



# 25mm Objective Sniper Weapon and Associated Recoil Considerations

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## **BRIEFING AGENDA:**

**□ Introduction – Steve Small**

**□ SOF Sniper**

**□ Battelle Feasibility and Recoil Assessment**

**- Jason Paugh**

**Conclude – Steve Small**



# Special Operations Force (SOF) Sniper

## Object

- My purpose today is to present to you an unclassified tutorial on the several roles, and operational challenges of the Special Operations Forces (SOF) sniper
- And the underlying rationale for a 25mm “Payload” Sniper Weapon



# Special Operations Force (SOF) Sniper

## The Importance of Snipers

- During the Vietnam War U.S. Army snipers killed 1,245 of the enemy over a seven month period--with an average of 1.39 rounds per expended kill--this was at a time when hundreds of pounds of ordnance were employed to kill a few enemy soldiers.



# Special Operations Force (SOF) Sniper

## Sniper Applications

- Both the conventional and SOF snipers are warriors, and as such, their central mission--as shooters--is to kill enemy combatants and/or disable their equipment.
- Additionally, they are employed as the “eyes of the commander” and are gatherers of essential elements of information.



# Special Operations Force (SOF) Sniper



- The *SOF Sniper* is expertly trained in specialized techniques for the interdiction of leader-personnel or material targets
- His targets may be strategic/operational in nature



# Special Operations Force (SOF) Sniper

## Types of Sniper targets

- The two general categories of sniper targets are human and material
- For the conventional military and/or SOF sniper --dependent on distance--a head or chest shot is preferred



## Special Operations Force (SOF) Sniper

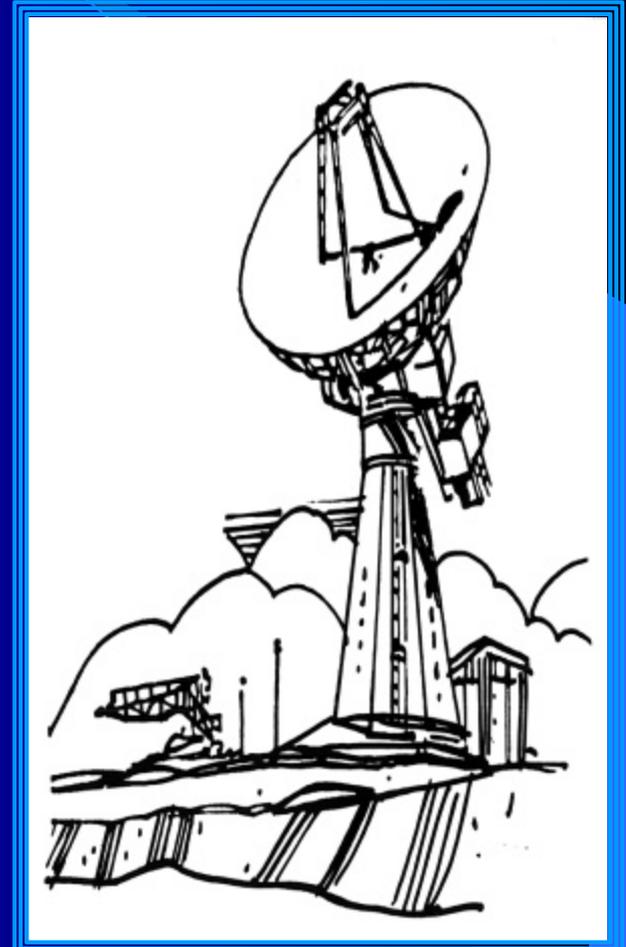
### Sniper Targets (cont.)

- Conventional military snipers tend to engage material targets of tactical importance, e.g. crew-served weapons.
- SOF snipers typically seek out HIGH-VALUE material targets, e.g. C4I SAR, equipment, SCUDs, etc.



