Fitting EO/IR sensors to helicopters has been commonplace for decades, especially in the law enforcement and military domains to assist vital surveillance and reconnaissance missions. Technological advances have seen these turrets reduce in size, while huge capability leaps have been achieved in HD thermal imagers that can see further in more detail and still operate in harsh conditions.

Faster processing also means EO/IR sensors are becoming more intelligent, with functions such as target tracking and augmented reality.

Most, if not all, of the major suppliers of EO/IR products are now offering these intelligent features, and the requirements for them are on an upward trajectory.

**ESTABLISHED PRODUCTS**

One company that has been active in the airborne sensor market for several decades is Selex ES. Its current portfolio includes the EOST-45 and Titan 385ES-HD multi-sensor turret systems. While the OEM has a significant military customer base, particularly in Africa, Europe and the Middle East, its sensor solutions can also be used in civil roles.

The stabilised EOST-45 features four payload slots and can include a medium wavelength (3-5 microns) thermal imager, based on the company’s Hawk focal plane array detector. During the day, EOST-45 users can utilise a 20x optical zoom colour camera for target spotting. A laser rangefinder and illuminator are also optional additions.

Weighing around 29kg, the EOST-46 has a 14in-diameter turret than can be fitted to helicopters, fixed-wing aircraft and UAVs. Selex ES said that it can be utilised for airborne surveillance in a number of missions, including maritime patrol, SAR, coast guard and police operations. Additional functions include target tracking, image processing, symbology and geo-pointing and localisation.

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Controp’s payloads are gyro-stabilised, with embedded INS/GPS and continuous zoom capability. (Photo: Controp)
Mark Byfield, VP of marketing of optronics and communication systems in Selex ES’s Land and Naval Systems division, revealed to RotorHub that the company was currently testing a new variant of the turret, known as the EOST-380HD. It will be ITAR-free, feature six payloads as well as HD cameras with high optical zoom and also have embedded processing and other features such as GPS and an inertial measurement unit.

The new turret is going through its final development stages, with an official launch of the EOST 380-HD expected early next year.

COMPACT PACKAGE
Another company that has recently unveiled new products is FLIR Systems, with its Star Safire 380HDc – the ‘c’ standing for compact. Compatible with existing Safire mountings, the system weighs around 17.5kg less than the current version of the 380HD. At 15x13.9in, it is particularly suited to rotary-wing platforms where height clearance is often extremely limited.

‘The compact variant has been the most successful product launch that we’ve had to date in the airborne market,’ said Andrew Saxton, FLIR Systems’ vertical marketing director. ‘It offers 90% of the performance that you would have got with a 40kg system in only half the weight.

‘One of the things that drove the development of the compact was that in the rotary market, a lot of our customers, whether military or civil, are very weight-constrained, so every pound they can reduce is an extra pound of fuel or rescue equipment, for example. This product is being very heavily embraced by the law enforcement market and the search and rescue market.’

FLIR Systems sees a wide range of applications for the HDc beyond just law enforcement and SAR, including disaster response, counter-narcotics and environmental monitoring.

The 380HDc comes with a 1280x720px MWIR sensor as standard, which can be downgraded to a 640x512px MWIR sensor if required. It also features an HD day CCD camera that can be supplemented with another HD unit, allowing one camera to be used for wide-area surveillance, while using the other for more detailed close-in work.

Other additional extras include an EM CCD low-light camera, shortwave IR camera and laser payloads such as rangefinders, illuminators and pointers.

ORDER BOOKS
The Norwegian Ministry of Justice and Public Security has selected the HDc for its new fleet of AgustaWestland AW101s that will be used as part of the country’s All Weather Search and Rescue Helicopter programme.

Meanwhile in 2014, the California Highway Patrol agency ordered 15 AS350 B3e AStars from the US division of Airbus Helicopters, all to be fitted with the 380HDc turrets as well as advanced systems including the Garmin G500H electronic flight information system, Spectrolab XP searchlight and Churchill Navigation’s Augmented Reality System (ARS) displayed on an Avalex 15.6in HD monitor.

Churchill’s ARS has become increasingly popular among law enforcement customers over the past few years. The mission management system is built to interface with gyro-stabilised cameras and increase crew situational awareness. It does this by overlaying key data onto the operator’s sensor image including street names, house numbers and business names.

‘If you have a FLIR or a Wescam, there is a very good chance that you would benefit from having access to these capabilities,’ said Tom Churchill, CEO of the company.

‘While our primary customer base is still civilian law enforcement, we have customers using this in the military space as well as in a variety of other fields; we have some customers that are using this for wildlife population surveys, finding out where polar bear dens are located or counting the number of caribou in a region.

Saxton explained to RH that his customers are now looking for more intelligent features to supplement the high-quality imagery provided by the sensors. ‘The operators are saying: “I’ve got a great picture in front of me, but how can you help my team do more with that picture?”’

INTELLIGENCE SUITE
FLIR Systems offers its Merlin ‘intelligence suite’, which it says reduces operator fatigue while improving crew effectiveness. Running on the internal processor of the turret, it features automatic detection and tracking capabilities, highlighting moving objects, even down to a single pixel.

‘What we are seeing across the board is more demand for intelligent sensors, particularly in the law enforcement community,’ said Saxton.

Merlin has two modes: one that can prompt customers to any moving targets; and another that alerts operators to the colour used in life jackets, life rafts and other life-saving appliances, again, at the single-pixel level. This means rescue helicopters can fly higher and utilise sensors on a wider field of view, making search and patrol missions safer and more efficient by covering areas faster than platforms fitted with legacy systems.

