



الوكيل الحصري بالمملكة العربية السعودية

شركة الوفاء الدولية  
AL WAFI INTERNATIONAL CO.



Defense and Aerospace Sustainment Partners: [www.wafaco.com](http://www.wafaco.com)

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# HMMWV COBRA EXTREME PERFORMANCE



**REPOWER & UPGRADE PACKAGE**



**Defense & Aerospace**  
SUSTAINMENT PARTNER



Defense and Aerospace Sustainment Partners: [www.wafaco.com](http://www.wafaco.com)



- » ISO Group is the preeminent provider for defense and aerospace engineering solutions, spare parts, tooling, and equipment requirements
- » Single point of contact for purchase and support
- » Regional locations for direct support
- » Provider of "Packaged Solution" for aging HMMWV fleets:
  - **Drive Train Replacement**
  - **Armor Kit**
  - **Additional Upgrades**



Defense & Aerospace  
SUSTAINMENT PARTNER

**HMMWV Extreme Performance Repower & Upgrade Package**

Defense and Aerospace Sustainment Partners: [www.wafaco.com](http://www.wafaco.com)





Here are just some of the many **Prime Contractors, MRO facilities and Government Agencies** benefiting from sustainment services:



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1. H.O. ENGINE

2. TRANSMISSION

3. PUSH BUTTON SHIFT

4. COOLING SYSTEM

5. SUSPENSION

6. ARMOR

7. TERRAIN TRAINING

**HMMWV**  
**GOBRA EXTREME PERFORMANCE**  
**REPOWER & UPGRADE PACKAGE**

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## Upgrade 1: Extreme 6.5L H.O. Engine

- Improved and redesigned engine based on the GM 6.5L.
- Engine will drop-in and bolt-up to any HMMWV with NO modification to the vehicle
- More durable - improving combat readiness
- Custom horsepower and torque range available tailored to any unique application, terrain and operating environment. (Optional engine configurations up to 400hp)
- Mechanical Fuel Injection (easier to repair and diagnose especially in a field environment)
- Extended Mean time Between Failure (MTBF)
- Life cycle is 10,000 hours before overhaul
- Compatible with existing spares inventory



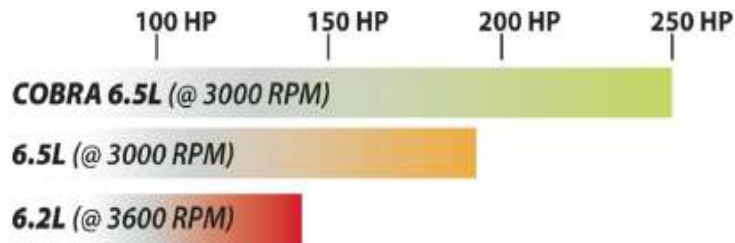
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## Increased Horsepower

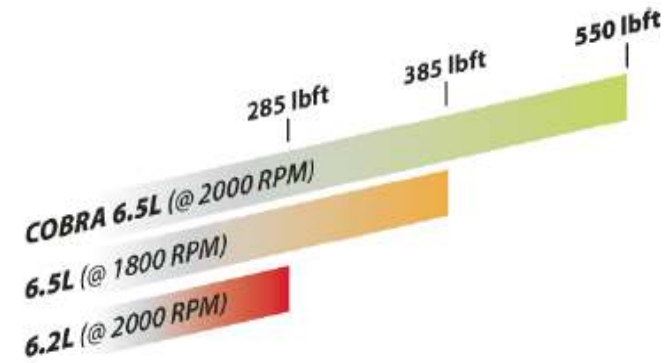


- Horsepower increased to 250hp at 3000 RPM
  - 32% increase over standard 6.5L engines
  - 79% increase over standard 6.2L engines
- **More horsepower = faster HMMWV for:**
  - increased response time

EXTREME PERFORMANCE			
Acceleration 0-60	Cobra 6.5L	Std 6.5L	Std 6.2L
	9 seconds	13.5 seconds	26 seconds

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## Increased Torque



- Torque increased to 550 lbft at 2600 RPM
  - **45% increase** over standard 6.5L Engines
  - **60% increase** over standard 6.2L Engines
- **More Torque = better capabilities for:**
  - off road and steep incline climbing
  - greater load capacity for ammo, cargo, personnel

