

Extended Area Protection and Survivability (EAPS) ATO

2016 ARMAMENTS SYSTEMS FORUM



U.S. ARMY
RDECOM



U.S. Army Research, Development and Engineering Command

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

25-28 April 2016

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Bottom Line Up Front



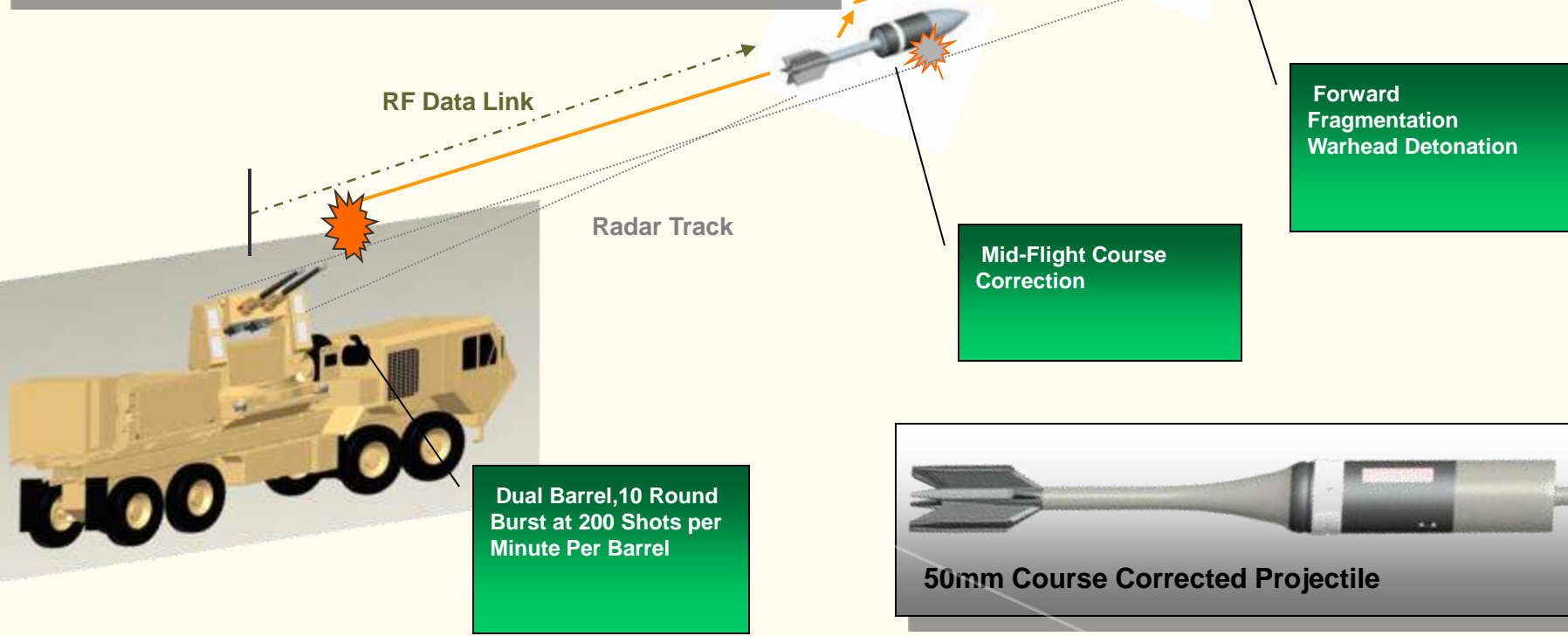
- Program completed final demonstration.
 - Successfully intercepted Class 2 UAS (Outlaw) at 1063m and 1487m.
- Improved successful intercept rate from 1/5 (Test 730, Apr 2015) to 2/3 (Test 740, Aug 2015)
- Technology Readiness Assessment rated TRL-6 for the following Critical Technology Elements (CTE).
 - EAPS Interceptor
 - EAPS Radar
 - EAPS Fire Control Software
- Technology available for transition for future C-UAS/C-RAM concepts.



