



# NDIA Joint Armaments Conference:

## 21<sup>st</sup> Century Weapon Systems

## Advanced Remote/Robotic Armament System (ARAS)

Presented by: Bob Testa, Brian Hoffman, Bill Burgermeister  
ARDEC Weapon Systems and Technology (WS&T)



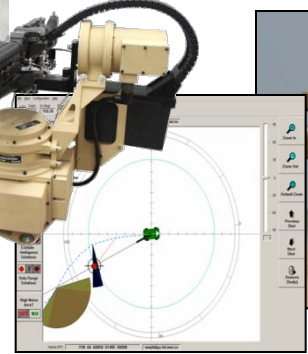
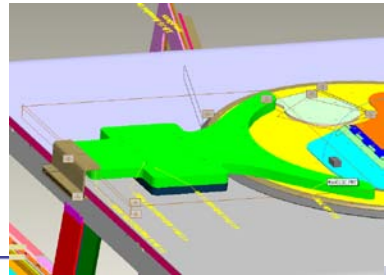
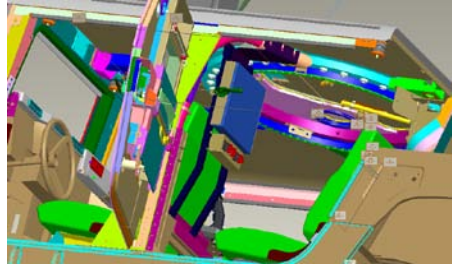
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19 May 2010

**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**



# Advanced Remote/Robotic Armament System (ARAS)



**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**





## Remote Weapons

What is wrong with this picture?



Mk19 40 mm GMG



.50 Cal M2 MG



M240B, 7.62 mm Medium MG



M249 Squad Automatic Weapon  
5.56 mm MG



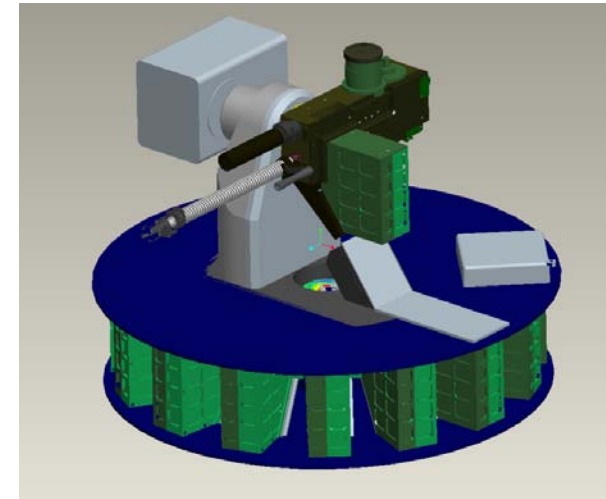
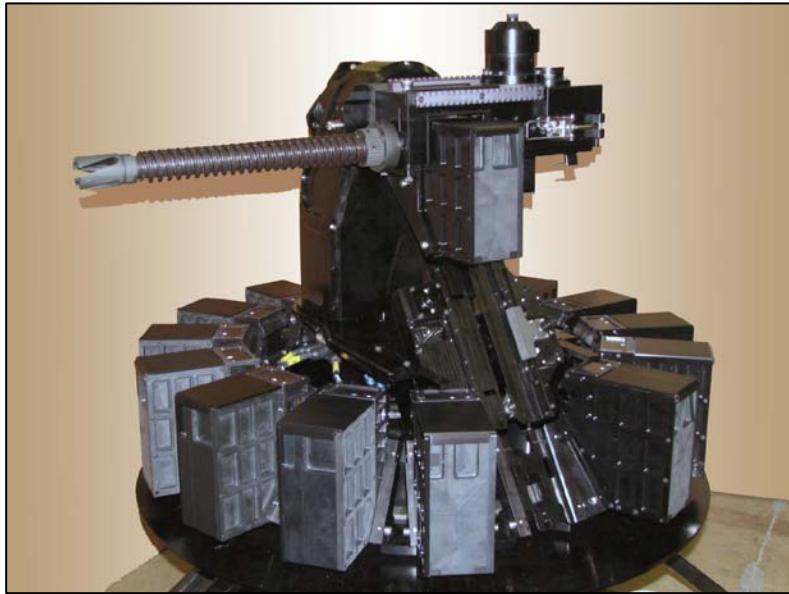
*Our development objectives are based on our understanding of the 'problem'*

