



**120 MM XM360 GUN FOR THE FUTURE COMBAT
SYSTEM – TEST RESULTS & NEW TECHNOLOGY**

**BRIEFING FOR THE GUNS & MISSILES SYMPOSIUM -
27-31 MARCH 2006**

Providing America Advanced Armaments for Peace and War



DAVID C. SMITH, P.E.



LOS/BLOS (XM360) ATD GUN OVERVIEW



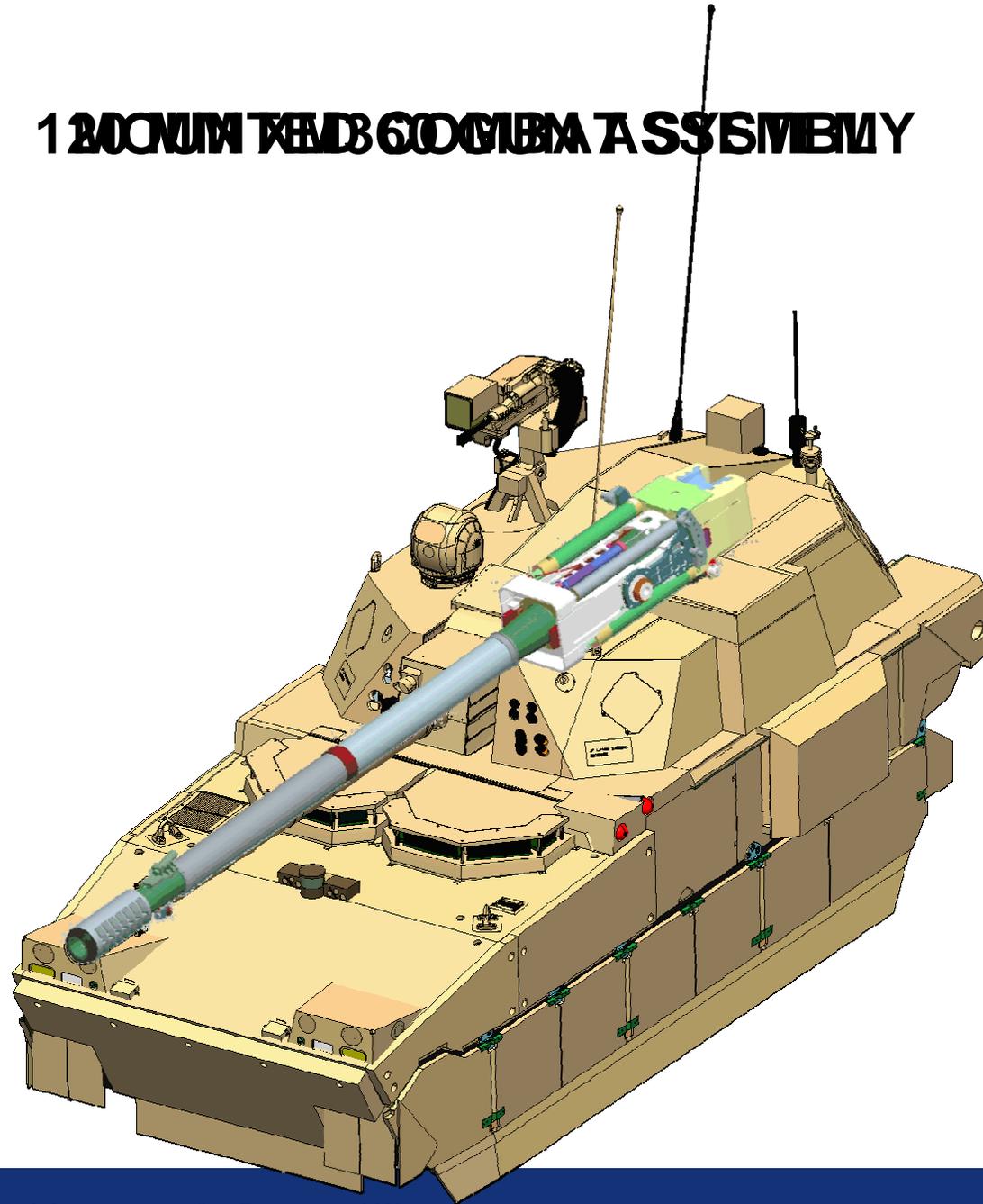
- **GOAL: DEVELOP A LIGHTWEIGHT 120MM GUN FOR USE ON A 20 TON VEHICLE**
 - **WEIGHT: < ~~4,400~~ 4,100 lbs POUNDS**
 - **RECOIL IMPULSE: < 5,300 POUND-SECONDS**
 - **RECOIL LENGTH 25 INCHES**
 - **SPACE CLAIM LIMITS OF MCS CONCEPT VEHICLE**
- **STATUS & ONGOING ACTIVITIES**
 - **VEHICLE DYNAMIC RESPONSE DEMONSTRATOR (VDRD) GUN DEVELOPED AND COMPLETED TESTING IN FEBRUARY 2004**
 - **LINE OF SIGHT/BEYOND LINE OF SIGHT (LOS/BLOS) ADVANCED TECHNOLOGY DEMONSTRATOR (ATD) PROGRAM BUILT AND TESTED 3 VERSIONS OF THE LIGHTWEIGHT 120MM GUN FROM NOVEMBER 2003 - JULY 2005**



1 BOUNDRY 600 GIBRA ASSSEMBLY



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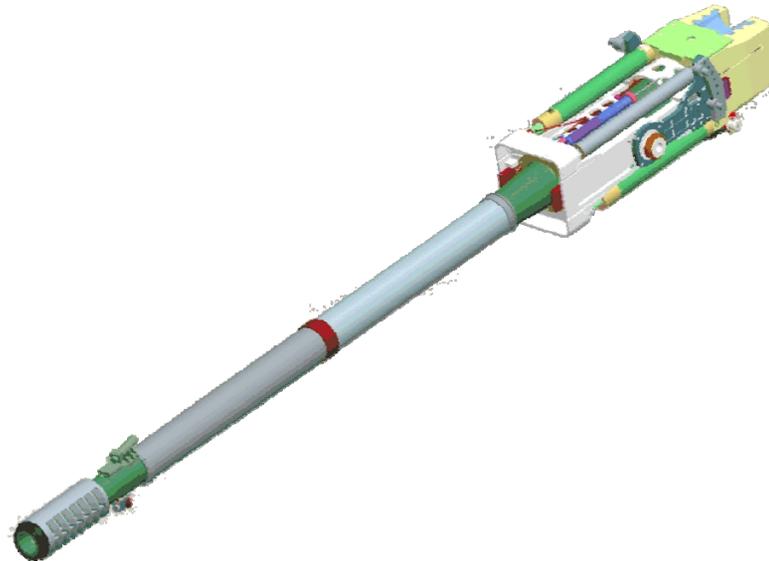
ARDEC