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## Design Improvements



### » **Cobra 6.5L Engine Design Improvements:**

- High Strength Forged Steel Crankshaft
- Forged Carbonized Steel Camshaft
- Redesigned Cross Section Forged Steel Connecting Rods
- Grey Iron/Molybdenum Engine Block
- New Ductile Iron Ladder Frame/Girdle
- Increased Cylinder Wall Thickness
- Increased Crank Journal Depth
- Grey Iron With High Chrome Content Cylinder Heads
- Higher Turbo Boost Pressure With Improved Flow Outlet
- Cast Aluminum Intake Manifold
- Cast Nodular Iron Exhaust Manifolds
- New Cast Alloy Structural Oil Pan



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## < Cost Saving Benefits

- Most existing drive train components such a transmission, transfer case, etc. on the HMMWV can be re-utilized including engine accessories such as starters, alternators, etc.
- Increased fuel economy at road speeds and vehicle flexibility with the optional Cobra Power Pack Transmission  
*(preliminary testing shows estimated fuel savings up to 7%)*
- Reduces fleet fuel logistics burden

**HMMWV fleet maintenance efficiencies and readiness levels improved**



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## Upgrade 2: 4L85E Transmission



- Meets all US DoD requirements
- Proven its reliability for nearly 2 decades
  - » 885 lb. ft. Maximum Gear Box Torque Rating
  - » Close Ratio Gears
    - First: 2.48
    - Second: 1.48
    - Third: 1.0
    - Fourth: 0.75
    - Reverse: 2.07
  - » 18,000 lb. Maximum GVW Rating
  - » 22,000 lb. Maximum Towing Capacity



### HMMWV 6.2L FLEETS

It is recommended to upgrade the transmission to the venerable 4L85E as offered with the H.O. power pack due to the increase in power and the benefit of an additional gear, this increases fuel economy at road speeds and vehicle flexibility.

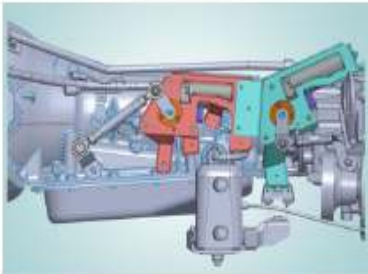
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## Upgrade 3: Push Button Shift



- Provides simplicity with automatic selection of correct gear shifting, preventing gear shifting errors thus reducing maintenance
- Shift-On-The-Fly transfer case range selection protects the transmission and engine when shifting into Low Lock
- Compatible with existing transmissions and transfer cases
- Compact design increases cabin space
- Improves survivability by eliminating gaps in the armor from traditional cable shifters (Standard HMMWV has hole in floor at shifter location)

**Approved Technology on MRAP**

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## Upgrade 4: Cobra Cooling Pack

- A redesigned and improved cooling system to ensure optimal performance in the harshest and hottest environments up to 145°F (62°C)
- Includes the radiator, engine oil cooler, transmission cooler and power steering cooler.
- Incorporated an air charge/intercooler to this system for increased:
  - **Power and Performance**
  - **Fuel economy**
  - **Durability and reliability of the engine and drive train components**
- Coolers are based on a lighter aluminum structure of plate & bar design considered the most durable in the industry.  
(Standard HMMWVs are copper and brass)

**Designed For Extreme Conditions,  
Towing and Heavy Loads**



Testing has shown:  
Overall engine temperature is 30° Cooler  
Transmission temperature is 15% Cooler  
Oil temperature is 20° Cooler

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## Upgrade 5: Extreme Suspension



**Unfortunately passive shocks are “programmed” with one set of responses you must choose between a “good ride” and “good handling”**

» **With passive shocks**

- They only respond to the relative velocity between the chassis and the wheel.
- The faster they move, the stiffer they get!
- A passive shock has “no idea” if the chassis is moving or the wheel is moving.

» **An enormous compromise must be made**

- This means damping is usually too stiff for a best ride and too soft for best handling.
- Each shock acts independently and has “no idea” what the “other” shocks are doing. Or, if the body is rolling, pitching, diving, squatting, heaving or yawing.



