

Unmanned Ground Vehicles

Jane's DS Forecast End Of Year Report 2010



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By Derrick Maple

Executive Summary

The Unmanned Ground Vehicle (UGV) market forecast for the ten year period 2010-2019 amounts to \$8.6 billion, with a -1.3% Compound Annual Growth Rate (CAGR). This is a significant increase in CAGR since 2009 as \$1.3 billion was added to the ten year forecast, supporting a long-term swing upwards in the forecast market. The US accounts for over 55% of the end-user market, although this share is reducing as the global market develops and nations develop indigenous capabilities.

The market leaders are iRobot, Northrop Grumman and QinetiQ, but new players will emerge over the period. China and Russia will increase investment in their unmanned vehicle indigenous industries and are forecast to develop significant capabilities.

Budget constraints will increasingly impact the procurement process with requirements facing more intense scrutiny and suppliers will continue to focus on how they can get the most out of their existing products by extending their multi-role applications. However, the future scope for UGVs is immense. The importance of UGVs demonstrated in Iraq and Afghanistan provides a strong basis from which the market can develop, demonstrating how this technology would support future needs in many spheres of application whether civil or military.

The market is at the very early stages of its life cycle, but is forecast to resume growth in the latter half of the decade. Beyond that, the market is expected to increase rapidly as UGVs become more and more integrated into future operations.

Global View

In 2010 the global economy avoided a double-dip recession. Nevertheless, growth in most developed economies remained weak, as the post-crisis healing process continued. Emerging markets, on the other hand, grew rapidly. IHS Global Insight projects that a two-speed recovery is likely to remain a feature of the global economy throughout 2011. While there is no shortage of downside risks, global growth has been revised up in recent months, which means that the distribution of risks may be more symmetric than a year ago.

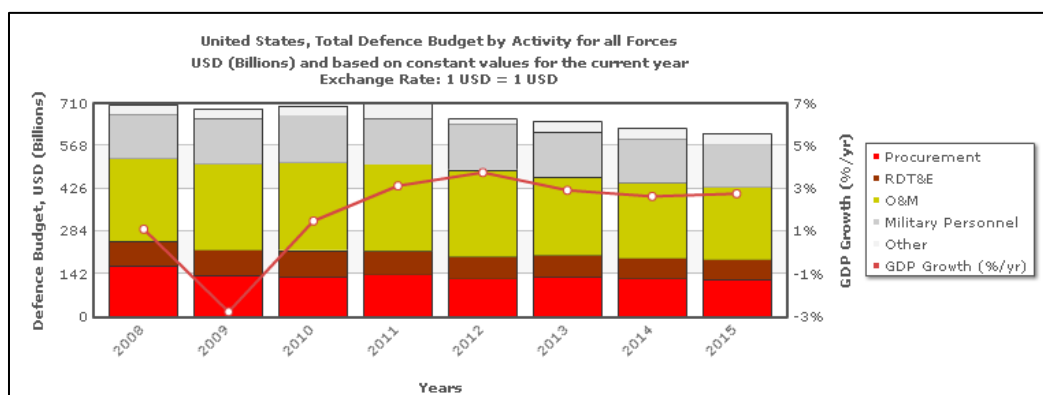
US economy getting back on track, exports set to lead growth

In 2011, the US economy is likely to be firing on more cylinders. Thanks to a weaker dollar, the US will enjoy export-led growth. Perhaps most important, additional fiscal stimulus will add 0.6% to growth in 2011. This means that GDP growth will average over 3.5% in the second half, compared with 3.0% in the first half.

The pace of growth in Europe is slowing, mostly because of fiscal tightening and concern over sovereign debt. As a result, growth will decelerate through the early part of 2011, before stabilizing and picking up, assuming that the recent euro crisis does not evolve into something worse. Stronger exports (helped by a weaker euro) and improved consumer spending (especially in Germany) will help.

Chinese and Brazilian growth to cool, Russia and India to remain stable, Asia-Pacific to remain growth leader

Among the big emerging markets, China and Brazil will see some slowing trends, as fiscal and monetary tightening is used to cool these economies, while growth in India and Russia will not suffer much, if at all. As a result, the emerging world is likely to grow about 6.2%, compared with 2.0% for the developed world. Asia-Pacific (excluding Japan) will remain the growth leader in the world.