120 MM XM360 GUN ASSEMBLY



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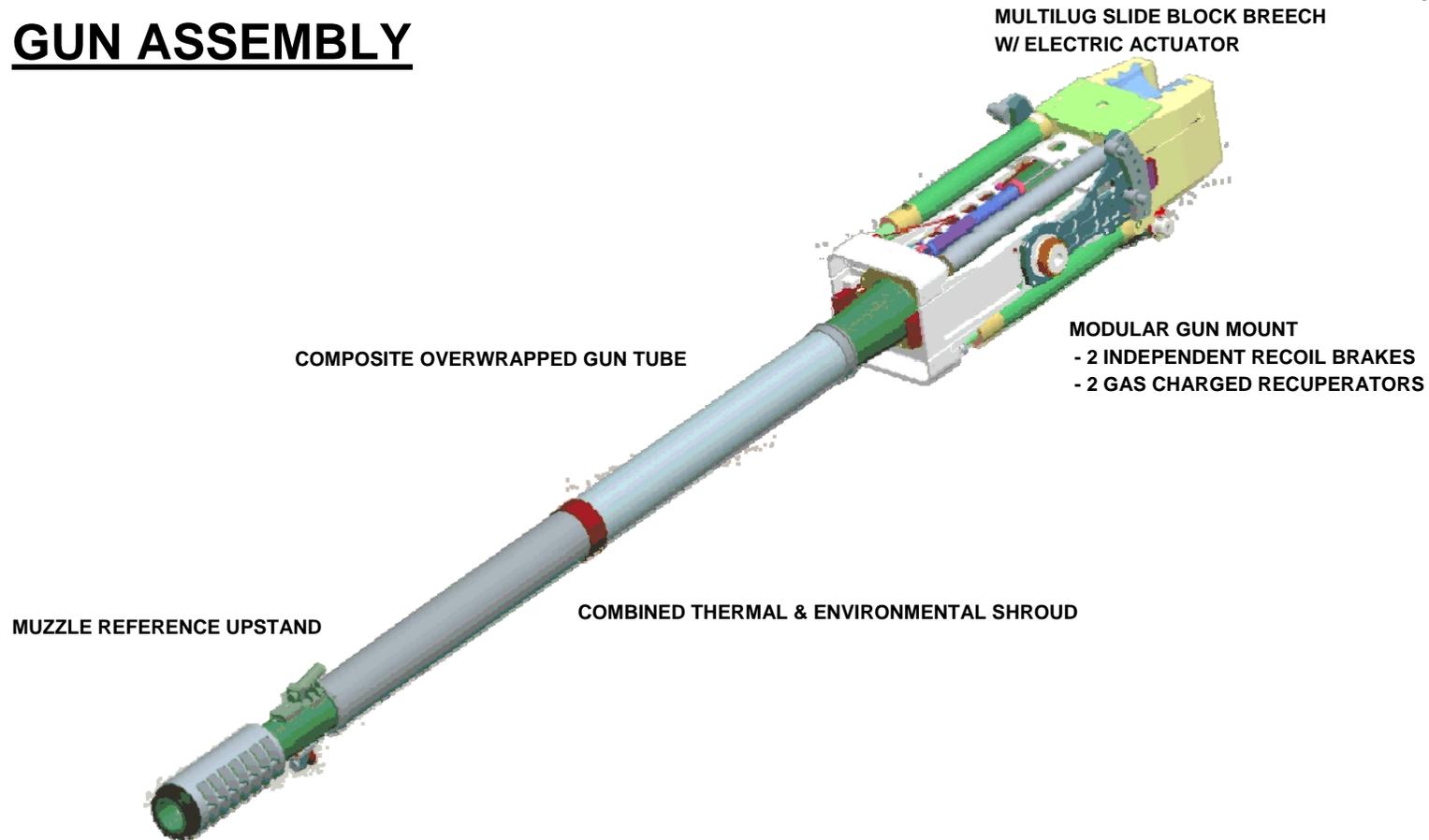


120 MM XM360 GUN ASSEMBLY



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GUN ASSEMBLY



ATD 1 BLAST DEFLECTOR SHOWN THIS VIEW

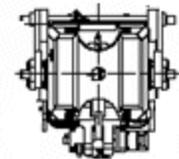


XM360 120mm Gun versus M256 COMPARISON

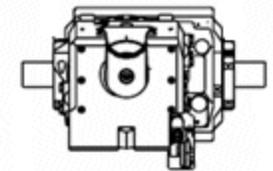
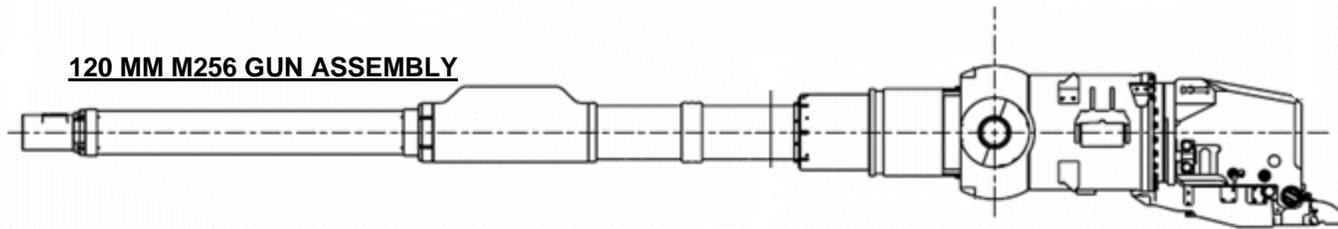


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120 MM XM360 GUN ASSEMBLY



120 MM M256 GUN ASSEMBLY





XM360 120mm Gun versus M256 COMPARISON OF FEATURES



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120mm M256 GUN

- FIRES NATO STANAG 4385 AMMO
- BALLISTIC EQUIVALENT TO XM360
- REQUIRES MODIFICATION TO FIRE NEW AMMO (MRM, AMP, AKE)*
- IS NOT CONCENTRICALLY BALANCED
- HAS A BORE EVACUATOR
- HAS NO MUZZLE BRAKE OR BLAST DEFLECTOR
- HAS A THERMAL SHROUD
- HAS A STATIC MRS
- REQUIRES MANUAL BREECH OPERATION ON 1ST ROUND – NO REMOTE CAPABILITY

120mm XM360 GUN

- FIRES NATO STANAG 4385 AMMO
- BALLISTIC EQUIVALENT TO M256
- DESIGNED TO FIRE NEW AMMO (MRM, AMP, AKE)
- IS CONCENTRICALLY BALANCED
- HAS NO BORE EVACUATOR
- HAS A MUZZLE BRAKE AND BLAST DEFLECTOR
- HAS A THERMAL & SIGNATURE REDUCTION SHROUD
- HAS A STATIC & DYNAMIC MRS
- IS REMOTELY ACTUATED (ELECTRICAL) AND CONTROLLED – ALLOWS MANUAL OPERATION, IF REQUIRED.