EAPS Operational Concept



50mm Bushmaster Cannon



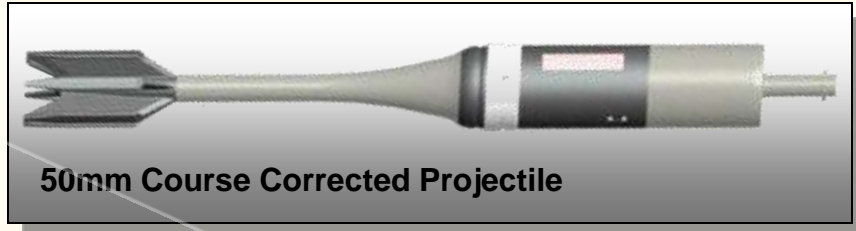
RF Data Link

Radar Track

Mid-Flight Course Correction

Forward Fragmentation Warhead Detonation

Dual Barrel, 10 Round Burst at 200 Shots per Minute Per Barrel



50mm Course Corrected Projectile



EAPS Historical Summary



Purpose:

To develop an inner tier gun based air defense technologies that will bridge the gap between the initial C-RAM capability and the Objective EAADS capability for providing a 360 degree hemispherical extended area protection from RAM threats.

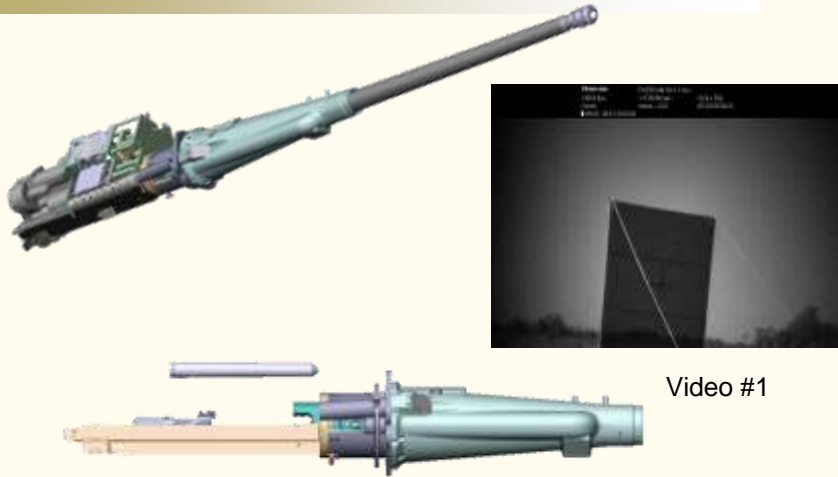
Product:Payoff:

Air defense platform with greater performance and less cost per engagement.

Demo key developmental technologies :

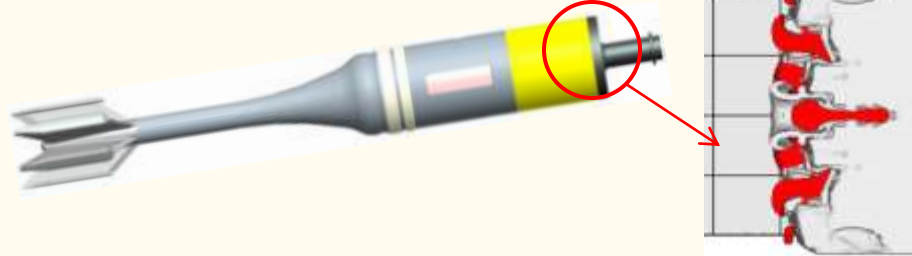
- 50mm Automatic Cannon
- Course Corrected Ammunition
- Advanced Forward Fragmentation Warheads
- Tracking Radar
- RF Communication

	<u>Phase</u>	<u>Time</u>	<u>Objective</u>
Phase 1	ATO-R	2006-2008	Subsystem Dev & Demo
Phase 2	ATO-ID	2009-2013	Subsystem Integration
Phase 3	ATO-ID	2014-2015	Dynamic Intercept Demo



Video #1

- Hybrid Bushmaster Gun
- BMIV AFT RECEIVER with BMIII BREECH & FWD RECEIVER
- Accommodates EAPS 50mm Caliber and 538mm Cartridge Length