United States total defense budget versus GDP growth (Jane's Defence Budgets)

Global defense spending is expected to be as varied. Despite the financial stresses facing the US, the House and Senate appropriations bills for FY2011 are within 2.0% of the requested budget and the war request has been fulfilled. However, the 111th Congress adjourned without passing the House and Senate defense bills. As a result, the Department of Defense (DoD) could end up operating on a continuing resolution into March, a month after the FY2012 budget is due. IHS Jane's analysts expect to

see the US budget fall from its current 4.6% to below 3.0% of GDP as the war commitment winds down in the second half of the decade.

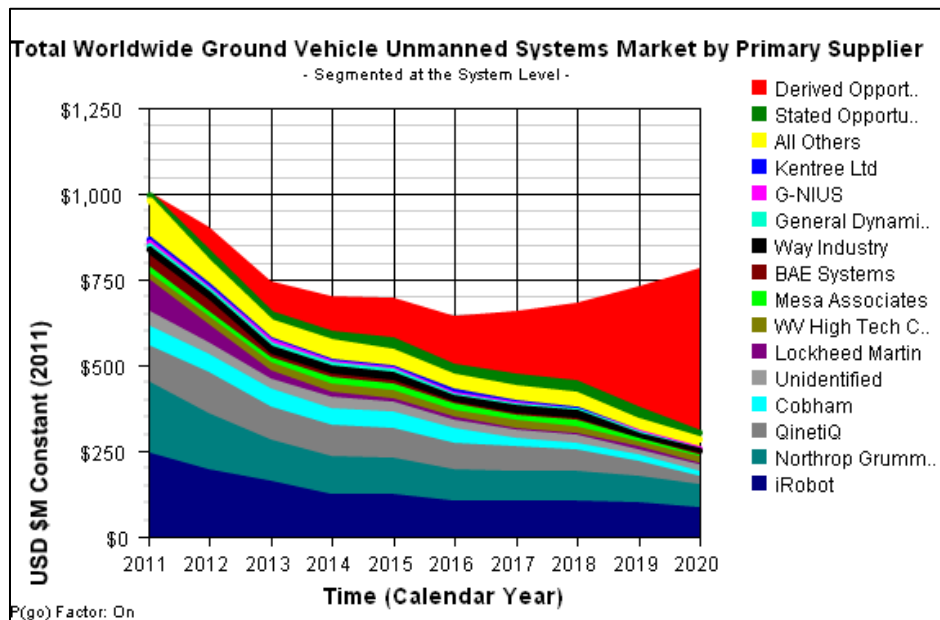
European growth will remain subdued until 2015

European budgets mostly hover around the 2.0% mark, but have been impacted by the worldwide financial crisis. *Jane's Defence Budgets* forecasts a near 10.0% contraction in the defense budgets of the top five spenders in Europe – UK, France, Germany, Italy, Spain – between 2010-2015. Growth will continue to be subdued until the latter half of the decade due to unprecedented high levels of public debt.

The UK is currently engaged in implementing procurement and maintenance cuts recommended in the Strategic Defense and Security Review aimed at achieving a 7.5% cut in the £42 billion defense budget. The declines in spending in Europe (and eventually the US) will be offset by the growth of new spending in China, Russia, India, Brazil, and some other South American countries. One of the major trends in defense spending in these emerging countries is the demand for technology transfers to build domestic defense industries. The Middle East will continue to be a major market for defense contractors but is heavily dependent on stable oil revenues for opportunistic spending.

Macro-Market View

The UGV market forecast for the ten year period 2010-2019 amounts to \$8.6 billion, a 6.0% decrease for the same period one year ago primarily due to the change in unallocated R&D, which underwent a major revision during 2010.



Total worldwide UGV suppliers – forecast revenues (Jane's DS Forecast)

However, CAGR is -1.3%, up from -6.2% for the forecast a year ago. Over the year new records added \$1.3 billion to the ten-year forecast and this combined with changes to existing records resulted in this positive change in CAGR and long term swing upwards in the forecast market.