MRM = Mid-range Munition /AMP = Advanced Multi-Purpose/AKE = Advanced Kinetic Energy

* The M256 gun would need to be modified to include an ammunition data link to fire MRM, AMP and AKE.

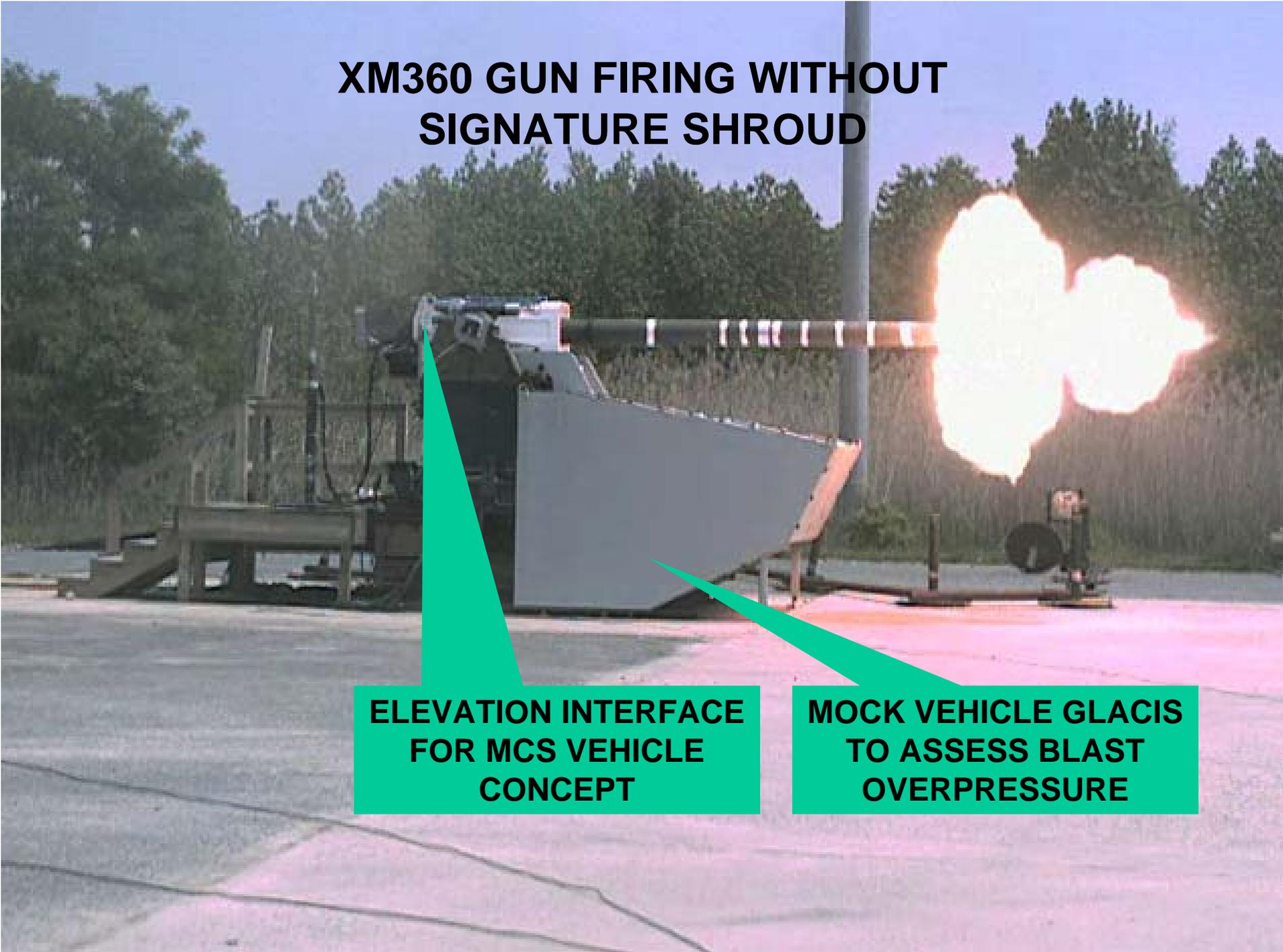
LOS/BLOS ATD GUN
ATD VERSION 1 – NOV 04



XM360 120 MM GUN ASSEMBLY ATD VERSION 3 – JUL 05

Round Type	VDRD	ATD 1	ATD 2	ATD 3	Totals
M829A3	38	37	21	74	170
M829A2	0	13	12	5	30
M829A1	13	0	0	1	14
M829	0	1	0	0	1
M865	18	14	14	8	54
M831A1	42	25	10	0	77
MRM-CE - SLUG	3	3	0	0	6
MRM-KE-SLUG	3	3	0	0	6
MRM-KE Fin Slug	0	1	0	0	1
MRM-CE Fin Slug	1	0	0	0	1
	118	97	57	88	360

XM360 GUN FIRING WITHOUT SIGNATURE SHROUD

The image shows an XM360 gun mounted on a test rig. The gun is firing a round, with a large, bright, multi-lobed muzzle flash visible. The test rig includes a grey glaciis (blast shield) and an elevation interface. The background consists of a line of trees under a clear sky. Two red callout boxes with arrows point to specific parts of the rig: one to the elevation interface and another to the glaciis.

**ELEVATION INTERFACE
FOR MCS VEHICLE
CONCEPT**

**MOCK VEHICLE GLACIS
TO ASSESS BLAST
OVERPRESSURE**



LOS/BLOS ATD GUN TEST RESULTS/STATUS



- **ATD GUN FIRING TEST SUMMARY**
 - **360 ROUNDS FIRED**
 - **TEST HARDWARE/PHASES COMPLETED**
 - **THREE DIFFERENT BLAST DEFLECTOR/MUZZLE BRAKE COMBINATIONS**
 - **THREE (3) DIFFERENT GUN TUBES**
 - TRADITIONAL 'GUN' STEEL
 - ULTRA HIGH STRENGTH (UHSS) STEEL
 - COMPOSITE OVERWRAPPED UHSS
 - **MOST OF THE CURRENT INVENTORY CARTRIDGES**
 - **DEVELOPMENTAL MRM ROUNDS**
 - **TWO (2) SPATTERED TANTALUM LINERS (BORE COATINGS)**
 - **AMMO DATA LINK**
 - **HIGH ENERGY IGNITION SYSTEM**