RF Communications, Single Shot Thruster,
 Forward Frag MEFP Warhead



Interferometric Radar

Angle accuracy (x,y,z) < 0.3 mils @ 20dB SNR

Range accuracy < 0.2 meters

Track 6 threats & 10 outgoing interceptors/threat

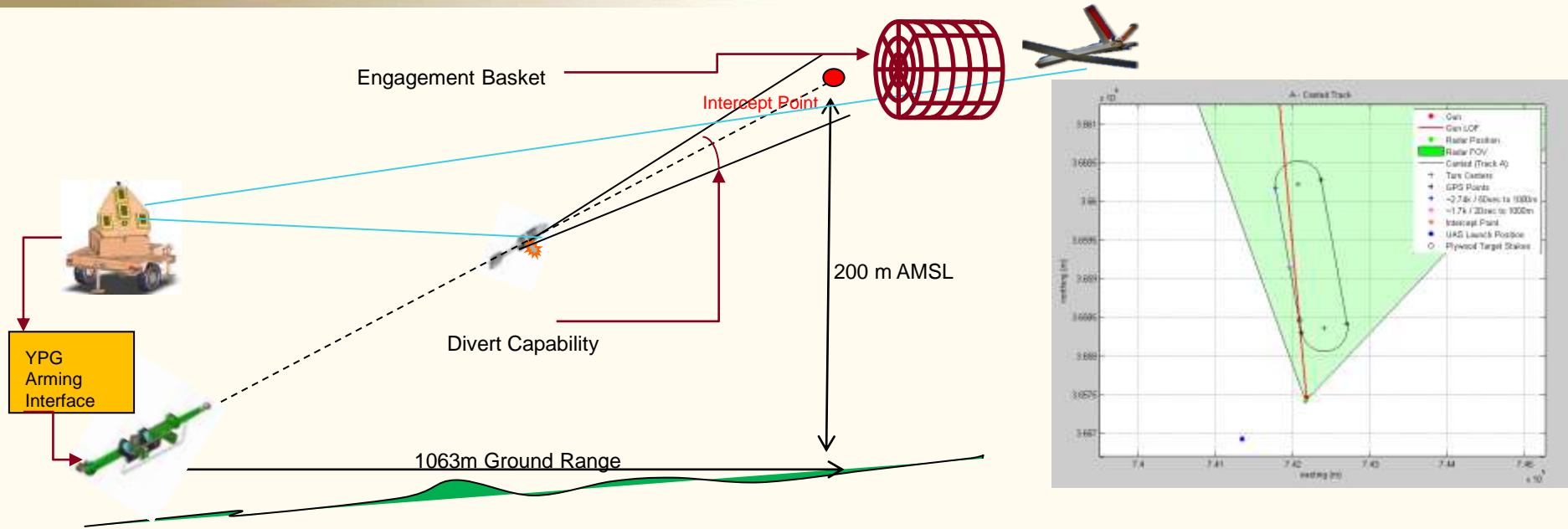
Ground Station For Fire Control & Communication



Dual Cannons for 400 rpm Firing Rate
 HEMTT Proposed Platform
 Stryker Class Vehicle Possible
 360° w/ Specific Engagements to 90° Quadrant



Fire Control Description



Radar Function
Tracks Threat UAV

F.C. Computations

F.C. Executions

Tracks Interceptor & UAS

Commo Function

TX
RX

(1) Computes Fire Time Solution

(2) Decides if Acceptable Engagement

(3) Computes Fwd Positions of UAV & Interceptor

(4) Computes Course Correction Maneuver (Time and Angle)

