

Teams Prep for Next Year's U.K. Grand Challenge One Team's Perspective: *Threats Abound and the Clock is Ticking*

By Joseph Barnard



Finding snipers is one goal of the challenge.

Companies large and small are preparing for next year's MoD Grand Challenge 2008, a United Kingdom Ministry of Defence competition aimed at opening the U.K. defense market to new suppliers and ideas.

The challenge, which shares the name with similar robotic contests that have been sponsored by the U.S. Defense Advanced Research Projects Agency, calls for demonstrating technology that a small army unit could use to enter a village in the Middle East. The timing is brisk: Within an hour, the systems must detect threats from snipers, improvised explosive devices (IEDs), truck-mounted guns and uniformed military troops.

Grand Challenge was announced last year by Lord Drayson, the minister of state for defense equipment and support, and defined its requirements on its website at www.challenge.mod.uk

Points will be awarded for correctly detecting the threats, with the most points awarded for detecting them autonomously without any false alarms. Extra points will be awarded for finding the snipers and IEDs, which can be more difficult to spot, and for the degree of autonomy in platform operation and information processing.

The objective is to "produce an autonomous or semi-autonomous system designed to detect, identify, locate and report a range of threats in a hostile urban environment." In the proposals submitted, points were assigned for innovation; technical quality; novelty; and the potential for exploitation or further use.

The Taking of Copehill Down

The Grand Challenge will take place at Copehill Down Village in August 2008. The village was modeled on an East German village during the Cold War and consists of assorted houses built from "breeze blocks." Copehill Down is representative of the type of terrain in which the competitors' systems would have to compete, complete with all the challenges of an urban environment.

Twenty-three teams submitted proposals for Grand Challenge, ranging from established defense contractors and universities to small- and medium-sized enterprises that are less well-known. At the inaugural meeting at Copehill Down, Lord Drayson announced six Group 1 teams that will get MoD funding to cover their development efforts, and eight Group 2 teams that will fund their own efforts.

Group 1 is:

- Barnard Microsystems Team (Barnard Microsystems and OptoSignal)
- MIRA Team (MIRA, ERA Technologies, BAE Systems, GFS Projects, University of Warwick and Royal Grammar Guilford School 6th Form)
- Silicon Valley Team (Silicon Valley Systems, IDUS Consultancy, Moonbuggy, Kingston University, Reading University and Burton School for Girls)
- Stellar Team (Stellar Services, Blue Bear Systems, Cranfield University, SELEX Sensors and Airborne Systems, TRW Conekt, Marshall Specialist Vehicles)
- Swarm Systems Team (Swarm Systems, Park Technical Services, Orrcam and the University of Surrey).
- Team Tumbleweed (University of Manchester, AV-I, BAE Systems, MBDA)

Group 2 is:

- Cortex Team (from QinetiQ)
- Dragonfly Air Systems Team (Dragonfly Air Systems, Gress Aerospace, CONTROP Precision Technologies, Birmingham University)
- Mindsheet Team
- Rapid Solutions Team (Rapid Systems Solutions, Manchester University, Oxford Brookes University, Northwest Composites Centre)
- Sagentia Team (Sagentia Ltd)
- Team i-Spy (Middlesex University)
- Team Locust (Advanced New Technologies and Scientific Ltd. And Portsmouth University)
- The Thales Team (T3) (Thales, Reading University, Cranfield University, Exeter University, Loughborough University)

Two teams are participating as associates: MBDA and Warwick University.

The winner of the competition will receive the R.J. Mitchell trophy, named after the designer of the legendary Spitfire aircraft, and could get further funding from the MoD that may lead to the deployment of the winning system.



A Royal Artillery member discusses a Buster UAV, currently used by British forces in the Middle East.



An example of a house at Copehill Down Village.

“The threat you are facing is not only small arms, in terms of direct fire, but also potentially rocket-propelled grenades ... and increasingly complex improvised explosive devices,” says Maj. Gen. John Cooper, the competition’s director general for training support.

Some Team Approaches

The Barnard Microsystems Team is one of the smallest teams competing, and plans to adapt and use a UAS developed to survey oil pipelines in remote areas. The team also plans to develop a quadrotor platform to supplement the medium-altitude delta-wing aircraft that will act as an all-weather reconnaissance plane. As leader of this team, I foresee some particularly difficult areas to be detecting motionless snipers in the back of a darkened room; moving near thin, low wires criss-crossing the area; and seeing around trees and other foliage that will make it harder to spot threats.

The Swarm Systems Team plans to use from eight to 10 dinner-plate-sized quadrotor helicopters that could fly in and out of a building. Each quadrotor will be equipped with a high-resolution camera and the swarm approach will use numbers to its advantage.

“There is only so much information you can capture from one vehicle,” says team leader Stephen Crampton.

Team Stellar has proposed a multiple vehicle approach called SATURN, for Sensing and Autonomous Tactical Reconnaissance Network. This system makes use of two different UAS and an unmanned ground vehicle. Julia Richardson, director of Stellar Research Services and leader of the Stellar Team, says, “the Grand Challenge is really exciting. As a research company we never get the chance to put our money where our mouth is, so we have a great opportunity to show what we can do.”

Regulations

The Grand Challenge Project Leader, Andy Wallace, has circulated a note concerning the operation of Unmanned Aerial Vehicles at the competition. Unmanned aerial systems used in this competition will be classified as civil aircraft, and their operation within the military controlled environment of the competition site will be subject to regulations that aren’t significantly different from the civil requirements in the U.K.

“Teams will be asked to provide sufficient information about their equipment, to allow a safety and risk assessment to be performed before they will be allowed to operate within the designated competition airspace,” it says.

Commercial Benefits

One of the aims of the Grand Challenge is to contribute to the building of an industrial infrastructure in the U.K. that can support the ongoing development and deployment of systems the MoD can use to detect threats.

To that end, participants were urged to start a dialogue immediately with potential sources of funding, enabling the participants to build on their involvement in the Grand Challenge. Contest leaders described the benefits as being similar to those reaped by DARPA Grand Challenge competitors, including media exposure and exposure to investors and potential customers.

Teams also can be sponsored, which could take the form of funding, providing or loaning hardware, such as thermal imaging cameras, and technical advice or design services.

All of the Teams participating in the Grand Challenge would welcome any enquiries about potential sponsorship, and would be more than willing to let you know what you would get in return.

Dr. Joseph Barnard is managing director of Barnard Microsystems Ltd., which he established to develop and market scientific software. He is now focused on building up the company’s UAS work, particularly the use of unmanned systems in geophysical survey and pipeline monitoring work. He is also the Focus Group Leader in EuroCAE Working Group 73, which is developing a common set of recommendations for the airworthiness, operation and command and control of small UAS. He can be reached at joseph.barnard@barnardmicrosystems.com

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