LOS/BLOS ATD GUN TEST RESULTS/STATUS



- **ATD GUN FIRING TEST SUMMARY (CONT'D)**
 - **DATA COLLECTED**
 - **STRESSES – TUBE, BREECH, BLAST DEFLECTORS, MOUNT**
 - **MUZZLE BRAKE EFFICIENCY**
 - **BLAST OVERPRESSURE**
 - NEAR & FAR FIELD
 - WITH & WITHOUT MOCK VEHICLE GLACIS
 - **RECOIL FORCE (BRAKES, RECUPERATORS, TRUNNIONS)**
 - **RANGE (30° ELEVATION – MRM)**
 - **MRM FIN DEPLOYMENT THROUGH MUZZLE BRAKE**



LOS/BLOS ATD GUN TEST RESULTS/STATUS



- **RESULTS (cont'd)**
 - **INITIAL EROSION TESTING ON CYLINDRICAL MAGNETON SPUTTER (CMS) COATED (TANTULUM) LINER (~2')**
 - **ACCURACY TESTING - TARGET IMPACT DISPERSION (TID)**
 - **M829A3 EXCELLENT RESULTS – WITHIN REQUIREMENTS**
 - **M865 & M831A1'S GOOD RESULTS – WITHIN REQUIREMENTS.**
 - **BREECH BLOCK WITH AMMO DATA LINK (ADL).**
 - **FUNCTIONALITY, STRUCTURAL INTEGRITY OF DUAL DATA PIN ADL DEMONSTRATED.**
 - **SINGLE PIN ADL (GERMAN) SYSTEM DEMONSTRATED.**
 - **PRECISION IGNITION DEMONSTRATION.**
 - **BREECH ACTUATOR HARDWARE DEMONSTRATED**

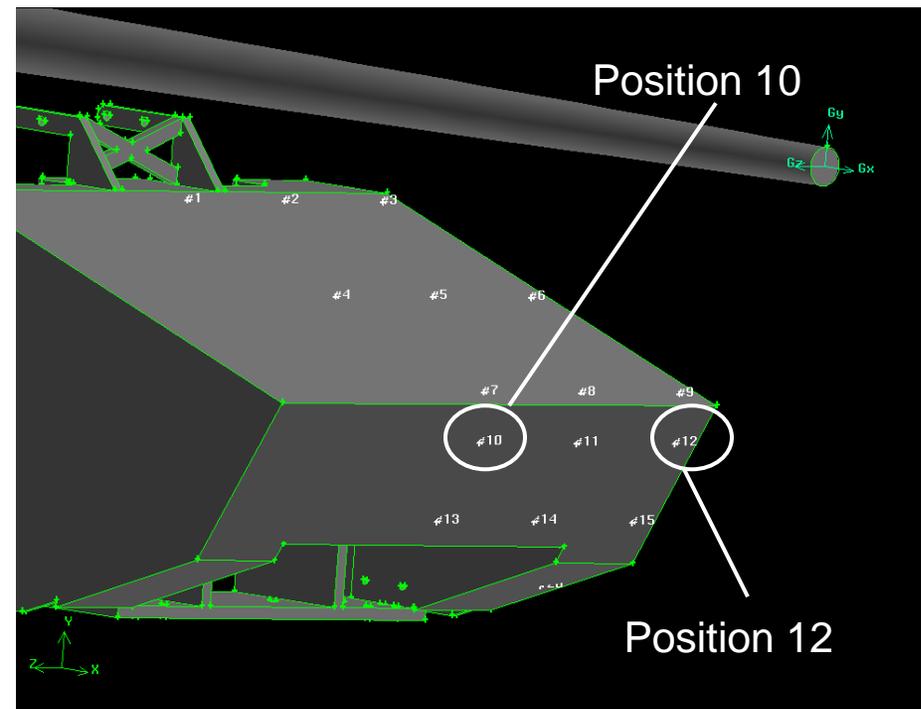
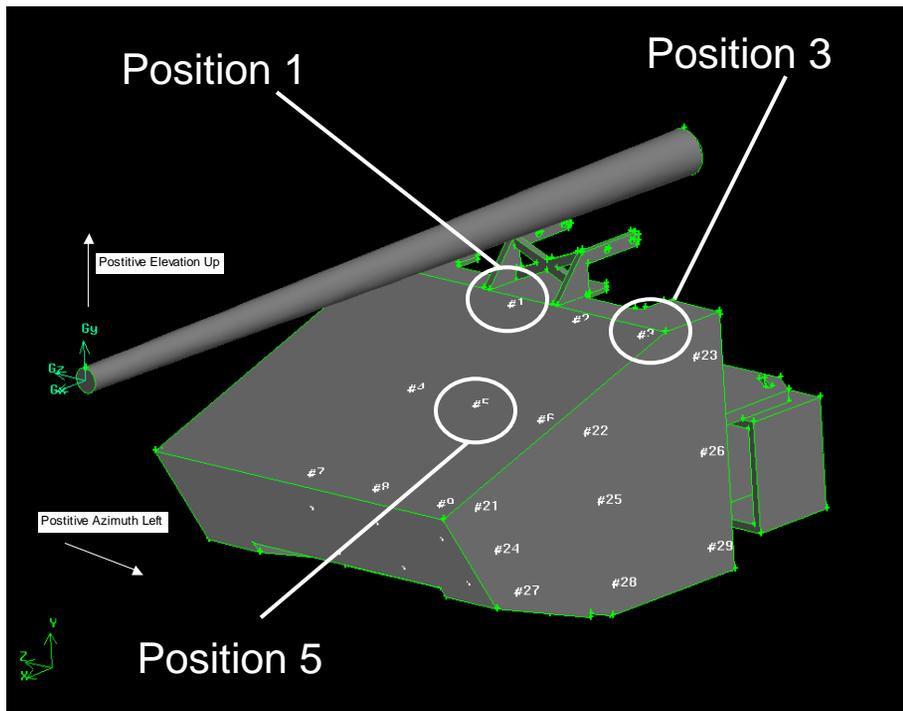