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# < The Extreme Suspension Difference



**Unlike a passive suspension...**

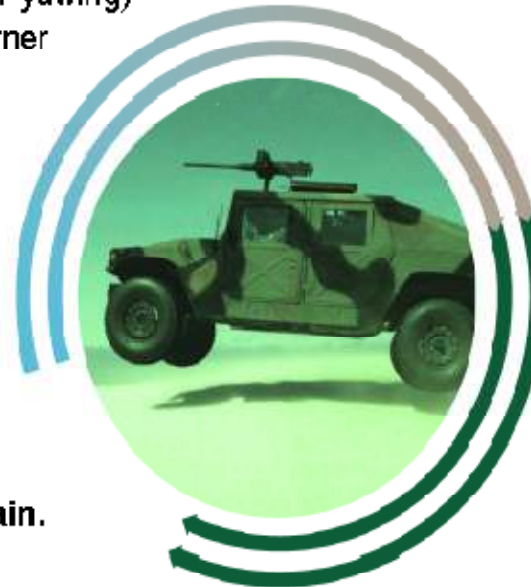
**The Extreme Suspension System monitors EVERYTHING and REACTS accordingly!**

» **It knows:**

- if the chassis is moving and in which direction (pitching, diving, squatting, heaving, cornering or yawing)
- how fast, and its acceleration rates at EACH corner and in all 3 directions
- its absolute position at all times
- to prevent bottom out or top out on each wheel – long before it happens!

» **In addition, it:**

- minimizes damage to vehicle and parts
- can detect extra loads by measuring average ride height and compensate automatically
- prevents driver and passenger fatigue



**Ride faster, smoother and travel safer over any terrain.**

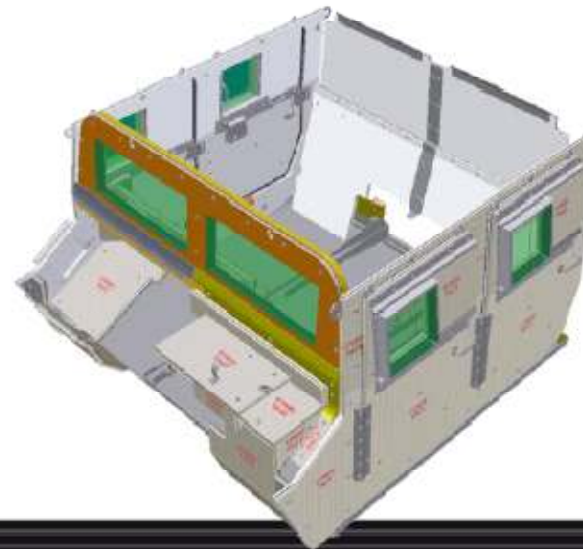
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## Upgrade 6: Retrofit Armor Kits

- » One of the Lightest Armor Solutions on the Market (2,800 lbs or less)
- » Ability to Quickly Adapt to Fit Older Truck Platforms and Modified Platforms
- » Simple Design with Minimal Modification to Vehicle and in Country Installation
- » Large Physical Appearance Changes (Psychological effect)
- » Protection Profile Appropriate to the Expected Threat
- » Threat profile expected to include:
  - 7.62 M80 Ball Rounds
  - 7.62 LPS Mild Steel Core
  - .50 caliber at 100 yard stand off
  - Light Explosive Threats
  - Optional Lightweight Gunners Protection
- » Utilizing Mature and Characterized Materials