(5) Computes Detonation Time

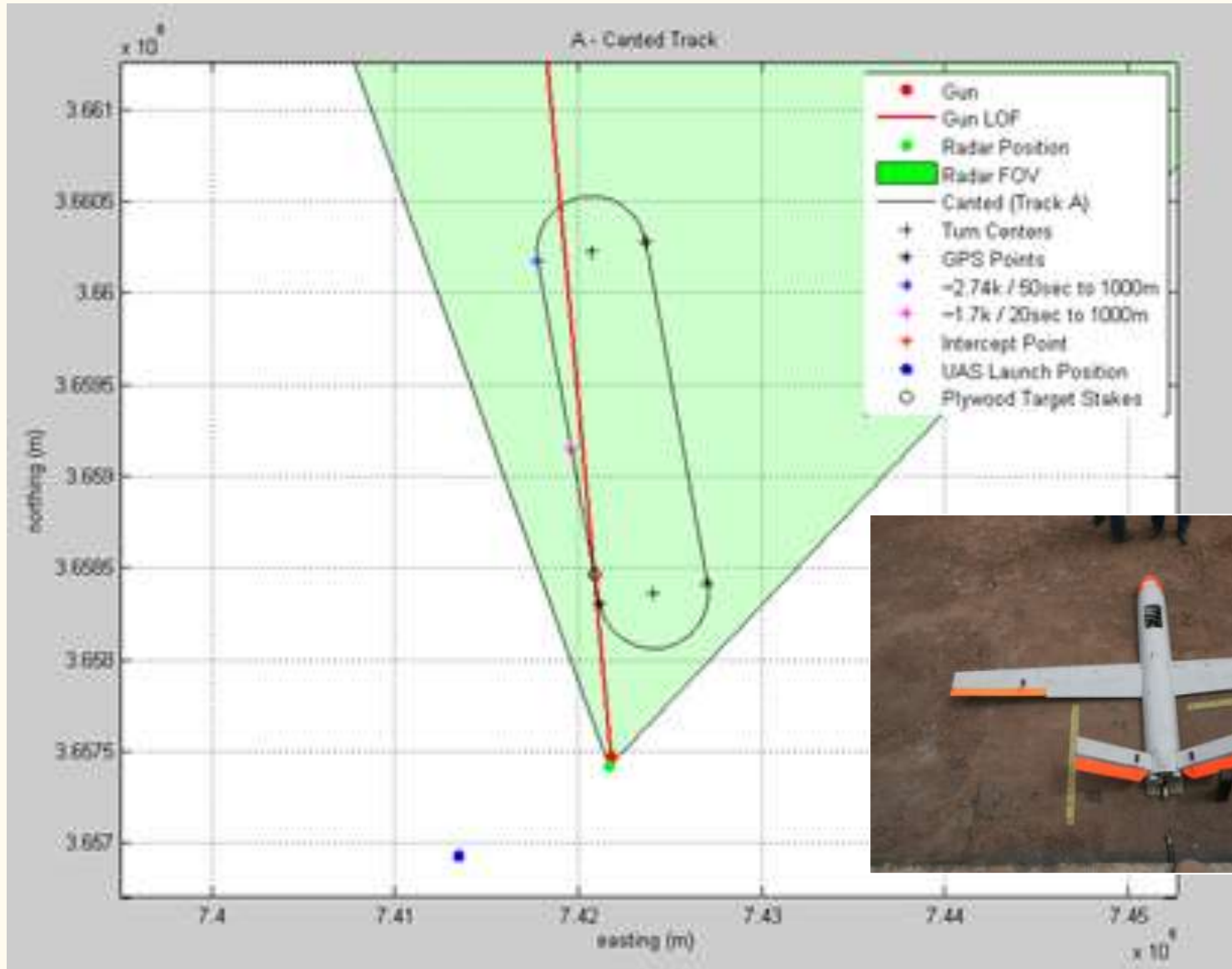
(A) Triggers Gun

(B) Commands Course Correction Thruster

(C) Commands Detonation



UAS Flight Path





