

## **Gun and Missile System 2008 Symposium**

**Unmanned and Autonomous Systems  
Weapon System Integration**

**Ground and Air System Platforms**

**Panel Discussion**

**23 April 2008**

- **Enabling—System Integration, Operational Readiness, and Warfighter Application of:**

- **Unmanned and Autonomous Systems  
Weapon System Integration**

- **Ground and Air Platforms  
Ground Robotic Systems (GRS)  
Land and Sea  
Unmanned Aircraft Systems (UAS)**

- ***Challenges, Needs, Solutions, Opportunities  
Ensuring Integrated Systems  
And  
Realizing Operational Capability***

- **Identify and Examine DOD and Industry Requirements, Needs, and Challenges to Enable Weaponized GRS and UAS Systems**
  - Legal and Related Considerations
  - Requirements
  - Technologies
  - System Integration
  - Safety
  - Concept of Operations (CONOPS)
  - Risks
- **Assess Status of System Development/Deployment Readiness**
  - Success Demonstrated/Applied—Barriers Identified
- **Identify Path Forward —Challenges-Technologies--Integration**
  - DOD
  - Industry

- **Panel Opening Comments/Format Description** Moderator
- **Panel Member Remarks** Each Member
- **Panel Dialogue—Lead by Moderator** All
- **Questions from Attendees** Panel Members
  - Written Questions
  - Open Format Questions (As Time Permits)
- **Concluding Summary Comments** Panel Members
- **Wrap-Up Summary** Moderator

- **Dave Broden** Moderator Broden Resource Solutions LLC
- **Robert Fondren** NSWC-Dahlgren
- **Kim Jones** US Army--Picatinny-ARDEC
- **Ed Hackett** iRobot  
EH Group

- **Ricky Houghton**

**Ibis Tek**

- **Adrian Erkenbrack**

**Foster Miller**  
**Defense Technology Solutions**

- **Charlie McCullough**

**BAE Systems**

- **Jim Krafcik**

**USAF Eglin AFB**

- **Integration Challenges—**

- The Evolving Requirements
- Establishing Programs and Priorities
- Funding
- Matching Platforms and Technology for Capability
- Linking the Technology and Resources---Collaboration
  - Platforms
  - Integration Resources/Capability
  - Manufacturing
  - Technology
- Realizing the Needed Innovation and New Technology etc.
- Evolving Operational Criteria --CONOPS
- How Can Resources be Captured/Shared/Applied to Meet DOD Needs and Industry Business Objectives
  - Data Rights Considerations



Robotics  
Companies Establishing  
National Ground Robotic  
Consortium

- **System Integration Approach and Criteria**
  - What are the Drivers for System Design/Performance?
    - *Requirements Driven Pull*
    - *Vs.*
    - *Technology Push*
- **Role of Industry and Government In Defining/Selecting:**
  - Requirements Pull vs. Technology Push
    - Innovation— “Making it Happen”
    - System Design
    - Technology
    - System Integration



- **DOD Requirement Evolution and Status:**
  - **Status of Requirements:**
    - **Ground Robot Vehicle Systems (Ground and Sea)**
      - **Weaponized Systems (Armed)**
    - **Unmanned Aircraft Systems**
      - **Weaponized Systems (Armed)**
  
  - **DOD Priorities for GRV's and UAS's**
    - **Defined or Evolving?**
  
  - **Program Focus**
    - **FCS**
    - **Service Mission Specific**
    - **Joint vs. Specific Service etc.?**
    - **Other**

- **Unmanned And Autonomous Weaponized Platform Status**
  - **Ground Robotic Systems (GRS)**
  - **Unmanned Aircraft Systems (UAS)**
- **Requirements and Initiatives—Opportunities**
- **Legal and Related Considerations**
- **Weaponized Platform Characteristics —Size—Weight etc.**
- **Weapon Capabilities and Characteristics**
  - **Missiles**
  - **Cannons**
  - **Other**
  - **Munitions Required**
  - **Lethal vs. Non-Lethal**

- **Weapons Available for Integration vs. Unique “New” Weapons?**
- **System Integration Considerations**
  - **Technologies**
  - **Barriers**
  - **Risks**
- **Command and Control Links**
  - **Sensors—Sensor Resolution—Capture Details  
Video, IR, Fusion etc.**
  - **Communication**
  - **Data Links—Content—Transfer Needs/File Size/Data Rate**
  - **Man in Loop Control**
- **System Integration Status**

- **Safety Assessment Factors—**
  - Review/Approval Process
  - Design/Performance
  - Operational
  - Collateral Damage
- **Situation Awareness**
  - What is Required etc,
- **Coordinated Missions**
  - Apache plus UAS
  - Bradley plus GRS
- **Concept of Operations (CONOPS)**
  - Mission Flexibility
  - Surveillance and/or Lethal
  - Recon
  - Other