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# Armor Materials



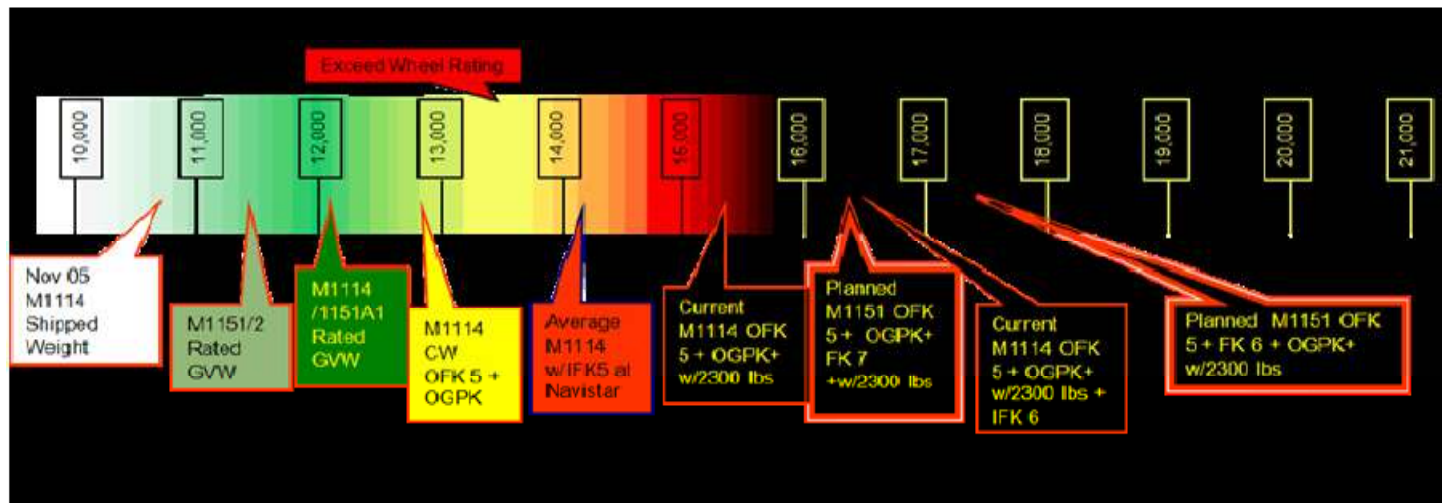
- » **Aramids**
  - Kevlar
  - Twaron
- » **Carbon Fiber**
- » **Polymers**
  - Polycarbonates
  - Polymethyl Methacrylates
- » **Ultra High Molecular Weight Polyethylene**
- » **Ceramics**
  - Silicon Carbide
  - Boron Carbide
  - Oxide Ceramics
- » **Glass Composites**
  - S-Glass
  - R-Glass
  - E-Glass
- » **Metallic and Aluminum Strike Face Technologies and Structures**

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# GVW History



The current Military HMMWV has nearly doubled in weight due to the extensive use of steel armor. This has significantly affected vehicle performance, payload and increased maintenance costs.

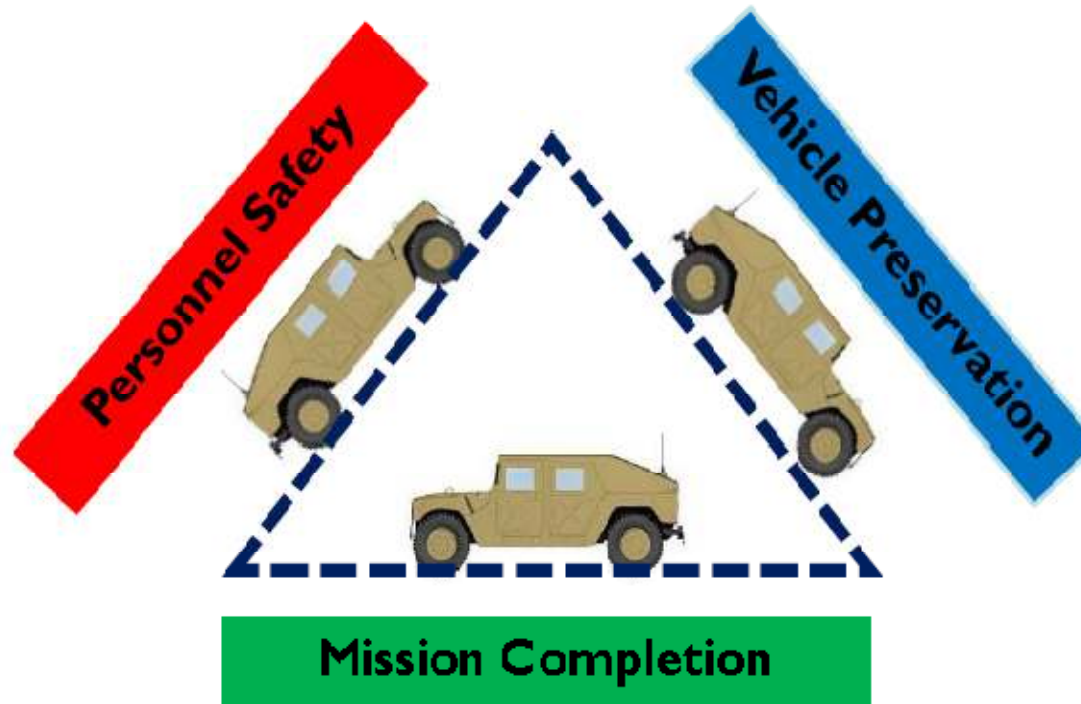
The HMMWV armor kit is a composite armor kit designed for deployment into urban environments with little or no IED threat.