## **ARAS CAPABILITIES:**

- ✓ Electrically actuated weapon firing standard linked ammunition
- ✓ High stabilization and pointing accuracy
- ✓ Reload from UNDER ARMOR
- ✓ Change Ammunition type from UNDER ARMOR
- ✓ Full ammunition inventory
- ✓ Non-lethal capability
- ✓ Real time operating system for critical subsystem performance
- ✓ Minimize reload or ammo type change time: ~6sec
- ✓ Theft/Tamper resistant weapon and ammunition
- ✓ Up to 90 degree elevation from low silhouette mount



# Advanced Remote/Robotic Armament System (ARAS)



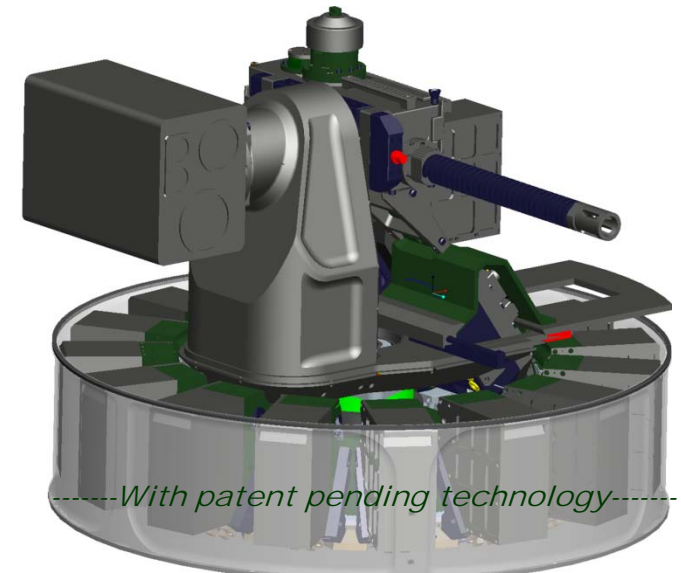
## ARAS Development:

FY05/06 – early concepts and internal marketing

FY07/09 – Baseline 7.62mm development

FY09/10 – Prototype 7.62mm fabrication

FY10/12 – 50cal ARAS development and fabrication



**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

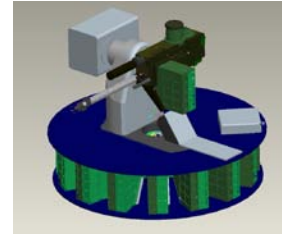


## How we did it:

- ARDEC management buy in; allowed us to work behind the curtain
- We kept our goals achievable: no modification of physics required
- We developed a strong multi-organizational team with supervisor buy in
- We understood key capabilities and added new requirements carefully
- We intentionally avoided specific platforms or applications