# Special Operations Force (SOF) Sniper

## High Value Materiel Targets





# Special Operations Force (SOF) Sniper

## Summary

- SOF snipers are surgical weapons of war
- As such, they need responsive technologies to enhance their already substantial effectiveness
- The Barrett 25mm Objective Sniper Weapon is a unique “payload” gun designed specifically to interdict SOF material targets:
  - **C 4 I SAR**
  - **Support Facilities**
  - **Light Vehicles**
  - **Crew Served weapons**



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# 25mm Objective Sniper Weapon Testing

- Test Setup
  - Weapons
  - Ammunition
  - Fixtures
  - Measurements
- Results
  - Recoil Study
  - Weaponneering Study
- Conclusions



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# Purpose of Tests

- Recoil Force Analysis
  - Measure peak recoil force and compare it to the .50 Caliber M82A1
- Dispersion Analysis
  - Evaluate shot dispersion with respect to the .50 Caliber M82A1
- Determine Lethality
  - Assess lethality with respect to the .50 Caliber M82A1



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# Weapons Tested

Barrett M82A1

.50 Caliber



Objective Sniper Weapon

25mm



Barrett M82A1A

<b>Length:</b>	57 inches (144.78 centimeters)
<b>Barrel length:</b>	29 inches (73.67 cm)
<b>Weight (Unloaded)</b>	32.5 pounds (14.75 kilograms)
<b>Bore diameter:</b>	12.7mm (.50 Caliber)
<b>Maximum effective range on equipment-sized targets:</b>	1800 meters
<b>Muzzle velocity:</b>	2795 feet (854 meters) per second
<b>Magazine capacity:</b>	10 rounds

25mm Objective Sniper Weapon

<b>Length:</b>	
<b>Barrel length:</b>	
<b>Weight (Unloaded):</b>	32.5 pounds (14.75 kilograms)
<b>Bore diameter:</b>	25 mm (0.98 inches)
<b>Maximum effective range on equipment-sized targets:</b>	TBD
<b>Muzzle velocity:</b>	1390 feet (424 meters) per second
<b>Magazine capacity:</b>	4 rounds



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# Ammunition

50 Caliber (Mk 211)

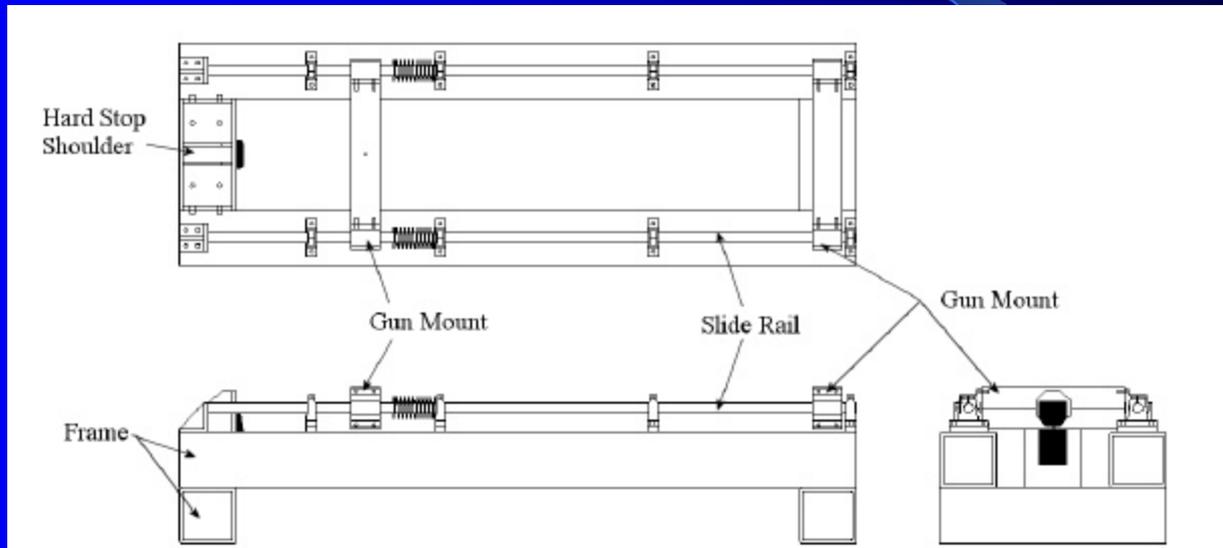
25mm (OCSW-TP)



