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9-10 APR 2009
Outline

• Fielded
  – Remote Weapon System (RWS)
  – Gun Fire Detection Integration

• Enabling Technologies
  – Platform Integration
  – Advanced RWS
  – Robotic Integration & Weaponization

• Challenges
• Summary
Remote Weapon Systems (RWS)

Description
- Compatible with M2, Mk19, M240 and M249
- Readily integrated with multiple platforms (MRAP, Abrams, HMMWV)
- Three-Axis Vector Stabilization
- Auto Focus (Day and Thermal)
- Uncooled Thermal Imager
- Auto Track, - Lead, - Scan

Warfighter Payoff
- Warfighter protection (operates weapon under armor)
- Enhanced target acquisition, identification, and engagement
- Enhanced situation awareness - both day and night
- Shoot-on-the-move

Protector M151

CROWS XM153

US Army has fielded Remote Weapon Systems
Gun Fire Detection Integration

**Description**
- Locate, Identify And Cue Up The Remote Weapon Station
- RWS integration with C2 system and Gun-fire Detection
- Counter Sniper ONS, fielding 679 systems, plus spares

**CROWS Lightning / PD Cue**

**XM154 Vanguard Counter**
Sniper System

**Warfighter Payoff**
- User can operate the weapon from within the safety of the vehicle
- Provides passive gun fire detection while on the move, with hemispherical coverage
- Track detected shots while on the move and provide Slew-to-Cue capability
- Can be mounted on HMMWVs and MRAPs

- ARDEC is actively involved with sensors integration to address emerging warfighter requirements
ARDEC Fielding Support To PM
Soldier Weapons

- Test support
  - In-house laboratory and firing tests
  - APG safety and performance tests
- System safety support
  - Identify and remedy potential failure modes
  - Hazard tracking
  - Quality Engineering Center
  - Human factors
- Weapon integration
  - Physical integration to mount
  - Monitor configurations for potential interferences
  - Ammo stowage and feed mechanisms
- Technical support
  - Mechanical and electrical subsystems
  - Platform integration
  - Software development and test
  - Configuration management
- Logistics support
  - Technical Manuals
  - Spare Parts
  - Reliability tracking
  - Diagnostic/repair equipment
• Integrated systems on various manned and unmanned platforms

• Each platform presents unique issues
  – Power takeoffs
  – Interior space claims for ECUs, displays, etc.
  – Roof and internal structures
  – No fire zones / motion inhibits
  – Hatches
  – Vehicle dynamics
  – EMI
ARDEC Developed HMMWV Vehicle Integration Kit

PRO Engineer Models

Hardware
Vehicle Integration

- CROWS on M1A2 Tank
- CROWS on M1114 HMMWV
- CROWS on M1151 HMMWV
- CROWS on FOX

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Vehicle Integration

**M151 on Stryker Platform**
- Platform requirements are consistently changing per mission and theater requirements.
- Additional platforms targeted and fielded with CROWS:
  - PM Light Tactical Vehicles – M1114, M1151
  - PM Assured Mobility Systems - RG31, Buffalo, JERRV, MMPV
  - JPO Mine Resistant and Ambush Protected - Caiman, MaxxPro (+), RG33L, Cougar, MATV
  - JPM NBC Contamination Avoidance - Fox M93A1

**CROWS on RG31**

*Other Services: SOCOM, USAF, UMSC/DOE/JLTV*
**Advancement of RWS**

**Picatinny Lightweight RWS**

- **Weight:** 160 lb
- **Slew rates:**
  - Azimuth: >200 deg/s
  - Elevation: > 160 deg/s
- **El Range:** -20 to 45 deg
- **Az Range:** Continuous 360 deg
- **Weapons:** M240, M249 and FN 303
- **Sensor suite:** Day camera
- **Can be integrated:**
  - FLIR
  - Laser range finder
  - Stabilization

**Advance Remote/Robotic Armament System**

- Remote weapon re-load and ammo type change
- Improved weapon reliability & safety
- Theft resistant weapon and ammunition
- Enables low energy propulsion munitions (non lethal)
- Design allows weapon super elevation to 90°
- Maximize internal ammo stowage (1500 - 7.62rds)
Ripsaw MS1

System Description:
- Modular Common Platform that can support multiple mission profiles
- Tele-Operated via a Remote Command Center
- Large Class (payload of 2000 lbs)
- Fast - speeds up to 60 mph
- Agile - Zero Turn Radius
- All Terrain and Rugged

ARDEC Partnership
- Platform was developed by the Howe and Howe Technologies, Inc
- Teamed with TARDEC
- ARDEC has integrated
  - Picatinny Light Weight Remote Weapon Station (PLWRWS)
  - Modular Crown Control Munitions (MCCM)
  - Remote Reality 360° camera
  - Counter IED Sensors

RF Link management, Weapon control, System latency, Emergency stop, Communication interference among other systems, Weapon safety in degraded modes, Operator interface
CHALLENGES

• Technical
  • Integrating state-of-the-art technologies to satisfy warfighter requirements
  • Improve secure communication bandwidth and range

• Safety
  • Eliminate single point failures
  • User in the loop

• Quality and Testing
  • Facilities and evaluation criteria required to test latest Armed Remote/Robotics technologies
In Summary…

Pulling the pieces together

- ARDEC is actively engaged in the integration of Remote Armament Systems on both manned and unmanned vehicles

- ARDEC has unique capabilities to provide remote armaments solutions for robotic platforms
  - Emerging technologies
  - Development programs
  - Network lethality
  - System Safety Certification

- ARDEC is partnering with OGAs and Industry
  - CRADAs – Foreign & Domestic