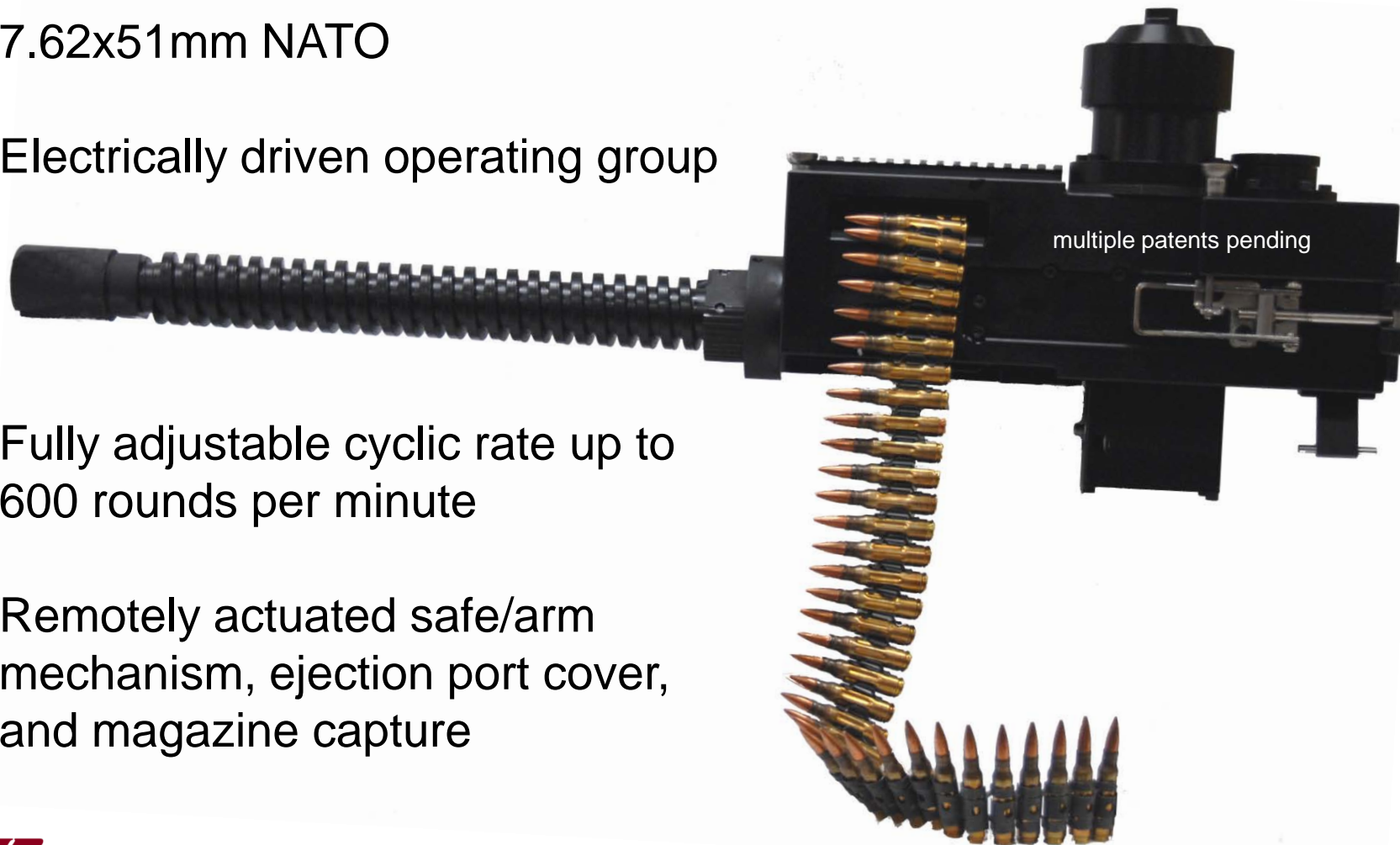






7.62x51mm NATO

Electrically driven operating group



Fully adjustable cyclic rate up to 600 rounds per minute

Remotely actuated safe/arm mechanism, ejection port cover, and magazine capture





- #1 Mission modularity with single weapon capabilities that span multiple conventional battlefield roles
- #2 High reliability when firing lethal and non-lethal ammunition
- #3 Scalable effects and ability to interchange lethal and non-lethal munitions on the fly and without hardware modifications

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- #4 Compact physical envelope with favorable inertial properties

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- #5 Barrel survivability (worst case payload dump of 1500 rounds in under 5 minutes)

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- #6 KISS

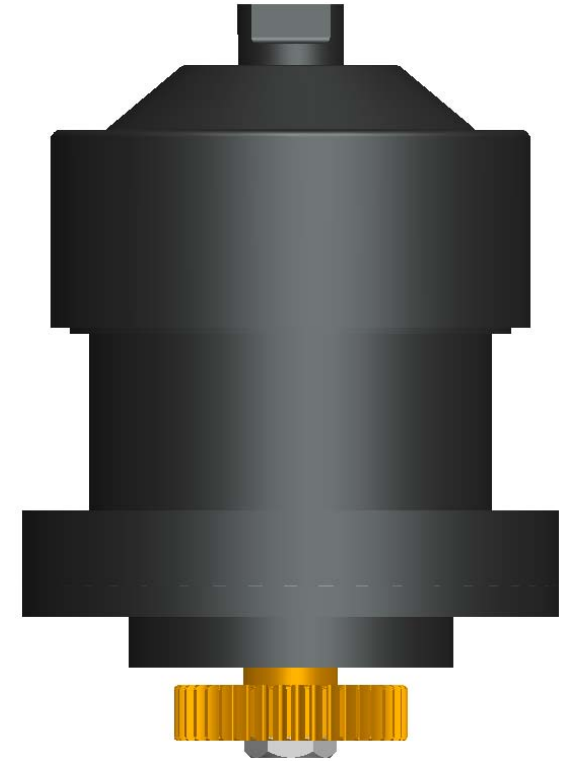
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External Power