Strong UGV sales driven by combat requirements in Iraq and Afghanistan

Unmanned ground vehicles continue to make their mark in Iraq and Afghanistan and sales have been a direct result of the ability of suppliers to meet the requirements of the war fighter. Market leaders such as iRobot (PackBot) with \$1.5 billion forecasted, Northrop Grumman (Andros) with \$1.2 billion forecasted and QinetiQ (Talon) with \$1.0 billion forecasted, continue to deliver effective vehicles and have been flexible in meeting dynamic requirements in 2010.



iRobot's PackBot at Eurosatory 2008

In January 2010 it was announced that only the armed version of the Lockheed Martin Multifunction Utility/Logistics and Equipment (MULE) would continue under the army's Early Infantry Brigade Combat Team (E-IBCT) program. For this, RDT&E was added in line with the latest schedule, which includes significant funding through 2012 in the IBCT Increment 2 phase and 9 prototypes are funded in FY2011. Delivery quantities for this will be added as and when this program becomes more clearly defined.

Recently, Northrop Grumman Corporation was awarded a contract to upgrade the US Air Force fleet of Andros HD-1 unmanned ground vehicles to help counter evolving threats from improvised explosive devices (IED). This sole-source, indefinite delivery, indefinite quantity contract upgrades as many as 173 systems over the next two years.

For the QinetiQ MTRS Talon the delivery profile was aligned with FY2011 PEDS, and the future forecast amended to compare with the current rate and the unit price was updated to FY2010 level.

During the year a number of stated opportunity records to awarded contracts were changed. This included the Xbot past and future production contracts for iRobot, covering several thousands of UGVs for the US forces.

Regional Views

\$1.3 billion added to ten-year UGV market forecast as a result of audits during 2010

Over \$1 billion of derived opportunities have been added during forecast audits of 36 countries during 2010. Each audit has considered the future potential for replacement and growth of UGV inventory, and in some cases the introduction for the first time of UGVs. Also the audits have considered the growth in indigenous design/production capability.

Europe

There was an overall reduction for France from the previous forecast due to the change in unallocated R&D methodology. However, two programs were added for initial operational evaluation batches and follow-on production buys for the French Army:

- The Cameleon tracked, medium multi-purpose vehicle used for counter-improvised explosive device, explosive ordnance disposal, route clearance, reconnaissance, first response, survey, mapping and hazardous materials operations
- The small Inbot, designed as a rugged and simple robot, created for scenarios where it can be thrown into service



ECA's Cameleon at Milipol 2009

In the United Kingdom, the British Army is looking at a number of programs:

- BAE Systems is promoting an autonomous load-carrying vehicle to the UK Ministry of Defence through a self-funded program called the Multi-Operated All-Terrain Vehicle (MOATV)
- The Questar modular surveillance and reconnaissance platform which can also be equipped for radio rebroadcast or chemical, biological, radiological, nuclear and explosives detecting or defeating
- The Trakkar logistics and multipurpose UGV is still in the pre-trials stage is designed to carry up to 250 kg of payload
- In early 2010, the UK Ministry of Defence (MoD) released initial funding for development of an unmanned Snatch TD; according to Marshall Land Systems this could provide a solution for 'several thousand' Snatch Land Rovers earmarked for disposal

The pan-European TALOS program was added. This is a large articulated track reconnaissance UGV to provide border security, particularly against illegal immigrants, those involved in international terrorism, and those involved in illicit activities, such as people trafficking. Partner companies include Aselsan (Turkey), EBIC (Romania), Hellenic Aerospace Industry, Israel Aerospace Industries, ITTI (Poland), ONERA (France), PIAP (Poland), Politechnika Warszawska (WUT), Smartdust Solutions (Estonia), SONACA (Belgium), STM (Turkey), Technical Research Centre of Finland, Telekomunikacja Polska and TTI Norte (Spain).