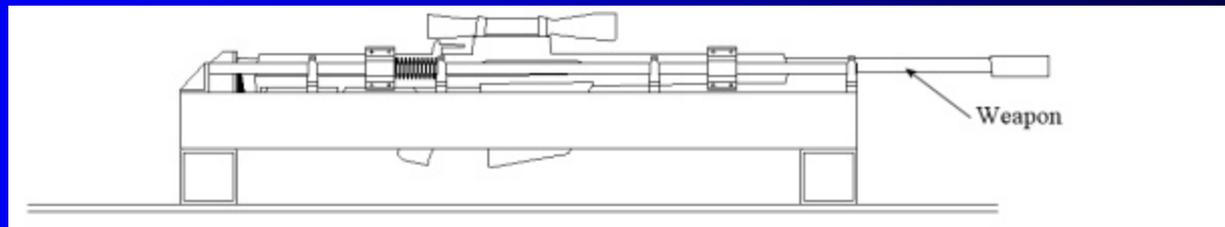
Weapon Data			General Data				Impulse Data				Energies	
Weapon	Caliber	Muzzle Brake Eff. (beta)	Chg. Wt. (lb)	Proj. Wt. (lb)	Proj Vel. (ft/sec)	Cham. Pres. (psi)	Total Imp. (lb-sec)	Imp.In-Bore (lb-sec)	Gas Imp. (lb-sec)	w/ Muz. Brake	Projectile Muz. Energy (ft-lb)	Projectile Muz. Energy (mJ)
<b>Small Arms</b>												
Barrett M82A1	.50 cal	1.60	0.033	0.091	2795	55000	12.082	9.34	2.74	7.69	11047.76	0.0150
Objective Sniper Weapon	25mm	0.40	0.014	0.290	1390	32000	13.436	12.83	0.60	13.19	8707.12	0.0118

# Fixtures

- Hard Mount
  - Hard Mount Fixture

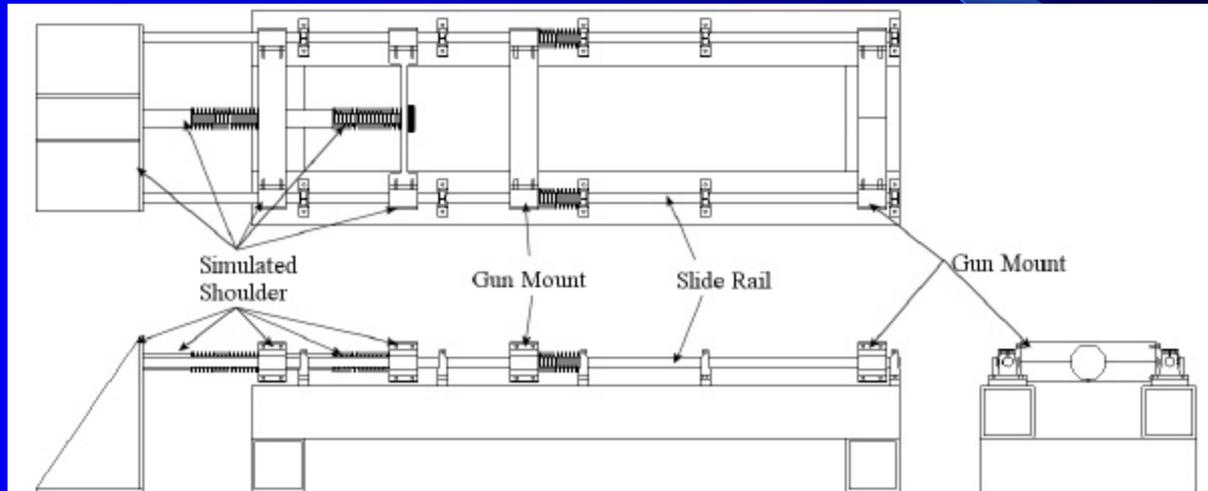


- Weapon mounted in hard mount fixture

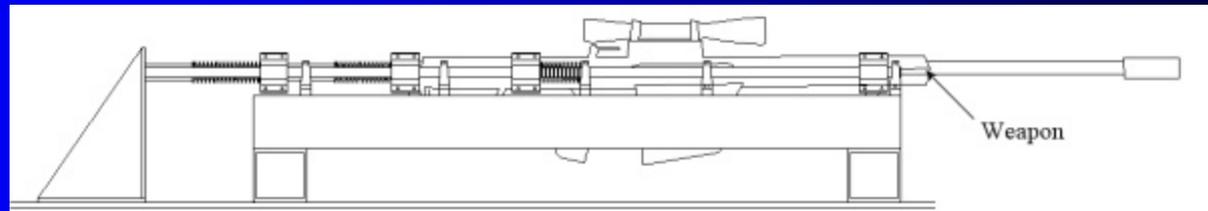


# Fixtures

- Simulated Shoulder
  - Simulates shoulder response in the standing or prone positions