Percussion Firing Mechanism

Software Control



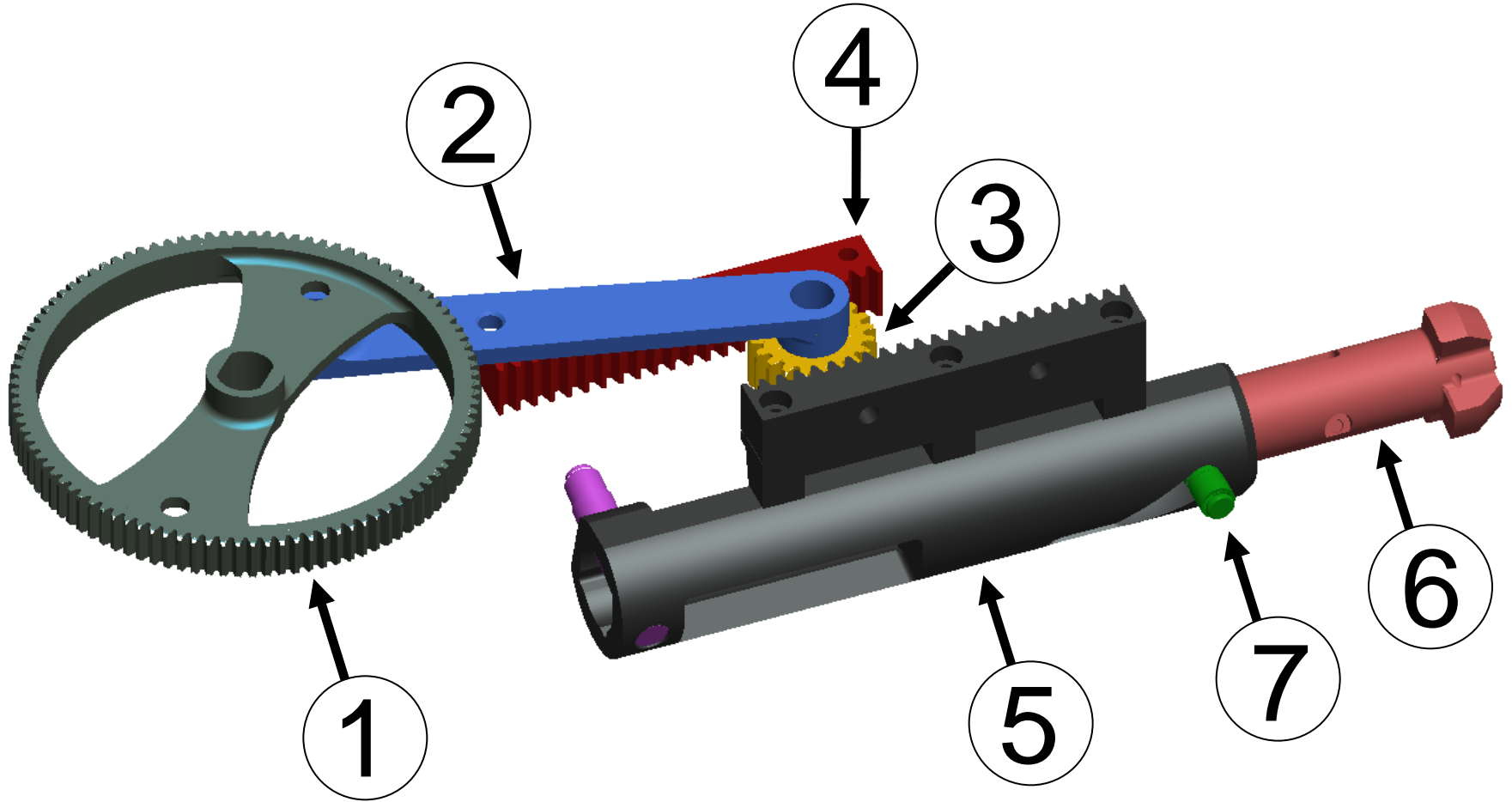
**sample code**

```
X=burst length;  
If (firing rate>400), X=10;  
//set burst length to 10 rds  
//for firing rates exceeding 400 rds/min
```



