

The PIAP TRM can be thrown into a building or to an open area and steered by remote control in order to perform an inspection from a safe distance. The TRM's construction is designed to withstand the impact produced by a fall from up to 9 metres. Shown: TRM robot and control panel. (Photo: PIAP)



One of the most crucial aspects to consider when developing armed autonomous machines, is the distinction between combatants and civilians. If done incorrectly, the robots deployment can be detrimental. This is particularly true in the modern era, when combatants often intentionally disguise themselves as civilians to avoid detection.

Throwable Robots

Throwable Robots are versatile, robust, stealthy, and easy-to-deploy tactical robot systems that can be "thrown" into deployment, where they can be directed by the operator to quietly move through a structure and transmit video and audio, saving lives and increasing the success of high-risk operations. The term "Throwbot" is trademarked by Recon Robotics, who manufactures the THROWBOT XT as "pound-for-pound, the most versatile, robust, stealthy and easy-to-deploy tactical robot system in the world." Weighing 1.2lb, THROWBOT XT is designed to be thrown up to 120ft and to survive repeated 30ft drops onto concrete. It resembles an axle with a wheel at each end and a stabilising tail. Even though the company was the second largest producer of military and police robots in the world, with thousands of sales of THROWBOT XT and Recon SCOUT XL micro-robots to international police agencies, the company has recently cut its staff by two-thirds after sequester-related cuts killed a deal with the US Army. As of writing, news sources state that creditors (RiverStar and RiverBend) are owed \$9.5 million and have asked a federal court to put the robotics firm into Chapter 11 bankruptcy reorganisation. Recon Robotics could not be reached for comment.

Another very versatile UGV is iRobot's 110 FIRSTLOOK throw-able robot. Weighing around 5lbs, FIRSTLOOK runs on rubber tracks and features a pair of arms on the rear wheel hubs that enable it to climb steps

up to 7in high and to right itself if it is flipped over, which it accomplishes autonomously. It measures 4x9x10in, can propel itself at up to 3.4mph and operates for up to six hours on a single charge of its battery. Its small dimensions enable it to investigate tunnels, ditches and other places that are hard to get into.

FIRSTLOOK's standard sensor suite includes four built-in cameras that provide an all-round view and feature adjustable exposure and gain settings along with pan, tilt and 8x digital zoom capabilities plus an infrared

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illuminator. A payload accessory port is provided to facilitate integration of other sensors such as infrared cameras, chemical and biological agent sensors and tools for deploying bomb disposal charges.

The Operator Control Unit (OCU) resembles and works like hand-held games console and includes the 5in display screen, integral radio and collapsible antenna. Weighing 2lbs, the OCU measures 4.3x9x1.8in excluding the antenna, and runs iRobot's AWARE 2 robot intelligence software.

To extend the robot's sensing capabilities it can be fitted with iRobot's Integrated Deployment and Camera (IDAC) accessory. Devices that can be added include an adjustable camera on a flexible mast and motorised retention pins for payload deployment.

The company quotes a line-of-sight communication range of up to 656ft, but the system uses digital mesh radio techniques that can both extend the range and overcome typical urban problems such as signal blockage.

In terms of ruggedness, iRobot has qualified FIRSTLOOK to IP67, sealing it against immersion at depths down to 1m and designed it to survive 16ft drops onto concrete. More graphically, company footage shows soldiers throwing it up flights of stairs and through first floor windows - without opening them first - and driving it off rooftops.

The GUARDBOT is Spherical Unmanned Amphibious Multi-terrain Vehicle System developed by GuardBot. GUARDBOT's unique spherical design allows the robot to roll across nearly all terrain and conditions, including water.

The SAND FLEA, developed by Boston Dynamics, is another perfect candidate for an affordable, survivable and effective next-gen robot. While iRobot's FirstLook and its rivals are happy to be thrown about, Boston Dynamics is working on an otherwise similar robot, called SANDFLEA, which can leap to great heights under its own power. SAND FLEA drives like a conventional radio-controlled car on easy terrain, but can jump up to 8m in the air, enabling it to clear a compound wall or a flight of stairs, land on the roof of a house or pass through a second storey window.

