claims increase the resolution, range and standoff distance of the sensors, as well as providing a high optical zoom.

In terms of power, Insitu is exploring a modification that doubles the time between overhaul of Blackjack and increases payload draw-off capacity. This will be introduced in the coming months, the company says. Additionally, it is looking at longer-term developments to increase power for even larger and more energy-hungry payloads.

**European options**

While the ScanEagle and Shadow have both seen success in Europe, there are also a number of indigenous TUAV programmes in progress.

Leonardo offers the Falcio TUAV, which is most notably used by the UN in support of peacekeeping missions, as well as the extended Evo variant. It announced in 2016 that it had secured its first two undisclosed launch customers for the latter.

During the 2017 Paris Air Show, the company announced that it was working to certify Falco for civilian flight in non-segregated airspace, in order to offer it as a service for commercial applications.

Leonardo also announced that it had partnered with certified air operator Heli Protection Europe to offer surveillance and reconnaissance services using UAVs.

Authorisation from the Italian aviation authority ENAC is the first goal it is targeting, and once this has been achieved, the new service is expected to begin.

Another European system is the Safran Patroller, which enjoyed its first commercial success in April 2016 when the French Army selected the type for its TUAV requirement. Beating Thales’ WK450 Watchkeeper to the award, 14 examples are expected to enter service between the end of 2018 and beginning of 2019, a Safran spokesperson told UV.

‘Safran will provide the resources for the training, and will train the French Army personnel who will then...’
instruct their different users,' they added. 'Once this first phase of training by Safran is over, the French army will [then] be autonomous.'

Patroller has a baseline endurance of 14h, which can be extended to 20h if required. It has a 250kg payload capacity that includes COMINT and other sensors, and has a range of 150km that can be extended to 200km.

At Le Bourget, the company announced that its Eurofir 410 airborne EO sensor had been selected by the French Army for its new Patroller fleet. This incorporates a number of sensors into one pod, including four lasers, two optical zoom cameras, and two spotters.

The company said that some potential customers are considering carrying weapons on Patroller although it noted that France is only using it as an ISR asset. Among the laser options for the Eurofir pod is a designator that can be used to guide air-to-ground munitions, while the laser options include a rangefinder, pointer and illuminator.

In September 2015, it was announced that Safran had teamed with the Arab Organization for Industrialization (AOI) Aircraft Factory to offer the Patroller to Egypt, but the company declined to comment on any progress made in this market.

At the time the teaming agreement was signed, it was announced by Safran that AOI would be responsible for the final assembly of the UAV should a contract be signed with the Egyptian armed forces, as well as providing system support. There was also discussion of it developing a centre in Egypt to train personnel in operation and maintenance of Patroller.

**Bird's eye view**

IAI, meanwhile, introduced the latest tactical system to its family of UAVs some 18 months ago, when it launched the BirdEye 650D.

This complements the smaller 450 and 650 electric-powered variants, being a new gasoline-engine UAV that is larger than the other family members and can carry more payload.

'The concept is the same [as the other systems], but it is a much bigger bird with a 4m wingspan,' Dan Bichman, UAV marketing manager at IAI's Malat division, told UV.

'In this case we are talking about a UAV with a gasoline engine, and the MTOW is about 30kg. We can have a larger payload — 5.5-6kg payload — and this can be mounted on a vehicle, so this is a very tactical system.' The ground vehicle can be integrated with all the required equipment — the aircraft, payload, communications and control station, plus spare parts.

The launcher can either be mounted on the vehicle or towed behind it, and Bichman noted that a standard BirdEye 650D system includes three aircraft and one GCS.

'This system... can carry a larger payload, and in this case also it has more than a 15h endurance with the gasoline engine, and the communications range can be up to 150km,' he added. 'What makes it tactical is that it is designed to be very easily carried by forces in the field, and they are very simple and easy to deploy, launch, fly and control from wherever you want.'

He claimed that the range of the system is high for an aircraft of its size, and that it benefits from carrying multiple payloads including EO and SIGINT. The company's
The USMC’s Blackjack achieved full-rate production and deployed with the service’s 22nd Marine Expeditionary Unit in 2016. (Photo: Insitu)

8in MiniPOP EO/IR pod is offered as standard, but Bichman says this can be swapped out if required.

The BirdEye 650D is operational and while Bichman could not comment on the end user, he said that a few hundred aircraft have been contracted. He also noted that the company is also looking at expanding the target market of the UAV into paramilitary operations, for example, and will adapt the payload accordingly.

Sweet spot
TUAVs sit between the strategic MALE platforms that have become synonymous with military operations, and the smaller systems that tend to be carried by soldiers for quick over-the-hill surveillance.

They must therefore be in a sweet spot in terms of capability, having to offer a significant amount of endurance and payload performance, while also having a relatively low logistical burden with limited support infrastructure.

Manufacturers of these types have been active for some time, and while a number of key proven systems are relied upon by NATO members and their allies, there is also a drive towards developments in the areas of propulsion, payload and market approach.

Then there are the new offerings to this market, although they are being offered by established manufacturers – such as Textron and IAI – that have derived the new aircraft from existing products using the experience they have gained in selling UAVs worldwide.

Despite the market continuing to be dominated by a number of technologies that have been around for some time, at least manufacturers are not resting on their laurels when it comes to keeping the systems relevant, which is of paramount importance given the demand from users for instant access to ISR data.

Target: Kratos Firejet by KRATOS Defense Systems.

**KONTIO LAUNCHER**
Powerful • Reliable • Highly transportable

[ROBONIC](www.robonic.fi)

---

WWW.UVONLINE.COM

VOLUME 22 NUMBER 5 OCTOBER/NOVEMBER 2017 UNMANNED VEHICLES 25