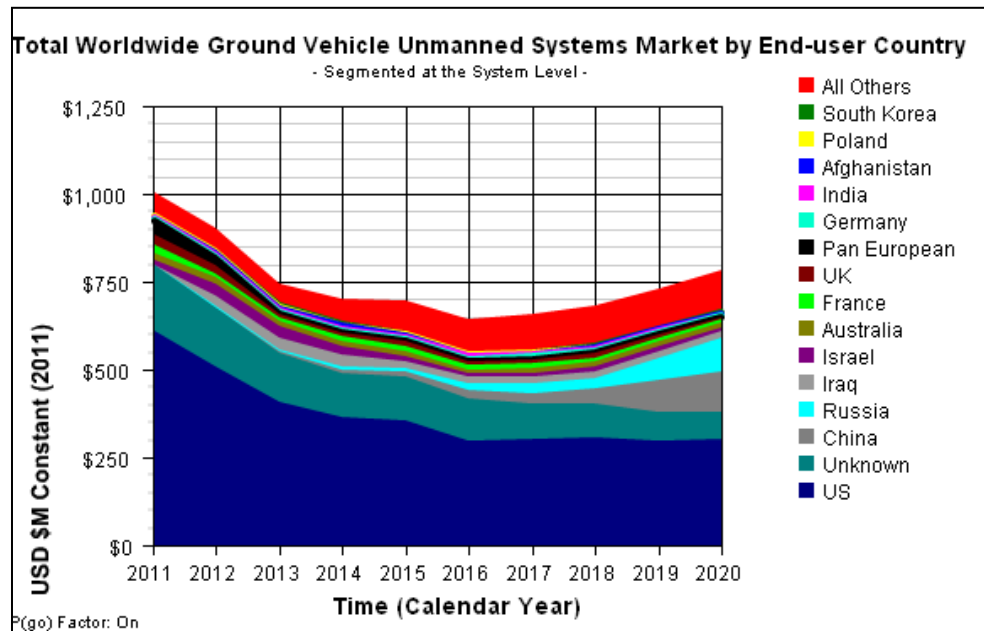
Americas

For the United States, the total program value was reduced since the forecast a year ago. Most of this reduction (-12% in US program value) was due to the change in unallocated R&D, as mentioned in the previous section.

Some of the other major changes and additions were as follows:

- The unit price for the US Army Small Unmanned Ground Vehicle (SUGV) record was reduced in line with the initial October 2010 contract, which calls for up to 70 model 310 SUGV robots
- The Joint Ground Robotics Enterprise (JGRE) ACD&P Joint Robotics Program was aligned with the FY2011 PEDS data, which was a reduction on the previous forecast
- The record for the Andros HD-1 under-vehicle surveillance UGV was given a lower P(Go) to reflect some risk in the longer-term forecast

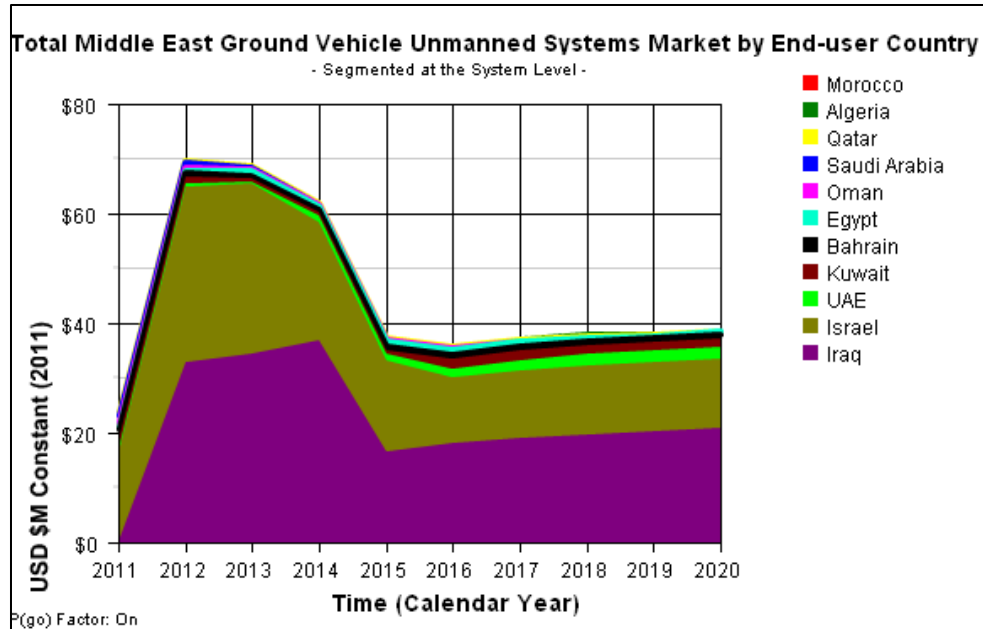
- A new record was added for the Cargo Unmanned Ground Vehicle requirement, for which the US Marine Corps Warfighting Laboratory (MCWL) selected Oshkosh's TerraMax technology to be integrated on the Marines' Medium Tactical Vehicle Replacement (MTVR) truck; the two-year experimentation project began in June 2010
- The Defense Advanced Research Projects Agency (DARPA) awarded a \$32 million, 30-month contract to Boston Dynamics to develop prototypes for the Legged Squad Support System (LS3) which is designed to carry 400 lbs of equipment for 20 miles in 24 hours for US soldiers and Marines
- A marketing record was added for the Northrop Grumman Carry-all Mechanized Equipment Landrover (CaMEL) UGV which is a company developed load-carrying system that weighs only 800 lbs, can travel up to seven miles an hour, and have the ability to carry a payload of up to 1200 lbs