- **Barriers**
  - Technology
  - To Development
  - To Application
- **Opportunities**
  - Technology
  - System Integration
  - Production
- **Role of Industry To Enable GRV and UAS Weaponization?**
- **Path Forward—Vision Ahead**

- **1. What are DOD and Service Needs and Requirements for:**
  - **Armed Unmanned Platforms**  
**Ground Robotic Vehicles (GRV)**  
**Unmanned Aircraft Systems (UAS)**
  
- **2. Definition and Consideration of Unmanned vs. Autonomous**
  
- **3. Military Application of Armed/Weaponized Systems--- Legal Implications**
  
- **4. What Initiatives are In Process for: GRV? UAS?**
  
- **5. Comments Regarding Warfighter Use of Armed Unmanned Platforms**
  - **“Lessons Learned”—Proven Systems—Results—Needs**
  - **Who Controls the Armed Platforms—Decision Maker?**

- **6. What are Priority Mission Objectives—Establishing Required Weapon Capability and Type?**
  - **Weapon Types Required? Lethal vs. Non-Lethal?**
  
- **7. What are Weapon System Integration Challenges and Barriers?**
  
- **8. What Technologies Drive and Enable Engagement/Defeat Objectives?**
  - **Precision Capability**
  - **Ability to Reach Into Threat Areas**
  
- **9. Coordinated Capability of Manned System and Unmanned System**
  - **Apache linked to UAS**
  - **Bradley linked to GRS**

- **10. What New Weapon Characteristics and Capabilities are Required?**
  - **Mechanisms—Type—Weight--Power**
  - **Lethality**
  
- **11. What System Integration Technologies Are Required?**
  
- **12. Unmanned Platform Command and Control Links:**
  - **Status**
  - **Barriers**
  - **Decision Maker—Who—Where—Links etc.**
  - **Needs**
  - **Issues**
  
- **13. Type and Size of Unmanned Platforms for Weaponization?**
  - **GRS**
  - **UAS**
  - **Small vs. Larger or Mix?**



- **14. Operational Benefits of Armed/Weaponized Unmanned Platforms**
- **15. Is Low Collateral Damage Realized?**
- **16. Safety Assessment Related to Unmanned System Integration and Operational Application**
- **17. Address Multi-Mission Capability and Flexibility:**
  - **“Surveillance Balanced with Quick and Precision Strike”**
  - **“Find, Fix, Finish” –Operational Implications and Benefits**
- **18. Operational Training**

- **19. Weapon Lethality Capability—Type**
  - **Lethal vs. Non-Lethal**
  
- **20. System Integration Considerations**
  - **Requirements Pull**
  - **Vs.**
  - **Technology Push**
  
- **21. Weapon Integration, Capability, and Sensor Range Relative to Operational Criteria and Rule of Engagement (Legal etc.)**
  
- **22. How does Situation Awareness Capability Drive Weaponized GRV and UAS System Integration and Application?**

- **23. Requirement and Challenges for Unmanned Water Craft**
  
- **24. Weaponization Considerations**
  - **Integration of Existing Weapon Systems vs. Development of New/Unique for Unmanned Systems**
    - **Technical Factors**
    - **Logisitcs and Supportability**
    - **Schedule**
    - **Cost**
    - **Benefits**

- **Written Questions Prepared During Panel Member Remarks**
  - **Moderator will Select and Ask Questions**
  
- **Open Format Questions From Attendees**
  - **Following Written Questions**

- Panel Members Present Wrap-Up Remarks
  - *Identify Top 2-3 Focus Priorities*
- *Focus on Key Topics*
  - Benefits of Weaponized Unmanned Platforms
  - Challenges
  - Barriers
  - Opportunities
  - Key Programs
- DOD and Service Objectives, Focus, and *Plans—Challenge and Opportunity for Industry*
- *Industry Focus Thrusts to Enable Weaponized Unmanned Capability Objectives*

- **Moderator Summary Comments**
- **Thank Panel Members for Participation and Candid Comments**
- **Panel Members will be Available for Discussion**
- **Panel Has Effectively Described Status of Unmanned Weaponized Systems—Identified the Needs—Challenges and Opportunities**
- **Partnership of DOD and Industry is Key to Evolving the Capability**
- **NDIA Offers a Forum for Exchange of Information and Networking to Enable Technology and System Integration Ensuring Superior Capability and Readiness.**

- **Opportunities for Gun and Missile Community**
  - Ground Robotic Vehicles
  - Unmanned Air Systems
- **Focus on Innovation and Systems Integration**
- **Ground Robot Consortium is Being Formed**
  - Linking the Robotic Community
    - Gun and Missile Community will be Complementary
- **Collaboration of Gun and Missile Committee/Armament Division and Robotics Division –**
  - Demonstrates Effective Leverage of Related Division Benefiting Membership/Attendees
  - Future Symposia will Expand Collaboration