Lightweight Remotely Operated Weapon Systems

Presented to:

NDIA International Infantry & Joint Services Small Arms System Annual Symposium

Session VIII: Weapons and Ammunition

19 May 2005

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Bottom Line Up Front

- **A given…..Remotely Operated Weapon Systems dramatically enhance lethality and increase soldier survivability; Combat proven!**
- **Proliferation of remotely operated weapon systems for manned/unmanned platforms undoubtedly dependent on size, performance, and cost design trades.**
  - **One-size doesn't always fit all!!**
  - **70-80% solution to a current requirement likely 100% solution for much broader customer base (fosters "Economy of scale production")**
- **Remotely operated systems generally result in degradation in situational awareness; Technology insertion required to "buy back" capability**
- **ARDEC developing two lightweight remotely operated weapon systems to demonstrate "What's possible?" to the warfighters**
  - **Picatinny Lightweight Remote Weapon Station (PLRWS)**
  - **Special Weapon Observation Reconnaissance Direct-Action System (SWORDS)**

How small, light, and affordable can you make it and still deliver acceptable firepower????

Picatinny Lightweight Remote Weapon Station (PLRWS)

Objectives:

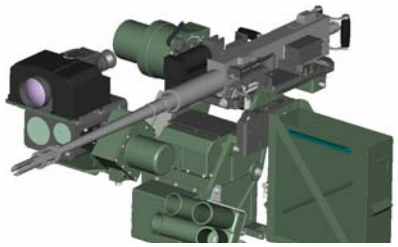
- Demonstrate lightweight cost effective system that can be affordably proliferated across spectrum of manned/unmanned platforms designed for weapons most available to units

Remote Weapon Station Design Drivers

- Weapon & Ammunition Quantities; weight/inertia/recoil forces
- Sub-system weight and inertia (sight, structure, stabilization sensors)
- Slew rates, accuracy and stabilization performance
- Sub-system armor
- Sensors: Sight package; Day/Night, Acoustics, 360^{o} Camera
- Continuous 360^{o} azimuth slew; slip ring requirements
- Vehicle Integration; sub-system mounting, power, operator station, cable routing