LOS/BLOS ATD GUN TEST DATA



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HULL POSITIONS MEASURED WITH CHASSIS SIMULATOR GAGES

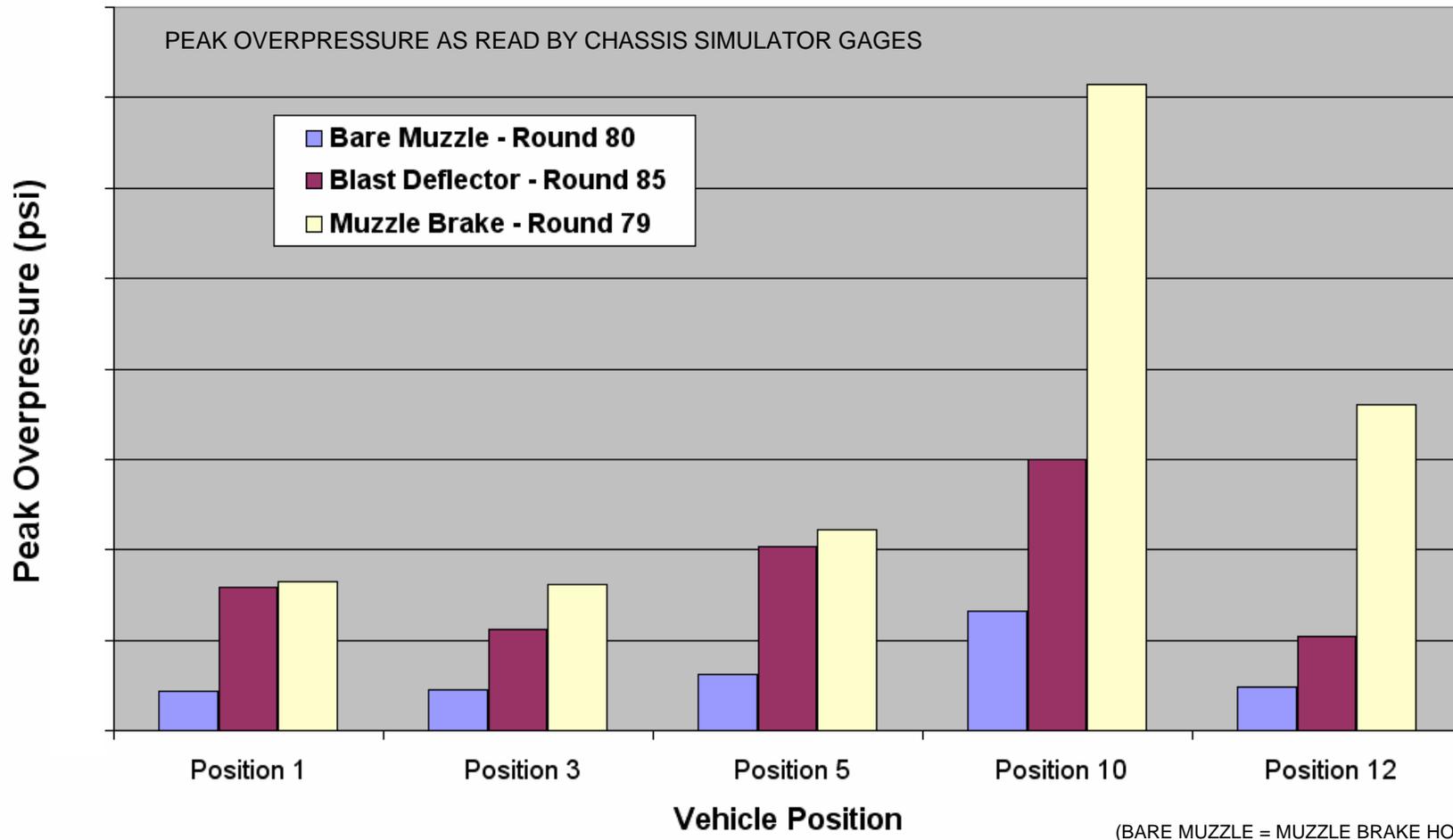




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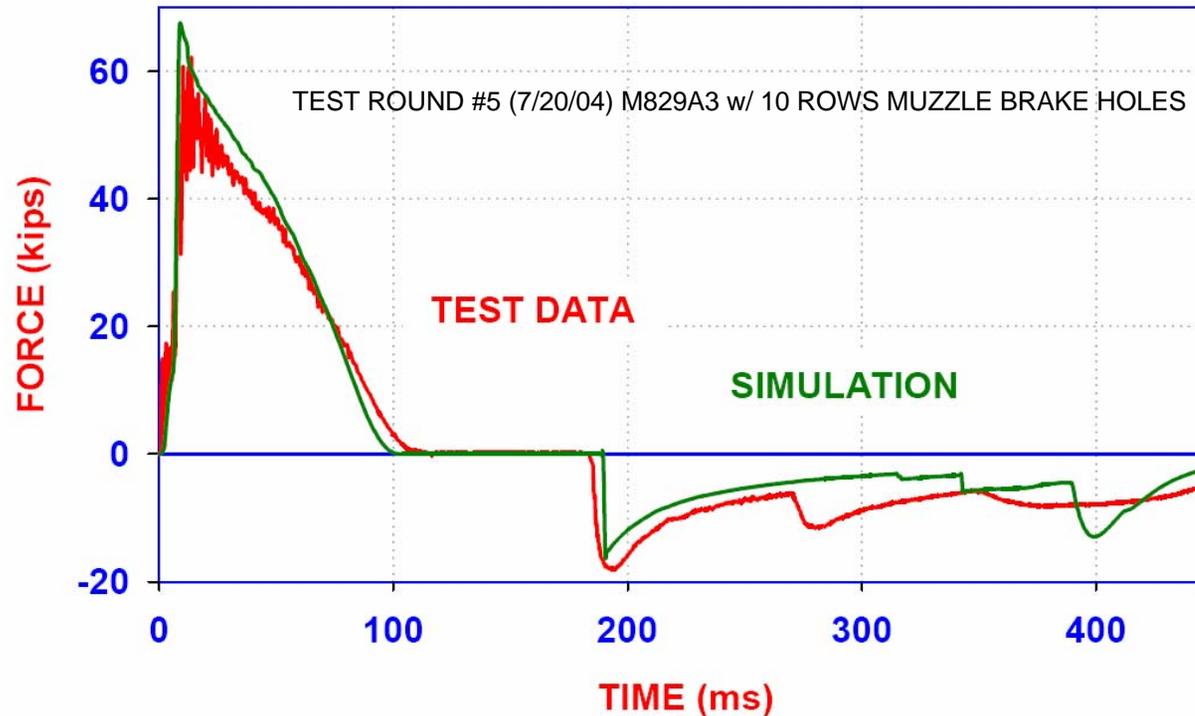


LOS/BLOS ATD GUN TEST DATA



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TOTAL BRAKE FORCE vs TIME



ROUND	CARTRIDGE	IMPULSE (LBSEC)	CONFIGURATION
5	M829A3	5,232	Full Muzzle Brake
6	M829A3	5,315	Full Muzzle Brake
7	M829A3	5,360	Full Muzzle Brake