‘Now you can zoom out, cover a wider area with each pass but still know that you’ll find that person in the water,’ said Saxton.

Increased onboard processing is also enabling full metadata tagging on the video – every frame not only has a time stamp and date, but geolocation, information about the sensor field of view and turret orientation.

‘We are at the iPhone stage, and we are literally coming up with new apps as fast as people can think of them,’ he added.
**COMPLETE PACKAGES**

Elsewhere, Israeli company Controp Precision Technologies told RH that it has also added intelligent features to its range of EO/IR sensors – under the Airborne Surveillance Mission System (A-SMS) package – due to increasing demand, particularly in the law enforcement community.

Nir Bar Natan, Controp’s marketing director for maritime and airborne systems, said that along with the EO/IR payload, customers can receive a control unit, a moving map mission computer featuring augmented reality as well as optional cockpit display, video downlink and a searchlight slaved to the sensor’s line of sight.

Users could also benefit from a digital video recorder function, useful for evidence gathering for police helicopters or mission debriefing following SAR operations, for example.

Controp has been an established EO/IR provider for around two decades, but it has only recently begun providing complete solutions for law enforcement and other civil applications such as SAR, fire-fighting and border surveillance.

‘Today, the customer doesn’t want just the payload – they want everything,’ said Bar Natan.

Earlier this year, the OEM's A-SMS receive its supplemental type certificate (STC) for installation on Airbus Helicopters’ AS350/355 from Transport Canada Civil Aviation. STCs from the FAA and the Brazilian ANAC are also being finalised. Bar Natan told RH that the company was now working with Airbus Helicopters on additional STCs for the H125 (AS350 B3e) and H145 as part of a programme with the Israeli Police.

Its A-SMS range of sensor turrets includes the high-end DSP-HD as well as the QUAD-HD and SHAPO. All three products are gyro-stabilised, with embedded INS/GPS and continuous zoom capability.

**BUZZ WORDS**

The top of the range model is the 27kg DSP-HD, which features a 36x zoom thermal imager, full HD colour day camera, B&W or colour day spotter camera and laser rangefinder/pointer on a 14in diameter ball. The 21.5kg Quad-HD provides similar capabilities on a slightly smaller 12in-diameter ball and with a x12.5 zoom thermal imager and no spotter camera. Each turret can be connected to a payload electronic box that enables target tracking and optional extras such as augmented reality.

‘[Augmented reality] is the new buzz of the market,’ said Natan. ‘The policeman only has one screen where he can see the sensor image and at the same time see the name of the streets and buildings, so he doesn’t need to look at the map. It’s much easier to work with augmented reality.’

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The smallest sensor turret, at just 10.7kg and 9in diameter, is the SHAPO, which features the same sensors as the Quad-HD but without an HD camera. However, that will change when Controp unveils a new HD version of SHAPO some time next year. The company revealed to RH that the SHAPO-HD is now in its final stages of development.

‘We are very competitive and with payloads such as SHAPO, more and more civil agencies will be able to buy EO/IR sensors for their helicopters,’ Natan added. ‘The SHAPO is only 10kg so you could even put it on a Robinson R44 or R66 – you don’t need an AS350 for that.’

The firm is now looking at developing HD thermal imagers as part of its company roadmap, but this high-end technology is cost-prohibitive, particularly for Controp’s main customer base in Africa and Asia.

‘It will take some time – it is a very expensive technology and I don’t think all of our customers have the money to buy it. As part of the roadmap we will develop an HD thermal camera, but it’s not like the HD in the daylight cameras which is relatively today.’

**UPGRADE PLANS**

Another well-known provider of EO/IR sensor turrets is Canada-based L-3 Wescam. Some notable users of the company’s imaging systems include the UK’s National Police Air Service, which selected the MX-10 in 2014 as part of plans to upgrade seven of its EC135 T2s. The upgrades are currently being carried out by Bond Helicopters and will be complete by December next year.

The first upgraded helicopter, with an MX-10 mounted on the starboard side, was unveiled at Helitech International 2015 in London.

In March, L-3 Wescam announced the launch of an HD colour spotter sensor for its MX-10 turret. The company said it was the first to market with a 10in stabilised turret complete with EO wide, EO narrow and daylight spotter camera offerings.

The MX-10 is utilised by a number of law enforcement agencies, including the York Regional Police in Ontario, Canada, on its EC120B. The service utilises the EO/IR sensor turret along with Churchill Navigation’s augmented reality software.

At 16.8kg and with a 14in diameter, the MX-10 is the smallest EO/IR turret L-3 Wescam has in its portfolio of products. It can accommodate six sensors, including a 640x512 thermal imager, HD day camera, low-light camera, daylight spotter, laser payloads including a rangefinder and illuminator. New features announced for 2015 have included a continuous zoom function for the IR camera, a high magnification spotter and ‘picture-in-picture’ capability.

In 2014, L-3 Wescam launched ‘Kinetic’ technologies for all the turrets in its MX-series. This included Kinetic Speed, a feature aimed at military and law enforcement customers that enables operators to gain an accurate indication of how fast ground vehicles are moving. Another is Kinetic Map, an operator control system that indicates the location of the sensor, its line of sight and field of view and overlays the data onto a moving map display. MTI and detecting multiple targets in an image stream have also been integrated as part of the upgrades.

While Selex ES has a significant military customer base, its sensor solutions can also be used in civil roles. (Photo: Selex ES)