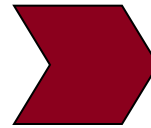
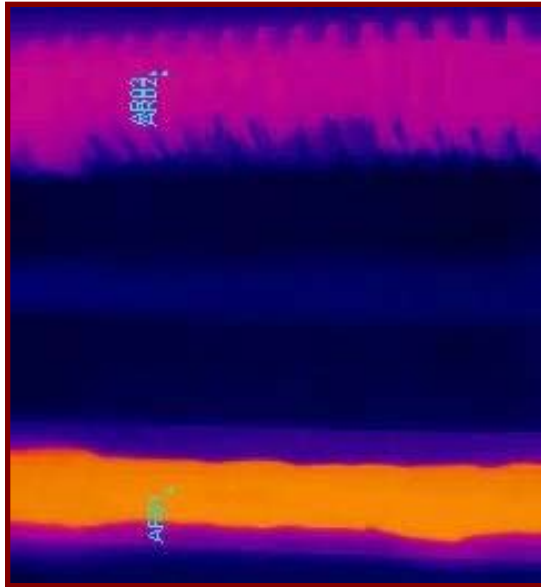
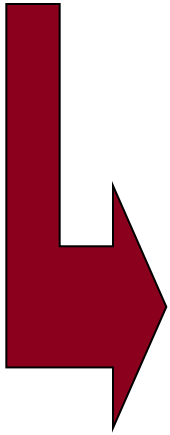
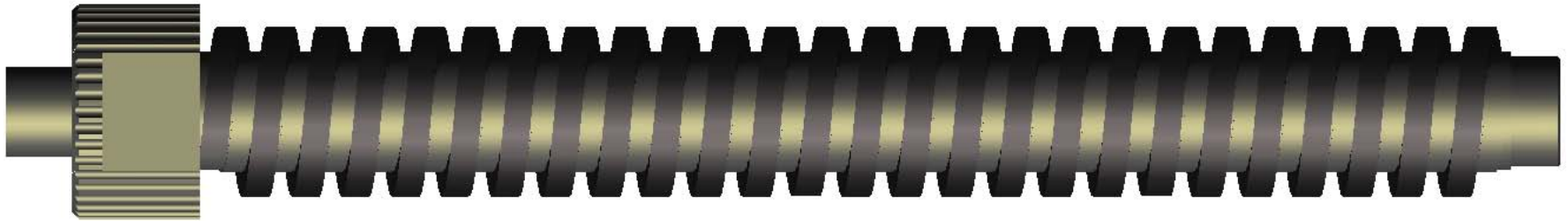