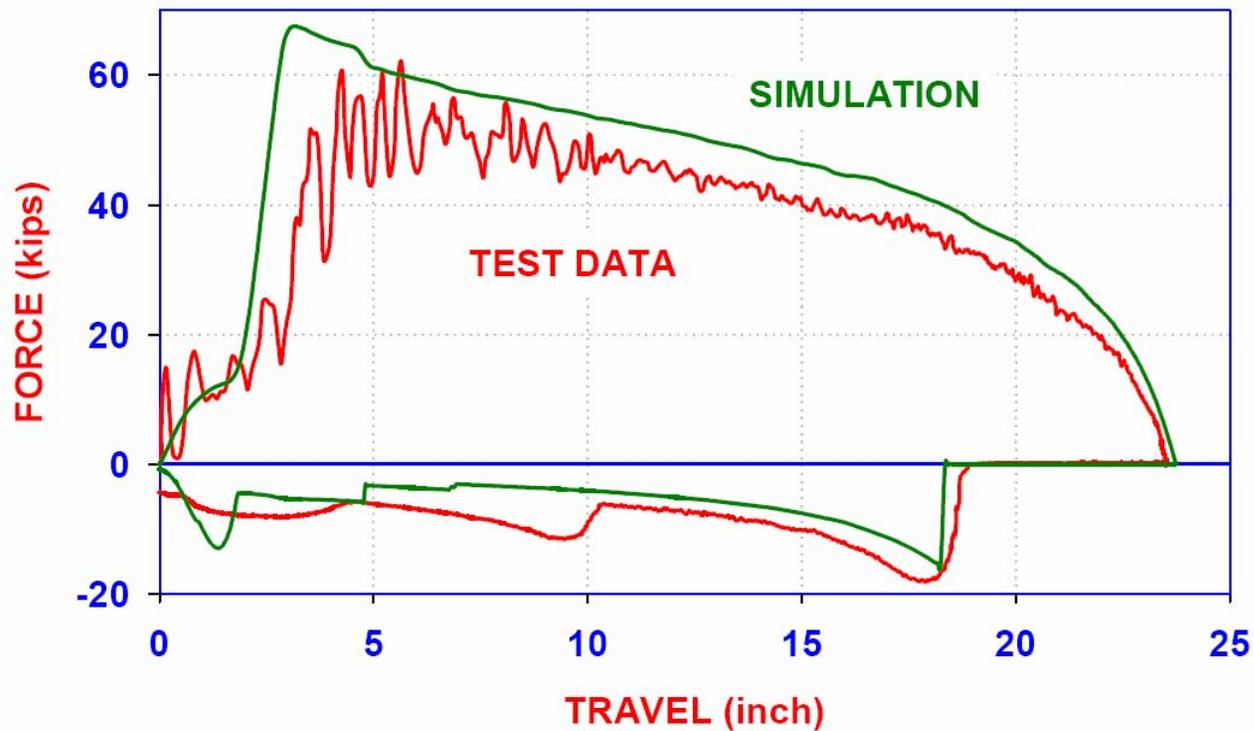


LOS/BLOS ATD GUN TEST DATA



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TOTAL BRAKE FORCE vs TRAVEL



ATD #1 RECOIL SYSTEM TEST RESPONSETEST ROUND #3 (7/20/04) M829A2 w/ 10 ROWS MUZZLE BRAKE HOLES



LOS/BLOS ATD GUN PRELIMINARY TEST RESULTS



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ROUND M829A2 @ 70DegF

ATD - TEST	BALLISTIC IMPULSE	IMPULSE at TRUNNION	PERCENT REDUCTION
1 (3)	6428	4818	25.0
2 (10)	6327	4803	24.1

ROUND M831A1

ATD - TEST	BALLISTIC IMPULSE	IMPULSE at TRUNNION	PERCENT REDUCTION
1 (3)	5645	4322	23.4
2 (10)	5560	4442	20.1

ROUND M865

ATD - TEST	BALLISTIC IMPULSE	IMPULSE at TRUNNION	PERCENT REDUCTION
1 (3)	4833	3628	24.9
2 (10)	4825	3549	26.4



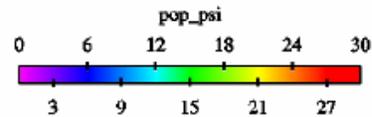
LAEP PROGRAM



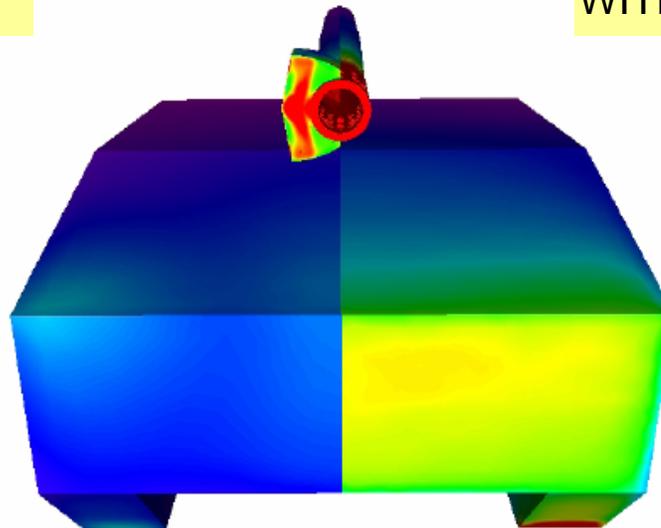
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LAEP KEY ELEMENT: BETTER ANALYTICAL TOOLS

XM360 PREDICTION
WITH BLAST DEFLECTOR



XM360 PREDICTION
WITHOUT BLAST DEFLECTOR



PATH FORWARD

ADVANCED TECHNOLOGY DEMONSTRATOR

LIGHTWEIGHT ARMAMENT ENHANCEMENT PROGRAM – GUN & INTEGRATION

**SPONSORS: ARDEC TECHNOLOGY BASE
OPM-FCS (BCT) WARFIGHTING
SYSTEMS INTEG DIRECTORATE**

OBJECTIVE: DESIGN, FABRICATE AND TEST

- IMPROVED COMPOSITE BARREL
- IMPROVED BLAST DEFLECTOR
- IMPROVED RECOIL BRAKES/
RECUPERATORS
- NEXT GENERATION GUN TUBE MRS
- BARREL RESHAPE INITIATIVE (BRI)
– JOINT EFFORT WITH ARL.
- NEW AMMO ANTI-FRATRICIDE FEATURES
- INCORPORATE MTO EFFORTS
 - DURABLE GUN BARREL
 - TANTULUM SPUTTERING

XM360 120 MM LIGHTWEIGHT GUN SYSTEM DESIGN & DEVELOPMENT

**CRADA TO : GENERAL DYNAMICS LAND
SYSTEMS (GDLS)**

**OBJECTIVE: DEVELOPMENT, INTEGRATION,
AND FABRICATION OF XM360 120 MM GUN
ASSEMBLY INTEGRATED WITH MOUNTED
COMBAT SYSTEM (MCS) VEHICLE.**