- Weapon mounted in simulated shoulder fixture





# Measurements

- Transducers
  - Recoil Force Sensor
    - Placed behind the stock
    - Measures recoil force versus time
    - Measures peak recoil force seen by the shoulder
    - Placed normal to the recoil force vector
  - Linear Variable Differential Transducer (LVDT)
    - Measures shoulder displacement versus time



# Results

- Hard mount recoil testing
- Simulated shoulder recoil testing
- ATC Testing
- Weaponneering Study





# BARRETT



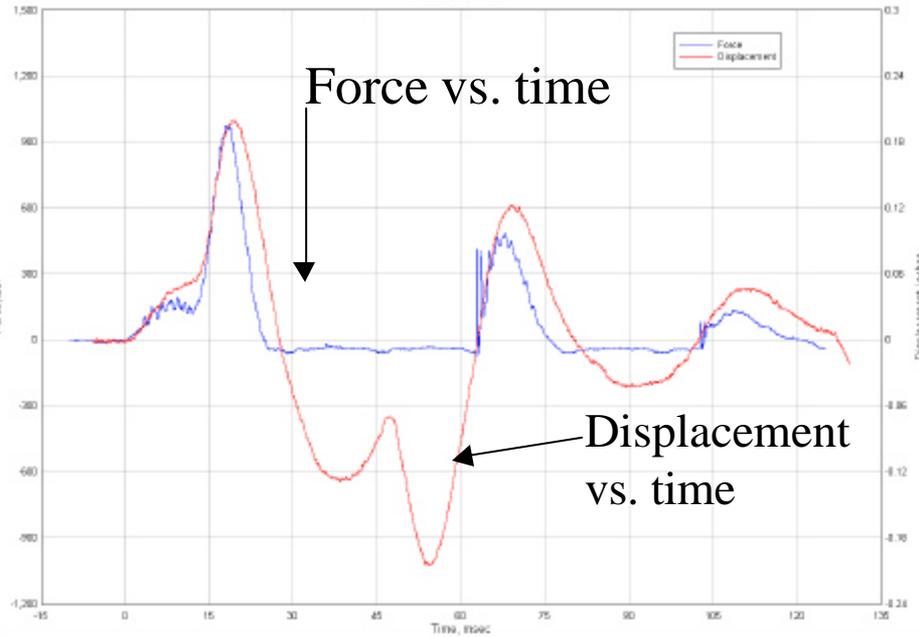
## Hard Mount Recoil Testing Results

### Barrett M82A1 .50 Caliber

### Objective Sniper Weapon 25mm

Force and Displacement Versus Time

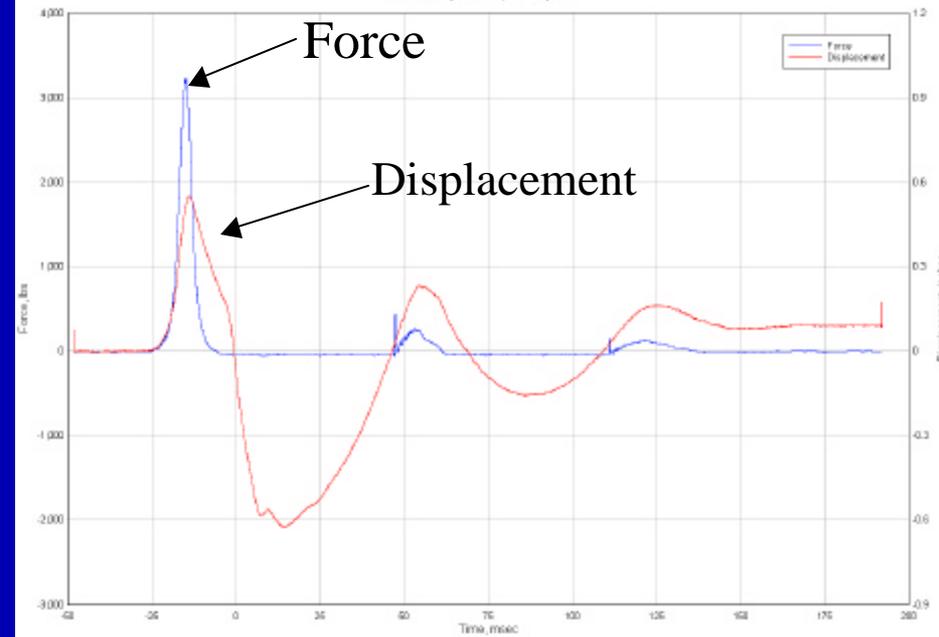
50 Caliber M82A1



Peak Recoil Force: 975 lbs  
Projectile Velocity: 2724 ft/s  
Weapon Displacement: 0.20 inches