The worldwide UGV market (Jane's DS Forecast)

Middle East

Iraq will require UGVs when the US-scheduled withdrawal takes place in 2011. It is possible that the UGVs will be donated by the US and other nations, but it is considered more likely that they will be purchased and the forecast for Iraq, which changed little over the year, still shows a large demand for UGVs building up from the start of 2012.



The Middle East UGV market (Jane's DS Forecast)

For Israel, a number of records increased in program value or were added for the first time. These included:

- The VIPeR (Versatile, Intelligent, Portable Robot) UGV developed by Elbit, which has been incorporated into Israel's Dominator Integrated Infantry Combat System
- The G-NIUS AvantGuard, which entered service with the IDF Special Forces in 2010; exploiting Guardian control technology, it uses instead the smaller Dumur Tactical Amphibious Ground Support (TAGS) platform
- Light, medium and large UGV derived opportunities were added to cover future potential

Asia and Oceania

Major derived opportunities were added for the first time for China and Russia. Both countries are investing in their unmanned vehicle indigenous industries and are forecast to develop significant capabilities over the decade and beyond. These placeholder records will be reviewed in finer detail during the forthcoming audits for China and Russia.

Six new UGV programs were added for Australia, including the Beagle, Digger, Sentry, Inspecta, Silverback and Ferret UGVs. Many more programs are likely to evolve as Australia supports active competition in this market.

Rest Of World

For various unidentified countries, light and medium UGV derived opportunity records were added to cover the medium- and long-term demand for a variety of forces and missions, which includes the growing application for police and homeland security operations. Many other records were added throughout the year for the marketing of new UGVs.

Technology Drivers

Suppliers are increasingly looking at ways of getting the most out of their existing products and are extending multi-role applications.

Multi-sensor, payload and mission platforms are being explored to maximize product effectiveness

iRobot, QinetiQ and Northrop Grumman are creating platforms that can employ the largest number of sensors/payloads and therefore missions. For example, the iRobot Packbot can perform chemical, biological, radiological and nuclear (CBRN), first responder, explosive ordnance disposal, simple reconnaissance and hostile fire detection roles. QinetiQ has developed the Talon basic reconnaissance vehicle into a medium-sized armed UGV with a range of variants such as CBRN, x-ray and EOD. Northrop Grumman continues to upgrade the Andros unmanned ground vehicles to help counter evolving threats from improvised explosive devices.



Marshall SDG's Questar (left) and QinetiQ's Talon (right)

G-NIUS (a joint venture between Israel's Elbit Systems and Israel Aerospace Industries), have been involved for many years with kits to convert manned vehicles to unmanned, which includes sensor and detector integration and in some cases weapon integration. Importantly, the vehicles are adaptable to various sensors in an effort to maximize the number of potential missions and customers.

ECA of France has developed the Cameleon UGV for reconnaissance, surveillance and target acquisition roles with an improved payload fit. The new system includes an acoustic hostile fire indicator.

