

THE TERRIBLE COST OF  
NOT TESTING WITH REAL WEAPONS  
SHOOTING AT REAL TARGETS

"Sicily had been a sobering experience. For years we had been told that our weapons were superior to any we would encounter. After all, we were soldiers from the most highly industrialized and the richest nation on earth. But that very preoccupation with our advanced technology caused many to assume that technology alone would win battles ... our problems stemmed very often from the lack of imagination, if not lack of intelligence, of those responsible for developing infantry weapons. The small bazooka was a case in point ...

... One of the scientists advising the Ordnance Corps, Dr. Charles Lauritsen, Sr., of Caltech, had resigned ... out of the conviction that the weapon was too small.<sup>1/</sup> Nevertheless, we manufactured the weapon in large numbers and placed it in the hands of our troops for the Sicily battle. It could have been tested against German tanks captured in North Africa, but it evidently was not.

Ironically, after many lives were lost, in mid-August 1943, we received a War Department intelligence bulletin telling us that the bazooka would not penetrate the front plate of the Tiger tank -- as though we didn't know it already. More sadly, we still had not obtained a larger bazooka by the time General MacArthur sent the first troops to Korea seven years later to meet the Soviet T-34 tanks in the summer of 1950. The American infantry combat team there was overrun by Soviet armor (p.51)."

"I then began to get the battalion organized for the move to our regimental objective near Gela. But the first order of business was to take care of our dead and wounded. We brought in 50 bodies and buried them near the top of the ridge ... The regimental chaplain made wooden crosses out of K-ration boxes and we gave the troops an appropriate burial. It had been a sad experience; many of them had pieces of bazookas ground up in them by tanks as they were crushed (p.43)."

On to Berlin, Lt. General  
James M. Gavin, Viking, 1978

---

<sup>1/</sup> The bazooka had a 60mm shaped charge. The Army's new bazooka, the Viper, is just now going into production with a 66mm warhead.

THE TERRIBLE COST:  
1973 ARAB-ISRALI WAR

- 800 ISRAELI TANK CREW MEMBERS KILLED
- 300 BURNED TO DEATH, MOSTLY BY MIL H5606  
HYDRAULIC FLUID IN U.S. M-60 TANKS

NO M-60 LOADED WITH FUEL,  
AMMO AND HYDRAULICS HAS BEEN  
TESTED FOR VULNERABILITY TO  
LIVE SOVIET ROUNDS -- BEFORE  
OR AFTER 1973

## THE TERRIBLE COST: THE VIETNAM AIR WAR

- WE LOST 3000+ FIGHTERS AND 1000+ PILOTS
- 2400 WERE LOST DUE TO FUEL\* OR HYDRAULIC FIRES
- 1600 OF THESE LOSSES WERE PREVENTABLE WITH JP-5 FUEL AND NON-FLAMMABLE HYDRAULIC FLUID

NO COMBAT-LOADED F-4, F-105,  
A-4, A-7, F-15 OR F-16 HAS  
BEEN TESTED FOR VULNERABILITY  
TO LIVE SOVIET ROUNDS - BEFORE  
OR AFTER VIETNAM

- \* COMBAT DAMAGE/LOSS REPORTS FOR F-4S IN NVN SHOW THAT FIRES IGNITED PER AA HIT WERE 3 TIMES GREATER WITH JP-4 THAN WITH JP-5.

STANDARD REASONS FOR NOT TESTING  
WITH REAL WEAPONS/TARGETS

- TOO EXPENSIVE
  - TOO TIME CONSUMING
  - TOO UNCONTROLLED AND TOO INACCURATE
  - PK/VUNERABILITY MODELS ARE MORE "ACCURATE"
  - NO ENGINEERING OR EFFECTIVENESS INSIGHTS
- LIVE FIRE TEST RESULTS MIGHT JEOPARDIZE THE PROGRAM

HOW DO THESE  
STANDARD REASONS STAND UP?

CASE EXAMPLE: 30MM LAVP TEST AGAINST REAL TANKS

● COST	300+ FIRINGS AGAINST M-47s AND T-62s = \$6M
● PK ACCURACY	REAL PK 4½ TIMES GREATER THAN JMEM COMPUTER-PREDICTED PK (T-62)
● INSIGHTS	MAJOR EFFECTIVENESS/ ENGINEERING ADVANCES POSSIBLE

JUST WHEN LAVP INSIGHTS MIGHT HAVE  
DOUBLED 30MM LETHALITY, USAF  
CANCELLED THE LAVP PROGRAM

WHAT WEAPONS DESIGN INSIGHTS CAN BE DERIVED  
FROM LAVP FIRINGS?