120 MM XM360 GUN SUMMARY



- **ATD GUN FIRING TESTS DEMONSTRATED**
 - **COMPOSITE JACKETED GUN TUBE FIRED & STRAIN MEASURED**
 - **MOUNT STIFFNESS & STRUCTURAL INTEGRITY**
 - **TRUNNION FORCE MEASUREMENTS:**
 - **IMPULSE <5,300 LB SEC**
 - **PEAK FORCES FIRING M829A3 < 65,000 LBS**
 - **MUZZLE BRAKE EFFICIENCY > 25%**
 - **MRM-KE ROUND FIRED TO 12.8 KM RANGE (30° ELEVATION)**
 - **AMMO DATA LINK FUNCTION**
 - **HIGH ENERGY IGNITION SYSTEM FUNCTION**
 - **ELECTRICAL ACTUATOR FUNCTION**



120 MM XM360 GUN SUMMARY



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- **DESIGNED, FABRICATED AND TESTED AN ADVANCED, LIGHTWEIGHT, LOW-RECOIL 120MM GUN IN 7 MONTHS, UNDER THE VDRD EFFORT**
- **THREE (3) ADDITIONAL ITERATIONS OF THE XM360 GUN DESIGN HAVE BEEN FABRICATED AND TESTED UNDER THE LOS/BLOS ATD PROGRAM**
- **A COMBINATION OF 360 TACTICAL, TRAINING AND SLUG ROUNDS FIRED TO DATE WITH EXCELLENT RESULTS**
- **ADDITIONAL TECHNOLOGY DEVELOPMENT TO FURTHER REDUCE THE WEIGHT AND IMPROVE PERFORMANCE OF THE XM360 GUN IS CONTINUING VIA LAEP AND MTOS**
- **INTEGRATION OF THE XM360 INTO THE MCS IS PROCEEDING ON SCHEDULE VIA A CRADA WITH GDLS**

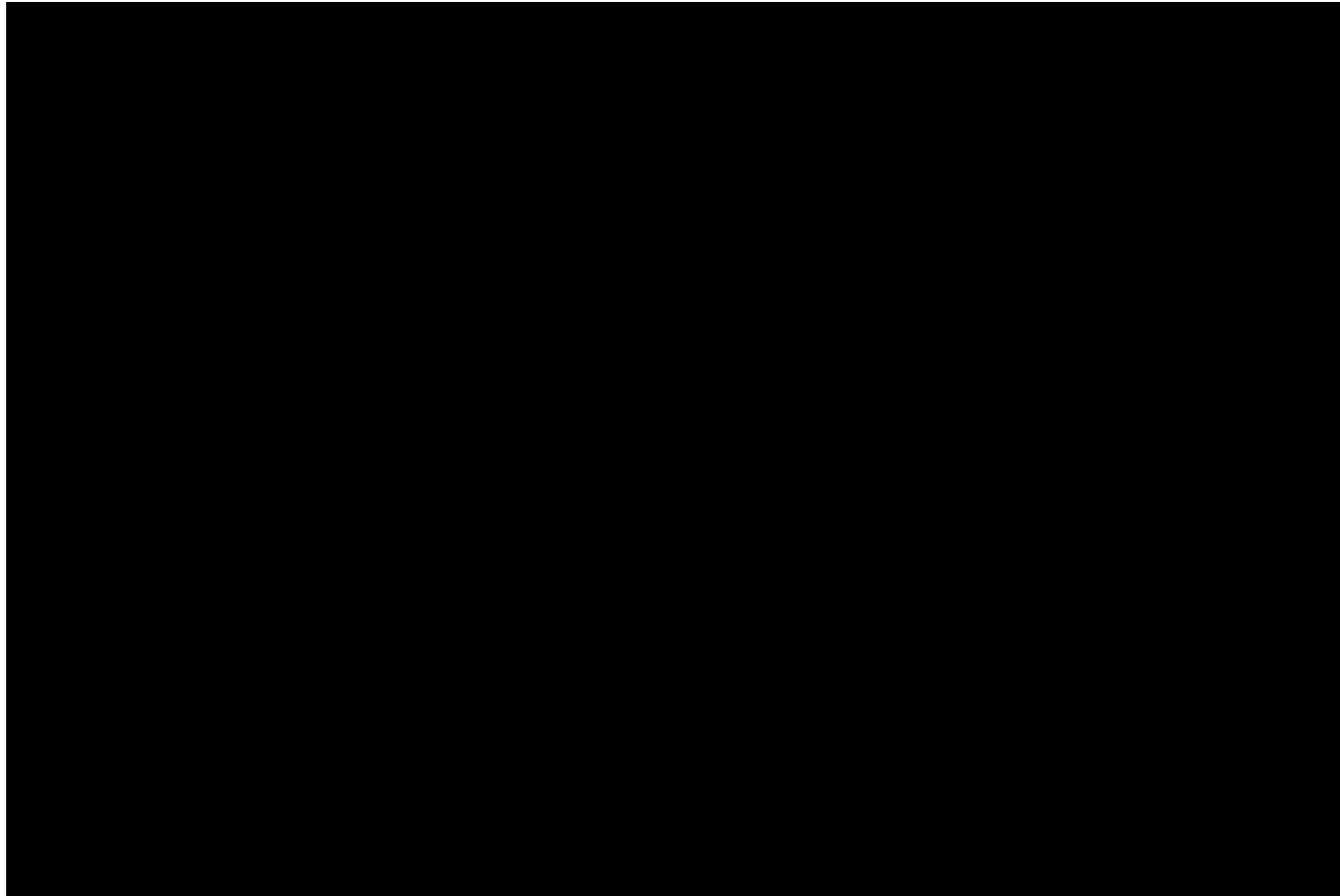
THE XM360 GUN PROVIDES LIGHTWEIGHT PLATFORMS (SUCH AS MCS AND FRES) WITH THE FIREPOWER OF TODAY'S 60+ TON MBTs!!