# Addressing Design Goal #4 (compact with favorable inertial properties)





# Addressing Design Goal #5 (barrel survivability)





FIXED HEADSPACE

FIXED TIMING

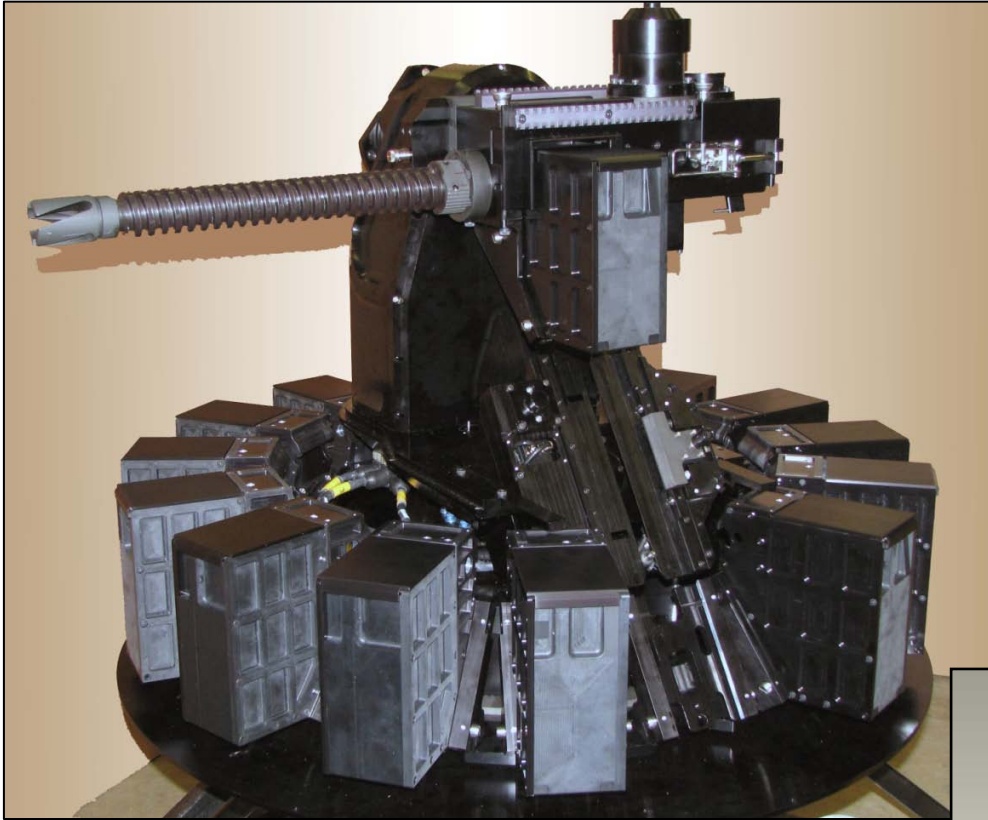
TOOL LESS USER FRIENDLY FIELD STRIP AND REASSEMBLY

NO BARREL CHANGE DURING PAYLOAD EXPENDITURE

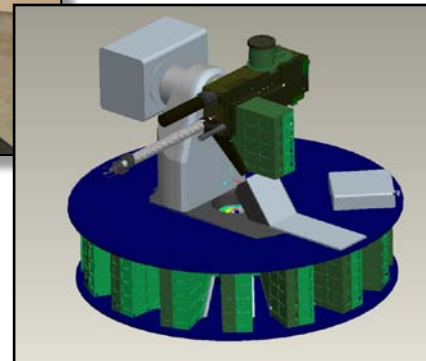
INTERNAL CABLING WITH TRANSPARENT CONNECTION  
WHEN ATTACHING THE WEAPON TO THE TURRET ARM