- BEST BURST LENGTH = .5 TO 1.0 SECONDS; LONGER BURSTS WILL LOWER Pk.

CONCLUSION: A-10 HAS TOO MUCH AMMO

- EARLY ROUNDS DO ALMOST ALL THE KILLING.

CONCLUSION: NEED HIGH ACCEL GATLING OR INSTANT RATE LINEAR ACTION GUN

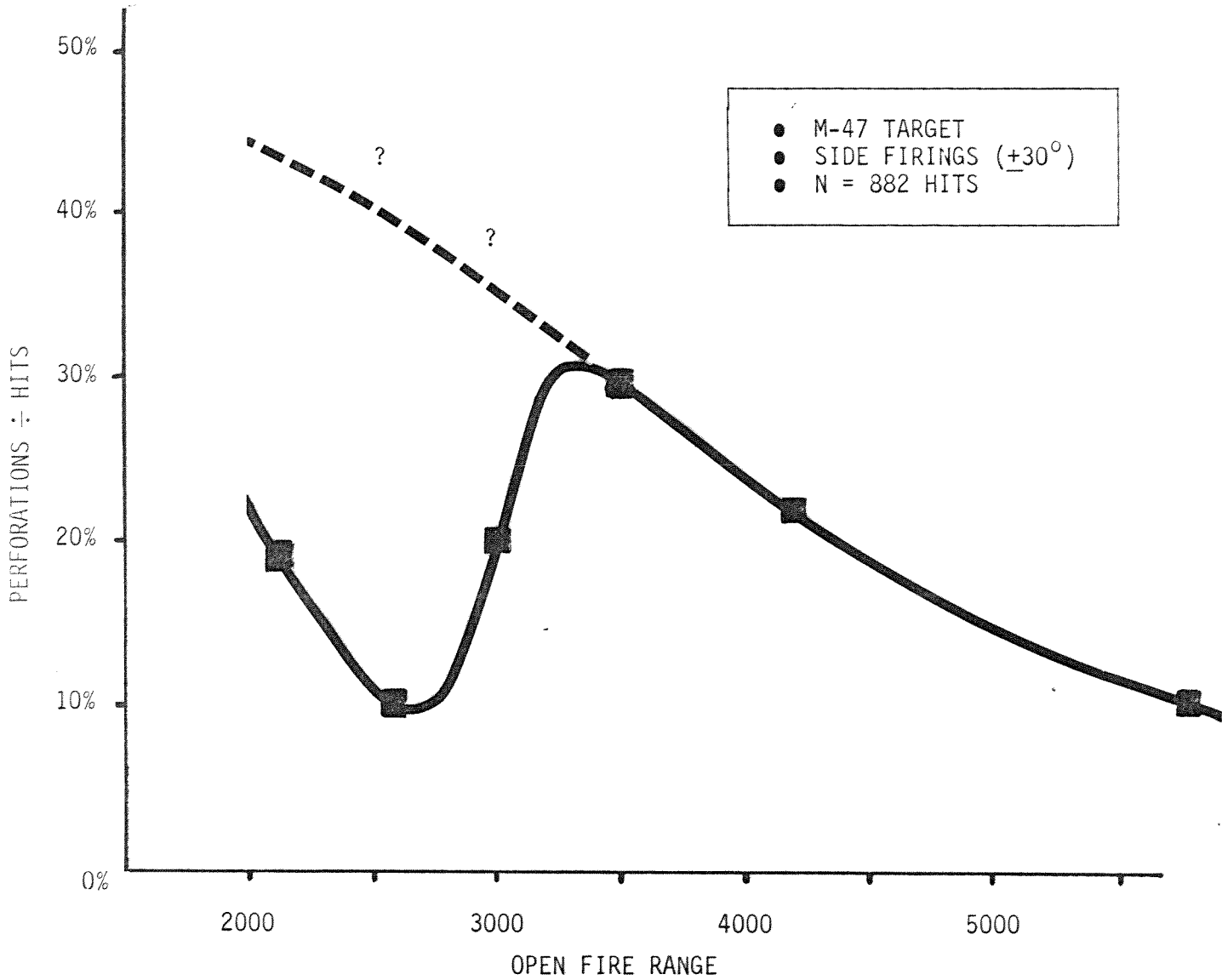
- FIRE (AMMO, FUEL OR HYDRAULICS) IS THE DOMINANT 30 MM KILL MECHANISM.