LOS/BLOS ATD GUN ACCOMPLISHMENTS



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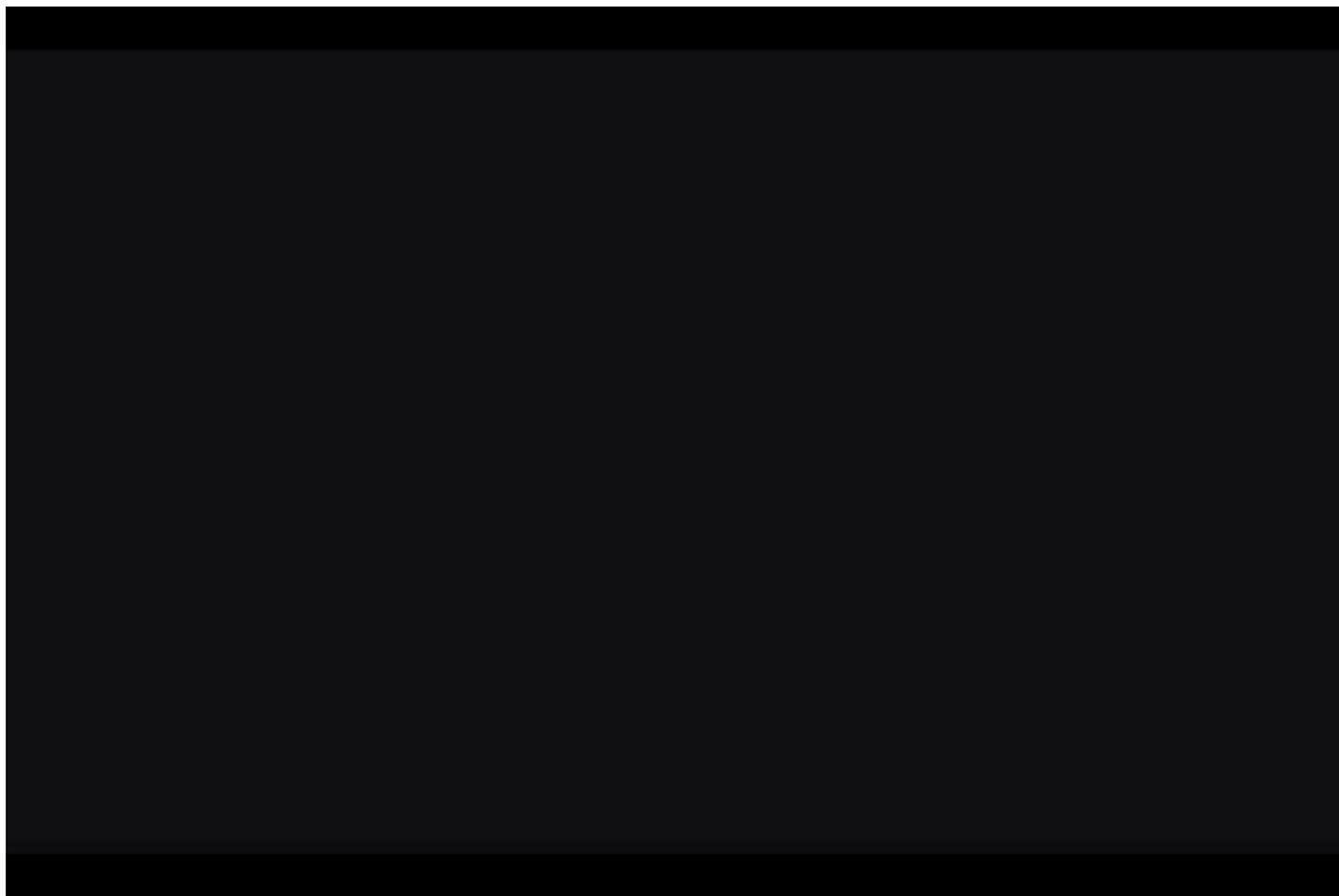


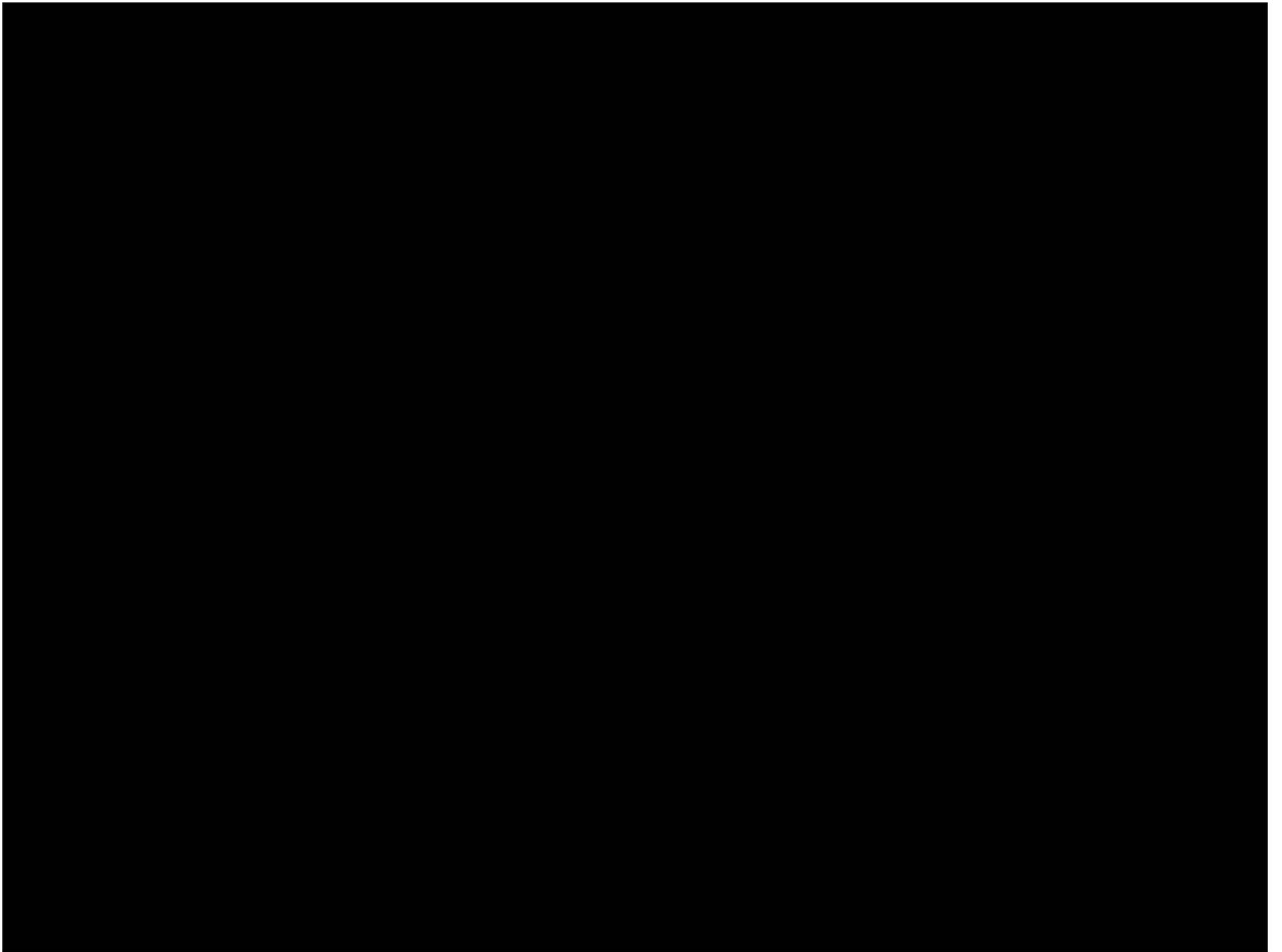


LOS/BLOS ATD GUN ACCOMPLISHMENTS



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