Another throwable 'bot is Qinetiq North America's DRAGON RUNNER 10.

France's ECA Robotics describes its INBOT as a throwable remote-controlled mini UGV for outdoor and indoor missions, particularly in confined areas such as double ceilings and floors, pipelines and underneath



Israel Aerospace Industries' (IAI) REX is meant to carry any payload of up to 200kg, including munitions, weapons, and logistics, to increase mobility of combat troops, particularly Special Forces. The vehicle, with an 11hp engine, could be programmed to maintain the pace of soldiers.

(Photo: Mönch / DPM)

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vehicles. Its standard sensor suite consists of a colour camera and both visible and IR lights mounted on a front head that can tilt through +/- 90°. Radio controlled at up to 100m, it can be managed from a touchscreen tablet computer or PDA, aided by a plug-in mini-joystick. A microphone and speaker enable audio communication.

Its lithium-in battery gives it a top speed of 1.8kph and a typical endurance of two hours. Weighing 2.1kg, INBOT measures 25x15.5x11 centimetres.

Nexter Robotics, a subsidiary wholly-owned by the Nexter Group, provides new solutions for the needs expressed both by France's Armed Forces and friendly forces abroad for small-scale robots capable of performing reconnaissance and C-IED missions for route clearance, while also offering new applications for civil security units. Both in France and abroad, working directly with customers and through its network of partners, Nexter Robotics is primarily focusing its activities on design, development, industrialisation, production, commercialisation, and technical support for both land-based and air/land hybrid robotic systems, together with all the associated components and mission modules. Nexter can also provide tailor-made engineering solutions to incorporate robots in existing weapon systems and infrastructures, and is developing licensing agreements as part of its activities. The first product in the Nexter Robotics line, the NERVA LG robot, was unveiled at EUROSATORY 2012 and IDEX 2013.

Oto Melara is focussing its Robotics R&D activities on designing original robotic systems able to perform routinely surveillance and patrolling tactical operations. Oto Melara is proud to offer a family of highly mobile robotic vehicles, both tracked and wheeled, which offer excellent performance in terms of their load capacity, speed, precision, and controllability. The UGVs, which are constructed around a precise modular architecture, can take on-board a range of actuators and sensors, which make the vehicles

capable of the efficient undertaking of different missions. The family consists of a complete series of robotic platforms starting to the smallest 3kg 4-wheels TRP 3 – NEC to the biggest 200kg 6x6 PRAETOR passing through the EOD specialised TRP 1, the mines-detector light tracked dual-use platform both TRP 2 in military version and TRP 7 – HS supporting the Home Land Security Forces. Oto Melara's OTO TRP2 is the military enhanced version of OTO TRP7 – HS, it has been designed in order to be easily packed in three military back-packs and then reassembled within a

couple of minutes. Its total weight is 60kg, 25 of them sensors or mission payloads. It can reach a maximum speed of 35km/h and its endurance is longer than four hours. The Control Ground Station, which is unique for all the vehicles, derives directly from Oto Melara's lengthy experience in the field of the Remote Control and ruggedisation of arms systems. The TRP 3 – NEC is a small, lightweight UGV equipped with six day/night cameras that fulfil ISR goals in order to enhance the operator's SA increasing his/hers safety. The robot can be employed for stealth recce missions, and is very rugged.

PIAP TRM is a small robotic device designed to deliver support for operations in difficult to access and dangerous places. PIAP TRM has been designed in response to the threats faced by forces responsible for public safety during area and objects reconnaissance. The small robot measures at 205x167x190mm, with 1.4kg + 0.16kg additional load weight, and can withstand the impact of a 9m fall.

Like its namesake, Northrop Grumman's CaMEL (Carry-all Mechanized Equipment Landrover) operates in the most desolate corners of our planet. Today's soldiers often find themselves deep in unforgiving terrain, miles from their support base, burdened with the extreme weight of equipment they need to live and fight. Rapid movement is a challenge requiring time and resources they just do not have. CaMEL is a robotic transport platform providing users a vital equipment transport capability. CaMEL is a hybrid motorised robot that can carry a half a ton of cargo across nearly any terrain. Optional kits are available to fit all mission requirements. (Photo: Mönch / DPM)



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