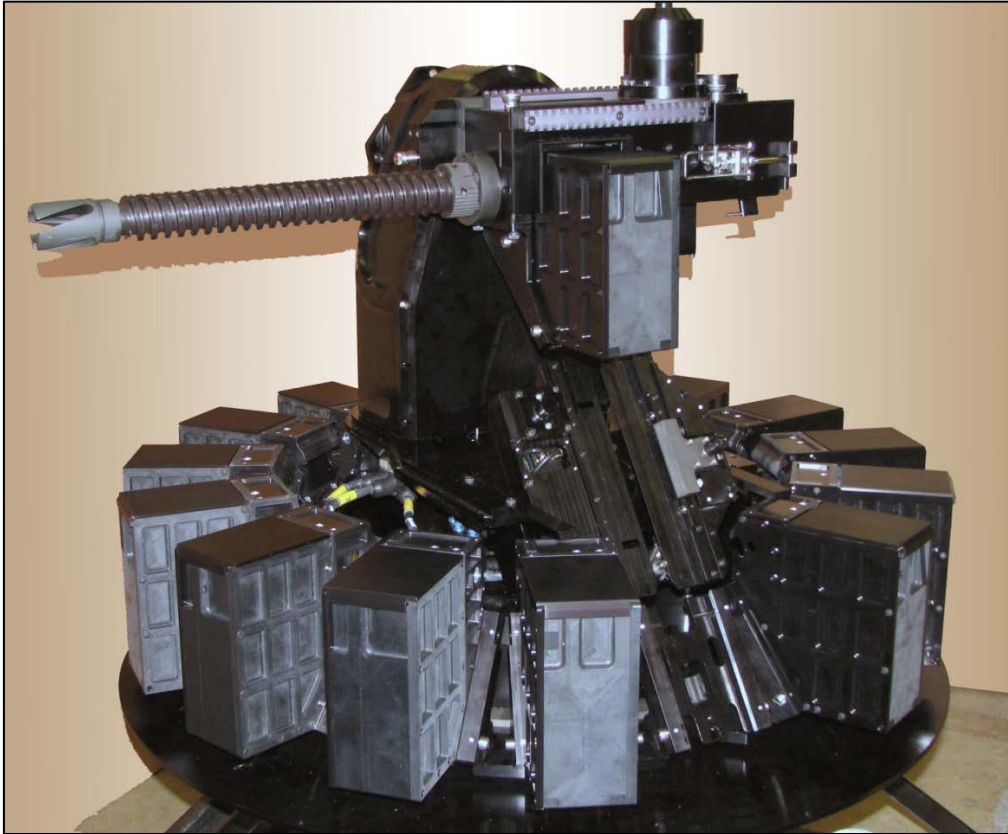


## Ammo Handling & Turret Design



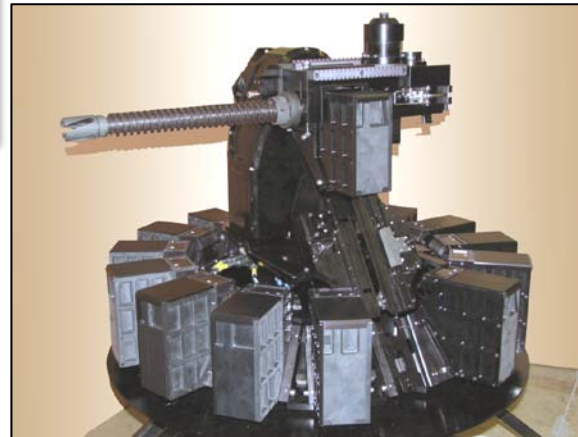
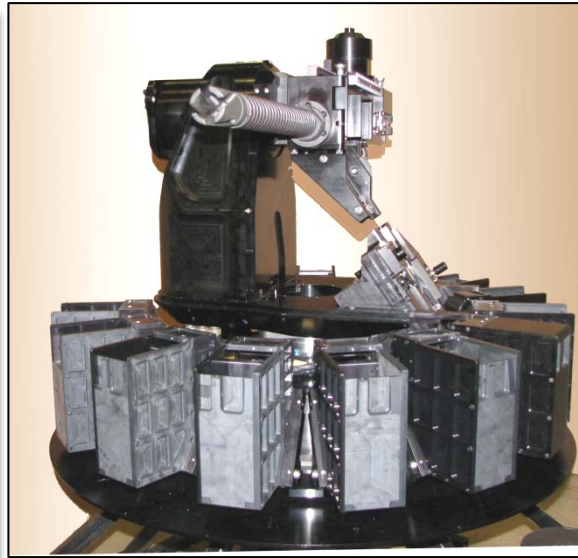
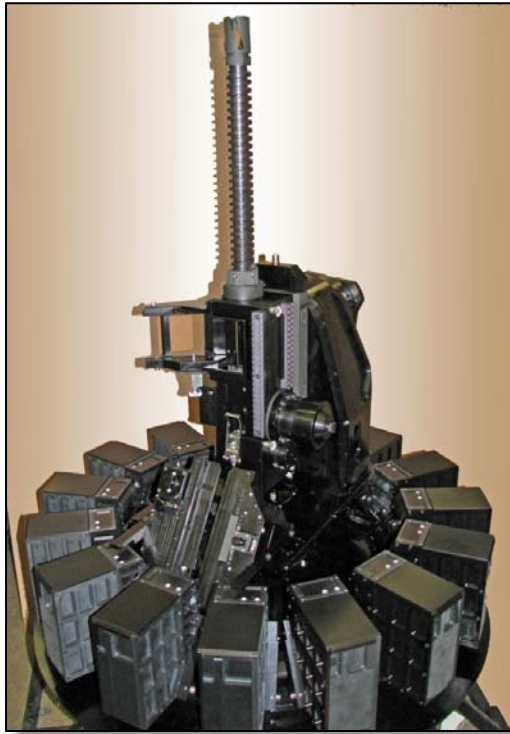
- Automated reload/switch ammo type under armor
- Reliably transport and lock magazine to weapon
- 360 ° continuous azimuth, 90° elevation -30° depression angle
- Ability to store and select different ammo types for mission flexibility and scalable effects





- First round select
- Internal Cable routing
- Lightweight and small footprint/swept volume
- High performance slew rate to facilitate stabilization and external systems ( PDQ, GDS, Network centric handoff...)
- Rigid turret system to improve weapon accuracy and round dispersion
- Fast reloading, target retention during loading.





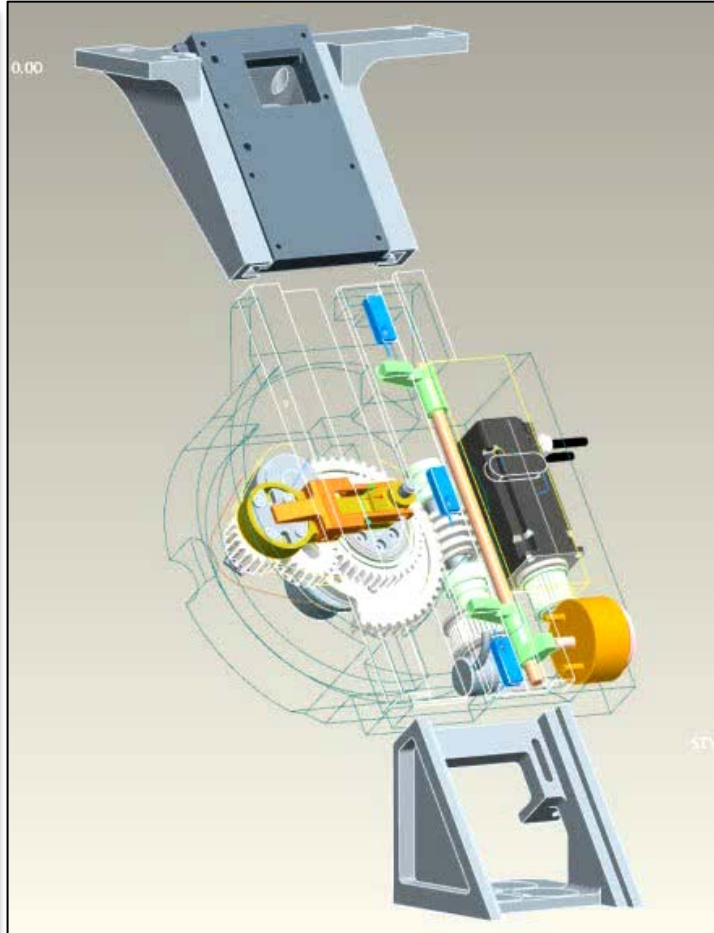
System Level approach in concurrent engineering of ammo handling, turret and weapon