Force and Displacement Versus Time

25mm Objective Sniper Weapon



Peak Recoil Force: 3240 lbs  
Projectile Velocity: 1418 ft/s  
Weapon Displacement: 0.55 inches



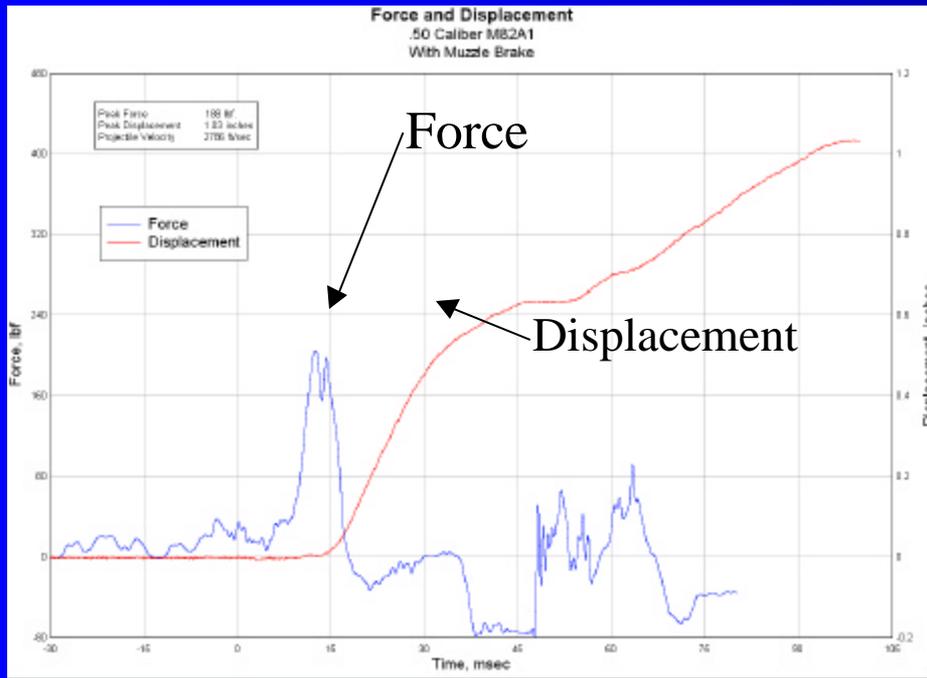
**B A R R E T T**



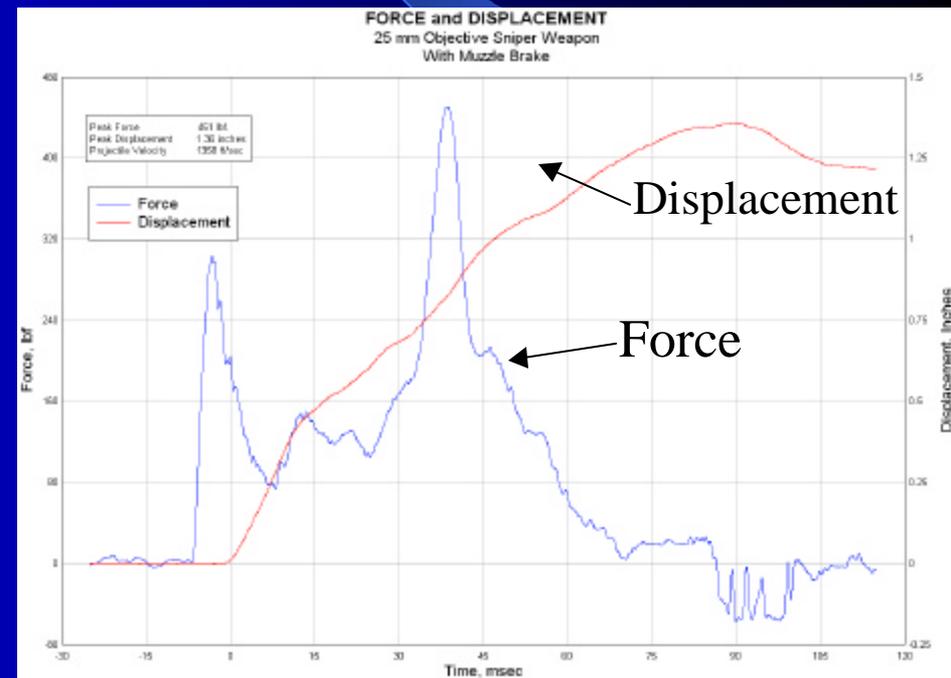
# Simulated Shoulder Recoil Testing Results