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## Upgrade 7: Integrated Crew Training

Focused on three core areas for teams operating HMMWV's in harsh terrain.  
Specifically designed for military personnel



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## Rough Terrain Driver Training

### Course covers:

- Vehicle operation and driving techniques in varying terrain (learn limitations, prevent rollovers)
- Self-recovery methods and vehicle-to-vehicle recovery for multiple stuck/disable vehicles (get unstuck)
- Field expedient repair techniques and materials
- Advanced off-road vehicle recovery techniques including complex winching

**Prevent vehicle damage and injury to personnel**



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# A disabled vehicle is a stationery target



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*This is the Right Package For You Because...*



- *It's Much Faster*
- *It Has Greater Load Capacity*
- *It's More Durable and Reliable*
- *Better Off Road Capabilities*
- *It Will Lower Maintenance*
- *It Provides Safer Operation*
- *And Can Perform Under Very Extreme Conditions*



The **RIGHT** support, the **RIGHT** technology,  
The **RIGHT** focus on quality and compliance.

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# ***Engine, Transmission, Cooling and Push Button Shift Addendum***

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## Comparison: Cobra Extreme VS. Standard HMMWV

		Cobra Extreme H.O. 6.5L	Standard 6.5L	Standard 6.2L
Engine	Displacement	6.5 Liters	6.5 Liters	6.2 Liters
	Configuration	V8	V8	V8
	Aspiration	Turbo-Intercooled	Turbo	Turbo
	Cooling System	HD Bar & Tube Aluminum Radiator	3 Row Brass/Copper Radiator	3 Row Brass/Copper Radiator
	Horsepower	25Chp @ 3000rpm	190hp @ 3200 rpm	136hp @ 3600 rpm
	Torque	55C lbft @ 2000rpm	385 lbft @ 1800 rpm	235 lbft @ 2000 rpm
Transmission	Type	Automatic 4L85E	Automatic 4L80E	Automatic 3L80
	Gears	4 Forward, 1 Reverse	4 Forward, 1 Reverse	3 Forward, 1 Reverse
	Construction	HD Planetary Unit	Automotive Planetary Unit	Automotive Planetary Unit
		HD Torque Converter	Automotive Torque Converter	Automotive Torque Converter
	Computer	Self-Learning	Conventional	Conventional
	Torque Capacity	885 lbft	440 lbft	430 lbft
	Shift	Shift by Wire	Mechanical Linkage	Mechanical Linkage
Armor	Crew Compartment	Maxcer	Conventional	Conventional
Performance	Acceleration 0-60	9 seconds	13.5 seconds	23 seconds
	Max. Speed	80 mph	66 mph	55mph
	Curb Weight			
	Payload			

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## End User Performance Test



- » Performance test of HMMWV in Desert Conditions from 24 to 25 July 2011, average temperature of 109.4 °F and humidity 60%.

### Extreme Performance 6.5L H.O.

No.	Terrain	Distance	Performance
1	Asphalt	300 km	Exceeded
2	Sand and Flat	100 km	Exceeded
3	Rough Terrain	50 km	Exceeded

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# ***Suspension Addendum***

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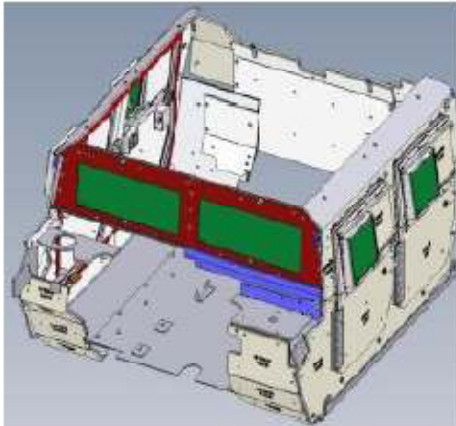
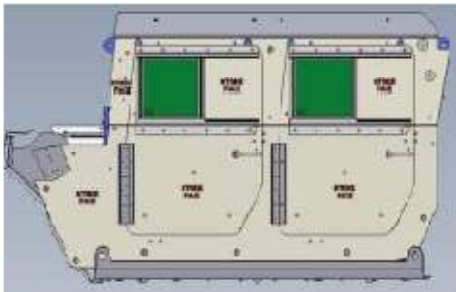
# *Armor Addendum*