- One arm turret accommodates ammo handling
- Weapon designed from onset to interface with ammo handling
- Magazine shuttle mechanism traverses with turret, carousel has separate axis, for fast reload capability and target retention
- Ability to select any ammo magazine in carousel
- Ammo magazines are environmentally protected





Patents Pending



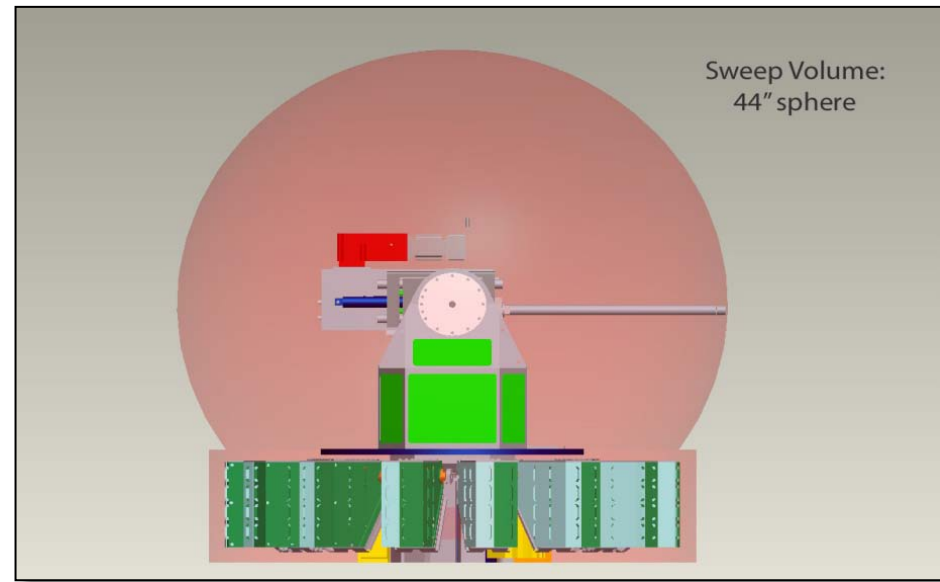
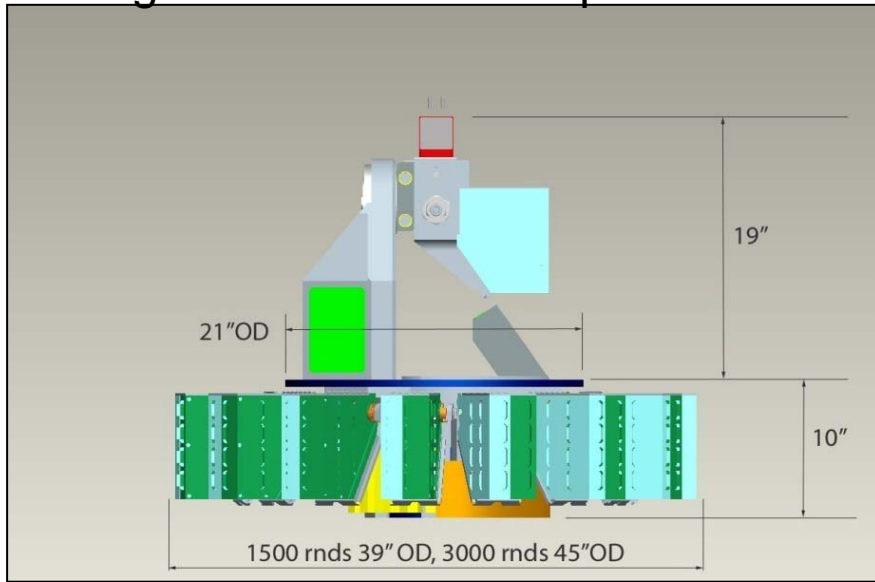
Provides a robust method to transport Ammo Magazine between Weapon and Carousel

- Fault tolerant design in case of control sequence malfunction
- Extended stroke length
- No intrusion into weapon or carousel swept volumes in home position
- Utilizes peak mechanical advantage at ends of stroke to latch ammo magazines to weapon and to carousel storage slots



## ARAS

Weight w/ 1500 rds: 410 pounds





# Contact information



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