Test 730 Summary Pre-Demonstration RDECOM

Test Date: 21 – 22 April 2015

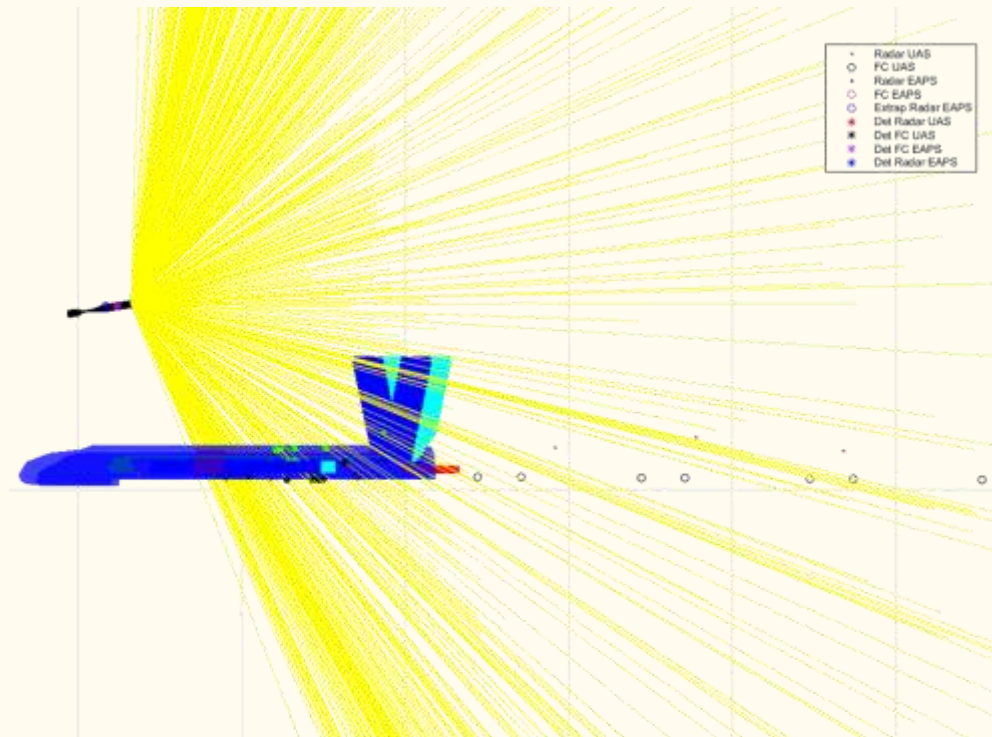
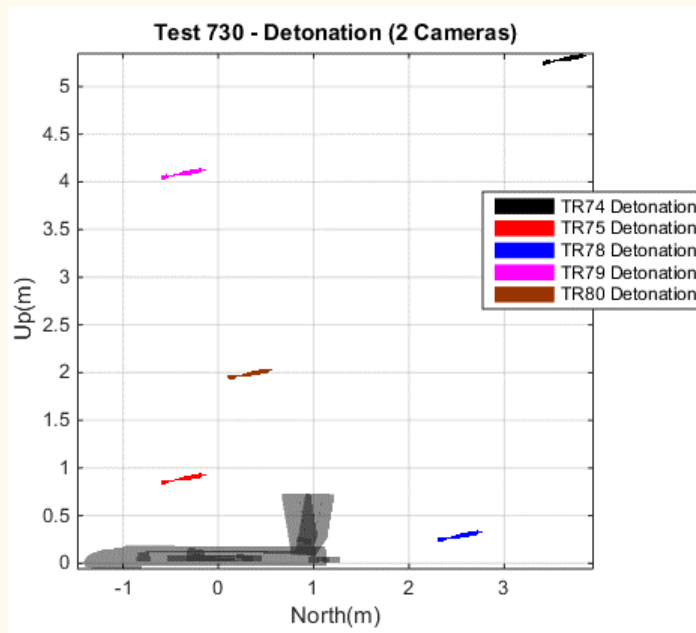
Test Location: YPG Cibola 10

Data Summary:

- 8 Rds for UAS engagement.
 - 5 Rds fully executed commands
 - 1 Rd Intercepted



Video #2

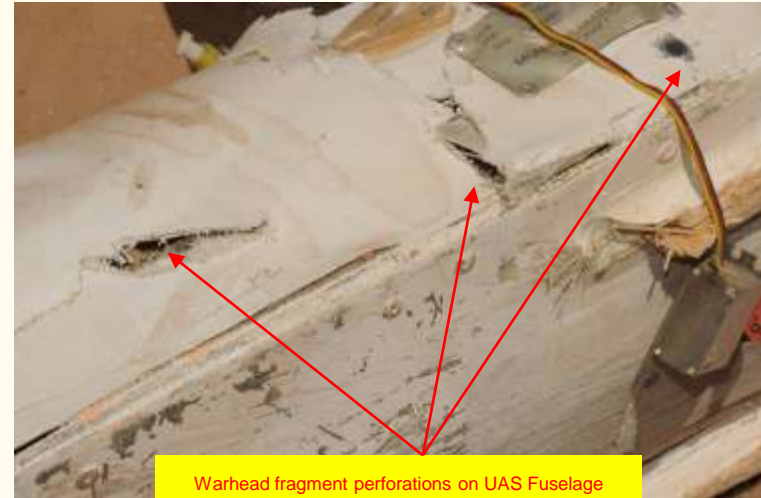




Pictures of UAV, Post Intercept Ground Impact: 882m



UAS Impact condition



Warhead fragment perforations on UAS Fuselage



UAS Fuselage Damage



UAS aileron and wing damage



Warhead fragment perforations on UAS wing



UAS Fuselage



Fuel bag perforations



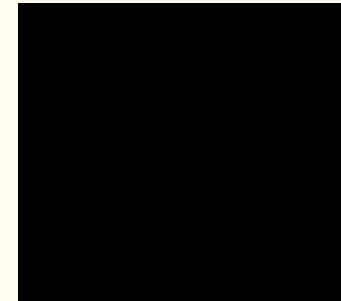
Test 740 Summary Final Demonstration

Test Date: 17-19 August 2015

Test Location: YPG Cibola 10

Data Summary:

- 4 Rds Elevated Shots for UAS engagement.
 - 2 Rds for 1063m Engagement
 - 1 Rd Intercepted (Rd #91)
 - 2 Rds for 1487m Engagement
 - 1 Rd Intercepted (Rd #95)
 - 1 Rd Warhead failed to detonate (no test)

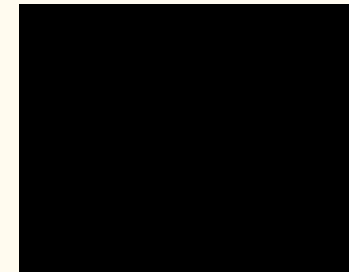


Video #3



Video #4

Test Rd 91

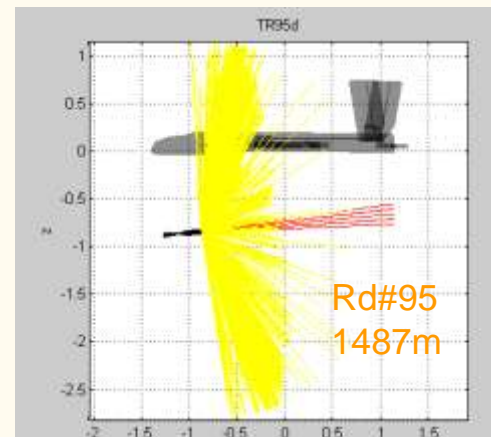
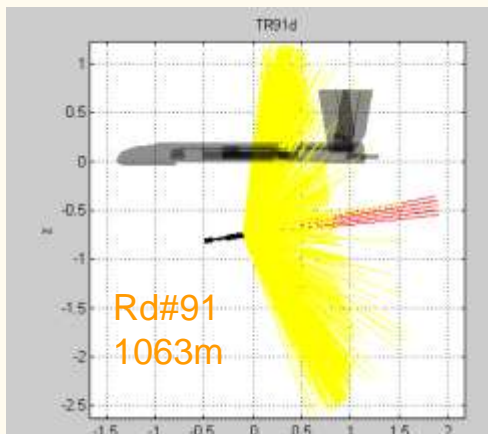


Video #5



Video #6

Test Rd 95





Summary



- Program concluded on a high note. We successfully and repeatedly demonstrated.
- Generated lots of interest across the C-UAS community.
- Built a strong knowledge & experience for direct fire command guidance and for gun based air defense.
- EAPS IPT as a whole is very proud of the results and the effort.