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## Expected Armor Weights



### .50 Caliber AP and Light Blast Armor Protection System

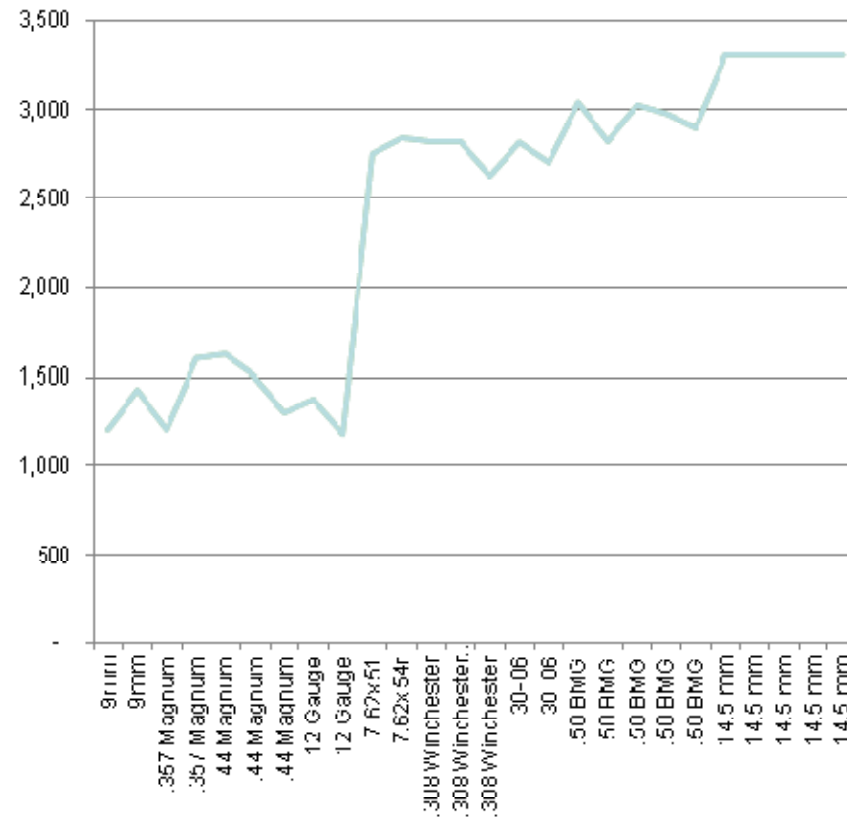
Description	Area (sq ft)	AD (psf)	Weight (lb)
Rear Partition, Upper, LH	5.3	13.2	69.8
Rear Partition, Lower, LH	3.7	13.2	87.9
Rear Partition, Upper, RH	5.4	13.2	71.1
Rear Partition, Lower, RH	3.5	13.2	86.2
Door, Front, LH	7.3	23	167.7
Door, Rear, LH	7.3	23	167.7
Side, LH	11.3	23	260.4
Roof, Upper, LH	4.2	45	13.9
Door, Front, RH	7.3	23	167.7
Door, Rear, RH	7.3	23	167.7
Side, RH	11.9	23	273
Roof, Upper, RH	4.2	45	13.9
Fenderwell, LH	4.1	23	93.6
Fenderwell, RH	3.1	23	187
Windscreen (w/o TA)	5.6	23	128.6
Firewall	5.8	60.1	357.4
Roof (w/o gunner ring)	34.8	45	156.6
Side Windows	4.4	29	136.5
Windshield	3.6	29	200.8
<b>Total</b>	<b>153.7</b>		<b>2,817.50</b>

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# Projectile Velocities



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## Supported HMMWV Products



### **A0 Series (1984-93)**

6.2L Diesel Engine  
3 Spd Transmission  
2,500 – 3,632 lb. Payload  
GVW: 7,700 lb.



### **A1 Series (1991-95)**

Improved Driveline  
Improved Suspension  
2,500 – 3,632 lb. Payload  
GVW: 10,000 lb.



### **A2 Series (1994-Present)**

6.5L Diesel Engine  
4 Spd Electronic Trans  
3,520 - 4,400 lb. Payload  
GVW: 10,300 lb.



### **ECV (1993-Present)**

6.5L Turbo Diesel Engine  
Suspension Upgrade  
Armor Capable  
1,800 – 5,100 lb. Payload  
GVW: 12,100 lb.  
Current Op: > 16,500 lb.

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# ***Driver Training Addendum***

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