CONCLUSION: PENETRATORS DESIGNED TO RETAIN POST-PENETRATION INTEGRITY PROBABLY REDUCE Pk

- REAL PENETRATION RESULTS VIOLATE PREDICTIVE FORMULAS.

CONCLUSION: SEE NEXT TWO SLIDES

AIRBORNE FIRING CONTRADICTS BOTH  
MODEL PREDICTIONS AND GROUND FIRINGS



AT LESS THAN 3000 FEET, THE 30MM IS MUCH LESS  
LETHAL THAN IT SHOULD BE.  
HYPOTHESIS: YAW IS THE PROBLEM



WHAT CAN WE DO TO ELIMINATE YAW  
AT IMPACT AND RESTORE LETHALITY?

REINSTITUTE AIRBORNE LIVE FIRINGS (LAVP) TO TEST  
FOLLOWING PROBLEMS, CORRECT DESIGN, THEN TEST  
AGAIN:

1. MUZZLE DEVICES CAN HELP -- OR HURT -- GREATLY.  
$$\frac{\text{PERFORATIONS}}{\text{HITS}} = \begin{array}{l} .40 \text{ FOR BATTELLE GAS DEFLECTOR} \\ .18 \text{ FOR FAIRCHILD MITERED BARREL} \end{array}$$
2. 30MM HAS WRONG RIFLING TWIST (PROBABLY MUCH TOO HIGH) - STABILITY FORMULAS ARE NEARLY WORTHLESS.
3. YAW MAY VARY DURING BURST AS GATLING ACCELERATES AND/OR BARRELS HEAT UP.
4. YAW IS NOT SAME FOR BOTH AMMO MANUFACTURERS.

NEITHER GROUND FIRINGS NOR BALLISTIC THEORY  
CAN EVEN IDENTIFY THESE PROBLEMS, MUCH LESS  
CORRECT THEM.

URGENTLY-NEEDED NEW GUNS: HOW CAN YOU ESTABLISH THE NEED -- AND THE RIGHT CALIBER -- WITHOUT REAL TARGET TESTS?

NEED	WHY?	OTHER APPLICATIONS
<p>NEW AIR-TO-AIR CANNON:</p> <ul style="list-style-type: none"> <li>● 4000 FPS</li> <li>● CAL .50 DU vs HEAVY 20MM</li> </ul>	<ul style="list-style-type: none"> <li>● U.S. 20MM ROUND HAS WORST RANGE AND WORST LETHALITY OF ANY 20MM IN THE WORLD</li> </ul>	<ul style="list-style-type: none"> <li>● LIGHT AA</li> <li>● SHIP DEFENSE</li> </ul>
<p>NEW ANTITANK FIELD GUN</p> <ul style="list-style-type: none"> <li>● 5000-6000 FPS</li> <li>● 75MM GUN vs 120MM RECOILLESS</li> </ul>	<ul style="list-style-type: none"> <li>● TOW WILL FAIL ON BATTLEFIELD</li> <li>● INFANTRY MUST HAVE BATTALION-LEVEL HIGH-RATE, POINT-AND-SHOOT ANTITANK WEAPON</li> </ul>	<ul style="list-style-type: none"> <li>● CANNON FOR SMALLER, MORE AGILE TANK</li> <li>● RECOILLESS FOR FAST BOATS OR PATROL CRAFT</li> </ul>

PROPOSAL FOR MAKING MAJOR ADVANCES  
IN AIRCRAFT CANNON EFFECTIVENESS

- INSTITUTE LIVE FIRINGS AGAINST SURPLUS FIGHTERS (.50 CAL TO 20MM).
- RE-ESTABLISH LIVE FIRINGS AGAINST M-47/T-62 TANKS (30MM WITH IMPROVEMENTS).
- START HIGH ACCEL MOD FOR GAU-8 AND GEPOD.
- CANCEL GUIDED PROJECTILE, FLEX BARREL GUN, 30MM LONG ROD APFSDS.
- START 3-WAY PROTOTYPE COMPETITION FOR NEW AIR-TO-AIR CANNON; HAVE SHOOT-OFF AGAINST SURPLUS FIGHTER TARGETS.

MAKE NO DESIGN DECISIONS BASED ON:

- JMEM MODELS
- MANN BARREL FIRINGS
- "BALLISTIC" TARGETS