## Barrett M82A1 .50 Caliber

## Objective Sniper Weapon 25mm



Peak Recoil Force: 188 lbs  
Projectile Velocity: 2786 ft/s  
Shoulder Displacement: 1.03 inches



Peak Recoil Force: 451 lbs  
Projectile Velocity: 1358 ft/s  
Shoulder Displacement: 1.36 inches



# Recoil Testing Results

- Peak Recoil Comparison

	Measured Peak Force (lbs)
.50 Caliber M82A1 Hard Mount	975
.50 Caliber M82A1 Simulated Shoulder	210
25mm Objective Sniper Weapon Hard Mount	3240
25mm Objective Sniper Weapon Simulated Shoulder	451

The Peak Force Produced by the 25mm Objective Sniper Weapon is Considerably Larger than that of the .50 Caliber M82A1



# ATC Dispersion Testing

- Comparative Testing
  - Single Shot Test Barrel Using Mk 211 Ammunition
  - Single Shot Test Barrel Using 25mm TP OCSW Ammunition
  - M82A1 OTF2 (SN3629) Using Mk 211 Ammunition
  - Objective Sniper Weapon Using 25mm TP OCSW Ammunition
- Target Distances
  - 600 meters
  - 800 meters
- Five round groupings



# ATC Testing Results

Dispersion Testing				
Pooled Data of 10 Shots (2 Groupings of 5) (MoA)				
Range	Single Shot Test Barrel Using Mk 211 Ammunition (MoA)	Single Shot Test Barrel Using 25mm TP OCSW Ammunition (MoA)	M82A1 OTF2 (SN 3629) Using Mk 211 Ammunition (MoA)	25mm Objective Sniper Weapon Using 25mm TP OCSW Ammunition (MoA)
600 meter	.71	2.49	2.30	2.53
800 meter	1.34	2.76	2.74	3.33



# Weaponneering Study

- Determine if the 25mm Objective Sniper Weapon is able to reduce the number of rounds it takes to disable a known target by a factor of three
- Targets
  - BMP-3
  - Big Bird Radar
- Range
  - 600 meters
  - 800 meters





# Weaponneering Study

- Approach
  - BRL-CAD
    - Determine the vulnerabilities of a known target
    - Calculate the shot line needed to impact vulnerabilities
  - COVART
    - Used BRL-CAD target and shot line models
    - Used ATC dispersion data
    - Determined the destructive capabilities of each round



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# Weaponneering Study

- Summarized Results

- Big Bird Radar

- At **600 meters** each weapon required the **same number of rounds** to disable the target.
- At **800 meters** the Objective Sniper Weapon **required half as many rounds** as the .50 caliber M82A1.

- BMP-3

- At **600 meters** the .50 caliber M82A1 required **2.5 times** more rounds than the Objective Sniper Weapon.
- At **800 meters** the .50 caliber M82A1 required **2 times** more rounds than the Objective Sniper Weapon.

**In both cases the, Objective Sniper Weapon had greater lethality than the .50 caliber M82A1.**



# Weaponneering Study

- Summarized Results
  - The Objective Sniper Weapon can accurately engage a target with three rounds fired in thirty seconds
  - Engaged targets within 3 minutes at 600 meters.
  - Engaged targets within 4 minutes at 800 meters.



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# Conclusions

- The concept is feasible
  - Free recoil energy can be reduced
    - Lowering the velocity of the round
    - Increasing the mass of the weapon
  - Peak force can be reduced
    - Weapon design update

The weapon provides greater lethality at range



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**Special Operations  
Force (SOF) Sniper**

