Operational Issues / Challenges

Breakout Panel

Questions

- **What capabilities can unmanned ground systems bring to operational mission areas?**
- **What technologies must be developed to enable the development of these capabilities?**
- **What tactical and doctrinal issues need to be addressed to allow for a smooth transition of these capabilities to the Warfighters?**
- **What actions need to be taken as part of the path forward to overcome the technological, tactical and doctrinal issues identified?**

What mission sets do we want Unmanned Ground Systems for?

Force Protection

- **EOD / UXO**
- **Route clearance / mobility / demining / area clearance**
- **Firefighting**
- **Decontamination**

Logistics

- **Transportation / haul**
- **Battlefield medical applications**
- **Refuel / resupply**
- **Humanitarian Assistance / Aid**

Reconnaissance

- **Perimeter / Site Security & Early Warning**
- **Short range – “around the corner”**
- **Long range – “outside weapons range”**
- **CBRNE sensing / ID**

Direct Contact

- **Lethal effects**
- **Less than lethal effects**

Q1 – Capabilities / Requirements

- Sensory Feedback to the operator – SIGHT, touch, sound
- Virtual environment – with seamless man-machine interface
- Environmental Hazards Detection and Identification – Hazardous military and industrial chemicals, explosives, radioactive materials
- Suite of systems – Recon, Action (movement / manipulation) – one size does not fit all – vehicle-delivered vs map packable system
- Add 3D Dimension – GMAV – but without requiring airspace coordination
- Plug and Play architecture – adding / removing capabilities – needs to enable the user to add sensors / tools to the system easily – from different manufacturers
- Strongly prefer Wireless devices
- Must be night capable
- Must be compatible with Counter-IED Remote Control Electronic Warfare (or CREW)
- Must improve ranges in urban environments

Q1 – Capabilities / Requirements

- Must be able to fix forward – transportation on the non-linear battlefield is at a premium – Soldiers trained to repair with repair parts inventories on-hand
- Must reduce cost
- Material Reliability
- Appropriately weight classed – small, medium and large. Weight reduction / portable within its weight class
- Commonality of controllers / user interfaces
- Long duration; power supply sufficient for sustained operations
- All-weather capable
- Highly mobile – undeterred by mud, shallow water, rubble, etc
- Self geo-referencing; mapping
- Creating 360 degree visual and aural environment
- Autonomous movement and autonomous task operations

Q2 – Technologies

- **Intelligent actuators**
- **Advanced materials – composites, plastics, alloys?**
- **Energy storage – increasing energy and power density**
- **Virtual displays that recreate human senses**
- **Precise navigation in GPS-denied environment**
- **Reliable, long-range, non-LOS communications; programmable frequencies**
- **Advanced sensors and sensor integration**

Q3 – Tactical & Doctrinal Issues

N/A

Q4 – Future Actions…

- **Combat Developers; increased feedback / input from end users.**
- **Integrated, full life-cycle support.**
- **Establish specific cost targets / ceilings.**
- **Supply chain analysis to determine necessary infrastructure required to support robotics industry.**