Existing Remote Weapon Stations
Some Examples

Kongsburg RWS



Recon Optical CROWS

Kollmorgen CLAWS

GD/RAFAEL Mini-Typhoon

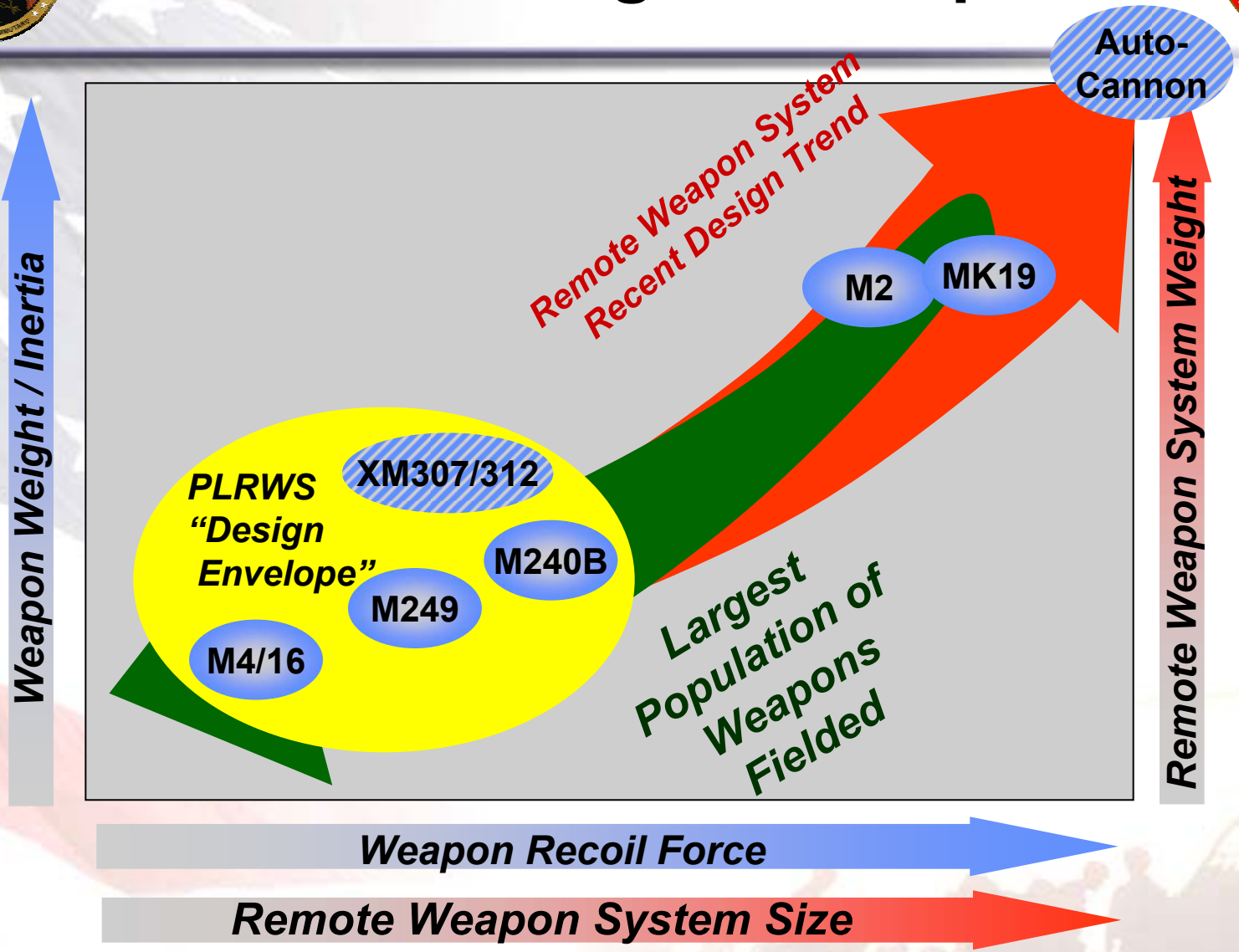
Others

- ROSAM
- HITROLE
- ????

RAFAEL RCWS

- Many great systems developed and fielded
- Most designed (structure & stabilization) for both 0.50 cal & 40mm Grenade Machinegun capability in addition to 5.56/7.62-class machineguns
- System weights generally fall between 200-500lbs w/o gun & ammo

PLRWS "Design Envelope"



Opportunity exists for a "light-class" remote weapon station

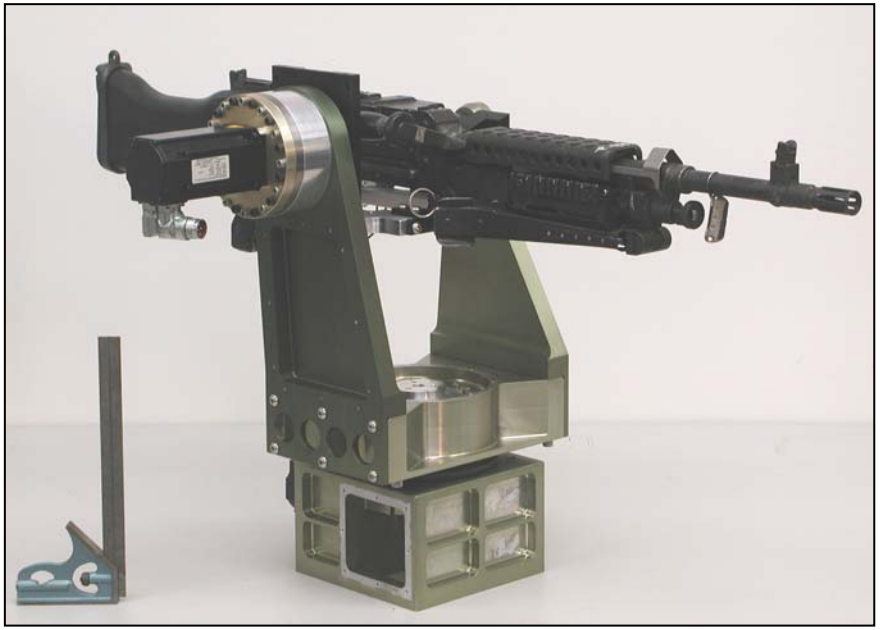
PLRWS

Program Description

- **Customer:** PM-Soldier Weapon & Rapid Equipping Force
- **Funding:** ~$1.7M
- **Weapons:** M240/M249 (& Future XM307/312)
- **Applications:**
  - HMMWVs
  - Trucks
  - Emplaced Weapon Sites
  - Unmanned Ground Vehicles
- **System Capabilities (Goals):**
  - Weight: <150 lbs above the roof
    (incl: gun & 200 rounds)
  - Slew rates: 90 deg/sec in Az and El
  - 2-Axis Stabilization
  - Continuous 360^0 rotation
  - Elevation Range $+45^o$ to -15^o
  - Integrated Crew Station