Lockheed Martin has recently demonstrated its Squad Mission Support System (SMSS) UGV to the US Army, Air Force and Marine Corps. Autonomous operations were demonstrated, including correctly following a road network, safely maneuvering through a building complex, obstacle avoidance, avoiding obstacles inserted in its path, following an operator in 'follow-me' mode and navigating to an operator in 'come to me' mode.

Questar from Marshall SDG is designed as a modular surveillance and reconnaissance platform but can also be equipped for radio rebroadcast or CBRN and explosives detecting or defeating.

For smaller UGVs, although they possess much less flexibility, there are opportunities for a single platform to have various specialized roles.

Looking Ahead

Although the end of combat operations in Iraq will reduce demand in the short term, the future scope for the market is enormous

Up to now, the operations in Iraq and Afghanistan have played a large part in driving the market, where UGVs have met and continue to meet the requirements of the war fighter. Assuming the US withdrawal from Iraq takes place as scheduled, the forecast annual total market is projected to reduce in the near term, despite the likely increasing demand for UGVs from Iraq's own forces.

The future scope for UGVs, however, is immense. The importance of UGVs as demonstrated in Iraq and Afghanistan provides a strong basis from which the market can develop, illustrating how this technology could support future needs in many spheres of application, whether civil or military.

The market is at the very early stages of its lifecycle and many new applications will evolve over the coming decade and beyond. Some examples of significant future programs include:

- The US Navy Advanced EOD Robot System (AEODRS) program, to develop a next-generation robot for dealing with improvised explosive devices (IEDs) and unexploded ordnance, which will mark a significant leap over currently fielded systems. The Joint Service EOD Program has reported that AEODRS would provide a Robotics Capability for the EOD technician in the 2013-2020 timeframe; desired features include: autonomy, scalability/family of systems; modularity (plug & play) and electromagnetic (EM) environment compatibility

- The iRobot Small Unmanned Ground Vehicle (SUGV) lightweight, man-transportable system capable of operating in urban terrain, tunnels, sewers, and caves. It has a manipulator arm, fiber optic tether, EO/IR sensor, laser rangefinder, laser target designator, and chemical/radiological/nuclear detector; the SUGV fits into two modular lightweight load-carrying equipment (MOLLE) packs.



iRobot's SUGV-300 vehicle

- The ARV-A(L) armed variant of the Multifunction Utility/Logistics and Equipment (MULE) UGV. This is an unmanned component of the US Army's Early Infantry Brigade Combat Team (E-IBCT) program. It is a lethal platform with two weapon systems – the M240 Machine Gun and two Javelin missiles. The ARV-A(L) will employ a target acquisition package to include aided target recognition; this is receiving significant funding though 2012 in the IBCT Increment 2 phase

The market for UGV logistical support is still in its early days, and although a number of programs are being developed/promoted, it is difficult to predict how this market will unfold. A number of programs are currently involved in market development:

- Oshkosh TerraMax technology integrated on the US Marines' Medium Tactical Vehicle Replacement (MTVR) truck
- BAE Systems' autonomous load-carrying vehicle promoted to the UK Ministry of Defence through a self-funded program called the Multi-Operated All-Terrain Vehicle (MOATV)
- The G-NIUS Guardium-LS (Logistical Support) UGV

- The Northrop Grumman Carry-all Mechanized Equipment Landrover (CaMEL) UGV
- The Legged Squad Support System (LS3), being developed by DARPA
- The IAI REX transport UGV
- The Lockheed Martin Squad Mission Support System (SMSS) transport UGV
- The Marshall Land Systems Trakkar UGV

The potential to convert manned vehicles to optionally manned is receiving a lot of attention and offers a lower-cost means of procuring UGVs. An example of this is the unmanned Snatch TD by Marshall Land Systems. A number of nations are now beginning to develop optionally manned vehicle plans.

Over the decade, China and Russia will increase investment in their indigenous unmanned vehicle industries, and both are forecast to develop significant capabilities. These and other developments will contribute to a total market that is forecast to grow in the latter half of the decade. Beyond the ten-year period the market is expected to increase rapidly as UGVs become more and more integrated into future operations.

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About Jane's DS Forecast

Jane's DS Forecast is the market-leading aerospace and defense industry market forecasting resource, providing accurate and reliable 10-year forecasts across 19 global markets.

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