PLRWS
Status/Plans

- System Development:
  - Fabrication 90% complete
  - Integration 60% complete
- Weight/Slew rate goals achieved
- Structural firing test Apr 05
  - Structure sound
  - Tight weapon position held



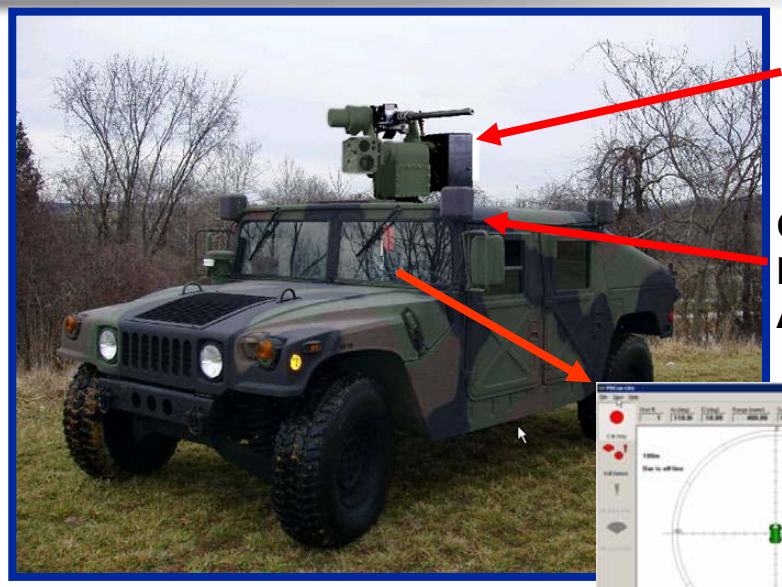
- Integration of XM116 Small Arms Fire Control System (SAFCS II) with stabilization software and control unit Jul/Aug 05
- Hardstand/Vehicle testing Aug/Sept 05
- Support customer demonstration requests Sept – Feb 06
- Insert technology enhancments as available

Remote Weapon Acoustic Counter Sniper

Example of "Tech Push" for Early User Demo

• **Objective:** Demonstrate an integrated low-cost acoustic sensor to provide a slew-to-cue capability against snipers while on-the-move.

- **Description:**
  - Integrate with Common Remotely Operated Weapon System (CROWS)
  - Full 360° hemispherical coverage for acoustic detection of gunfire and location of shooter
  - Mobile Subsystem and INS for on-the- move updates
  - Automatic or Manual Weapon Positioning via touch screen on GUI
- **Customer:** PM-Soldier Weapons (PM-SW) and AMC-FAST (USARPAC)



- **Status:**
  - CROWS/Acoustic system interface complete; Integration underway
  - 6-week test program planned May/Jun with live-fire against remotely operated HMMWV
  - User evaluators from USARPAC
  - ARDEC and with PM-SW working path ahead for evaluations in Iraq

Provides situational awareness for most critical threats....Shooters!

Special Weapon Observation Reconnaissance Direct-Action System (SWORDS)

SWORDS

Program Description

- **Objective:** Demonstrate integration of available firepower options on small, low-cost, remotely operated weapon system at extended ranges
- **Warfighter Payoffs:**
  - Remotely Operated Recon, Security, Sniper Asset
  - Increased weapons accuracy/control
  - Early opportunity for TTP development
- **Design Approach:**
  - Maximize use of proven components
  - Enable easy integration of existing fielded small arms
  - Early User feedback on design
  - Early Safety Confirmation testing
- **Joint ARDEC/OSD funding (~$2M)**
- **Transitions to Joint Project Office for Robotic Systems**

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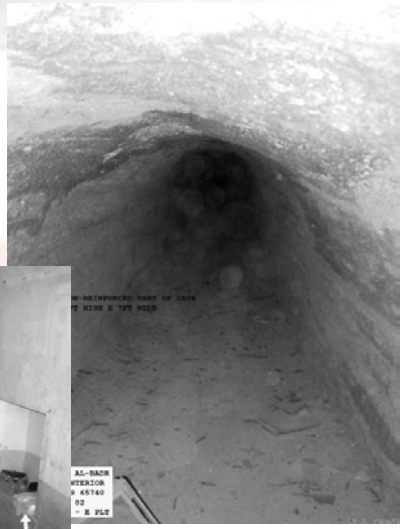
A QinetiQ Company

precision remotes

Helps keep soldiers out of harms way

Background

- Project initiated from a deployed EOD Unit's desire to clear cave entrances of potential threats (i.e. IEDs, enemy combatants)
- Two (2) concept demonstrators completed in ~1 month+
  - ARDEC EOD NCO "boot strap project"
  - Capitalized on existing EOD TALON Robot
    - Reinforced EOD robotic arm
  - Maximized use of existing armaments and/or ammo



Live Fire - Early Concepts

40mm Grenade Launcher

Mobile 40mm Grenade Launcher Prototype Tests

sponsored by TACOM

Range supported by ARDEC - Picatinny

testing perfromed by Foster-Miller

Live Fire - Early Concepts

M202 66mm Rocket Launcher

Early User Demonstrations

- Army's Stryker Brigade
  - FY03 at Ft. Lewis; Proof of Concept
  - FY04 in Kuwait; User evaluation
  - Yielded evolution of SWORDS configuration integrating small arms
- SOCOM in FY03/04
- VERY POSITIVE feedback on utility of concept

Early User Feedback Key to Validate Design Principles

System Description
Latest Configuration

- Integrates TRAP Mount on TALON
  - Accurate weapon pointing independent of chassis
  - ± 35° Az and ± 22.5° El
  - Integrates M249, M240B, M16, & 0.50 Cal Sniper Rifle w/o weapon modifications
- Unmanned RF control to 1KM (line-of-sight) via Operators Control Unit (OCU) for:
  - Mobility
  - Camera display options (view up to four images)
  - Weapon arm/safe/firing
- Five cameras/sights
  - Day/ Night drive cameras
  - Pan & tilt camera (situational awareness)
  - M145 w/Unitary Night Sight (Gen 3) for targeting
- Combat weight 180-190 lbs (w/o OCU)
- 3-6hr Lithium Ion Battery Life
- ~$200K/Sys (Target: ~$150K/Sys)

Live Fire & Mobility Demo

(segment from History Channel's "Mail Call")

Safety Confirmation Test Program

- Initiated early in development to support Urgent Material Release and flush out any anomalies
  - Two test iterations: Jun 04 & Jan 05
  - Included 100hrs reliability testing
- Testing currently halted; Program addressing test findings
- What's been demonstrated:
  - Stable firing platform for accurate single shot & burst performance
  - Better line-of-sight range command control performance than expected
  - Excellent video performance from cameras/sight upwards to 1km
- Remaining areas to be validated:
  - Weapon safety during communications loss/interruption & operator notification
  - Fire on the move disable feature
  - Lithium battery performance parameter refinement (controls) for safe operation, charging, and discharging
  - Sunlight readable LEDs on OCU

Design modifications required for operation in theater of war

Path Ahead

- Return to Safety Confirmation Testing (~Jun 05)
- Continue demonstration of capabilities to Users
- Continue preparation activities for Urgent Material Release
- Plan and seek resources for follow-on spiral improvements

Summary

- **Remotely operated weapon systems…. “one size” doesn’t necessarily fit all [applications]**
- **Biggest market opportunities will likely be met with the smallest and most affordable solutions delivering sufficient firepower**
- **PLRWS will demonstrate warfighter benefits of lightweight remote mounts for broader set of vehicle applications**
- **SWORDS provides a small, low-cost integrated mobile weapon platform demonstrating future technology <u>TODAY!!!</u>**

ARDEC/Picatinny…….

Products, people, and processes enabling our ultimate customer, the soldier, to “take care of business” throughout the spectrum of conflict!