



# HMMWV

BY

 **TELEDYNE  
CONTINENTAL MOTORS**  
General Products Division

**HIGH MOBILITY MULTIPURPOSE WHEELED VEHICLE**



# **INTRODUCTION TO THE HMMWV BY TELEDYNE**





# EXPERIENCE

TCM's HMMWV is a mature, fully developed weapon system preceded by several generations of prototypes built and tested since 1977.

The Cheetah® was Teledyne's response to the Army's RFP issued in 1977 for a Combat Support Vehicle. Two generations of this rear engine configuration were built and tested during 1977-78.

In 1979 the Cheetah® rear engine design was replaced by a vehicle having a front engine configuration. Operational requirements of the military user were designed in from the ground up to provide exceptional multi-mission versatility. Three generations of the present vehicle configuration were built and tested. Testing has been conducted in the Middle Eastern deserts, and a variety of terrains in the U.S. including mountains over 8,000 ft. elevation in the Western States.

TCM's production HMMWV's will have been preceded by five vehicle generations which will provide the military user with a highly reliable and durable vehicle. We started with a Cheetah® and developed a low, lean Tiger tough HMMWV design.









# DURABILITY

All-American manufactured high capacity engine and power train components were selected to assure completing the first 20,000 miles of operation without replacement or overhaul. The components selected also provide excellent durability for payload growth from 2,500 pounds to 3,600 pounds.

Since 1977 we have completed over 60,000 miles of testing on several generations of vehicles to provide reliability exceeding 2,400 mean miles between failures.

## ENGINE

- 6.9 liter (420 cu. in.) displacement diesel by International Harvester produces 170 horsepower and 310 lb. ft. torque needed to meet desired HMMWV performance requirements.
- Rated for trucks to 28,000 pounds GVWR. This reserve capacity provides margin for payload growth and lets the engine work easier for longer life which lowers life cycle cost.

## TRANSMISSION

- Model 475 Turbo-Hydramatic 3-speed automatic transmission by General Motors is rated for medium duty trucks to 19,500 pounds GVWR.
- High torque capacity spur gears used in the planetary gear set rather than helical gears which provides the best durability.
- Oil cooler flow to 4.3 GPM to prevent overheating in desert environments.

- Six bolt torque converter for diesel engines.

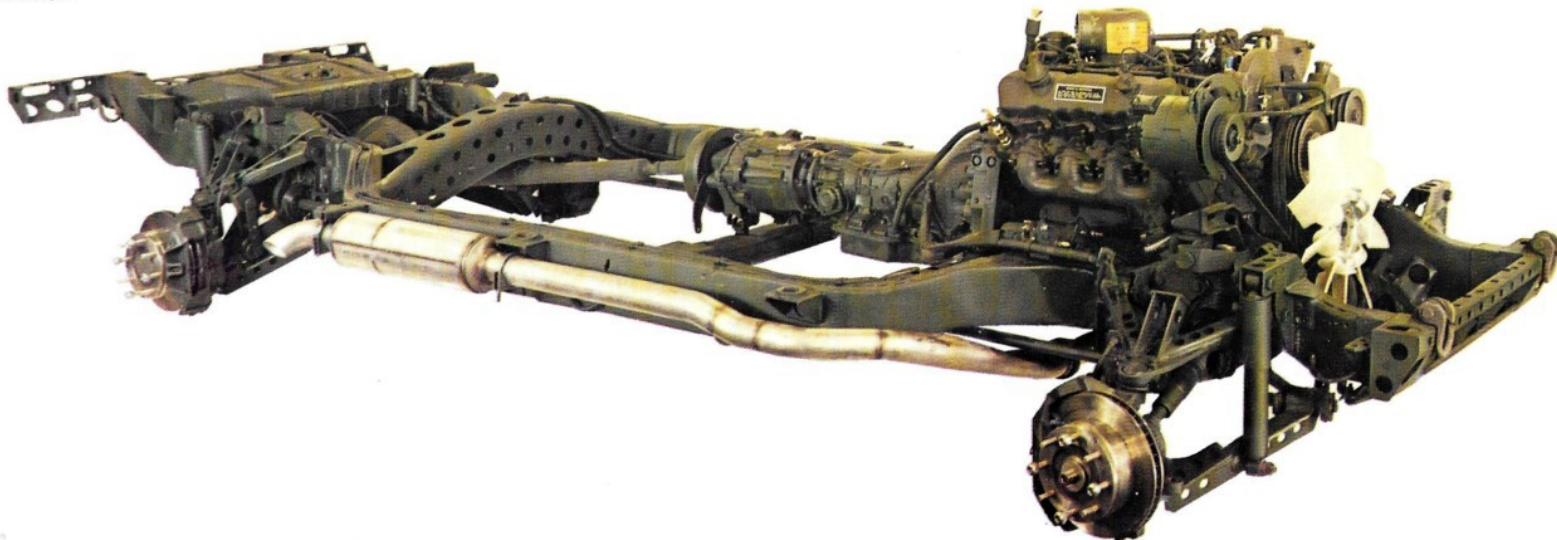
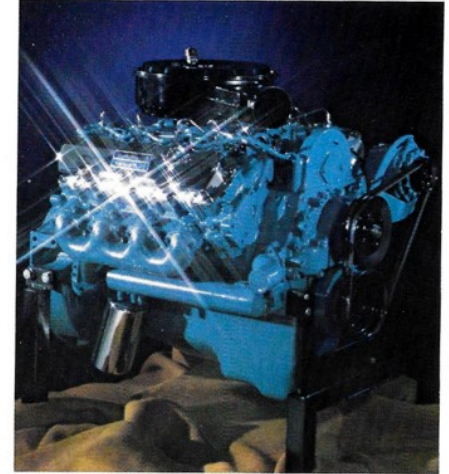
## TRANSFER CASE

- This rugged Model 208 New Process four-wheel drive transfer case has high and low ranges for maximum mobility in all terrains.
- Maximum efficiency is obtained for highway driving by using the two-wheel drive selection feature to increase component life by eliminating drive train windup and steering fight.

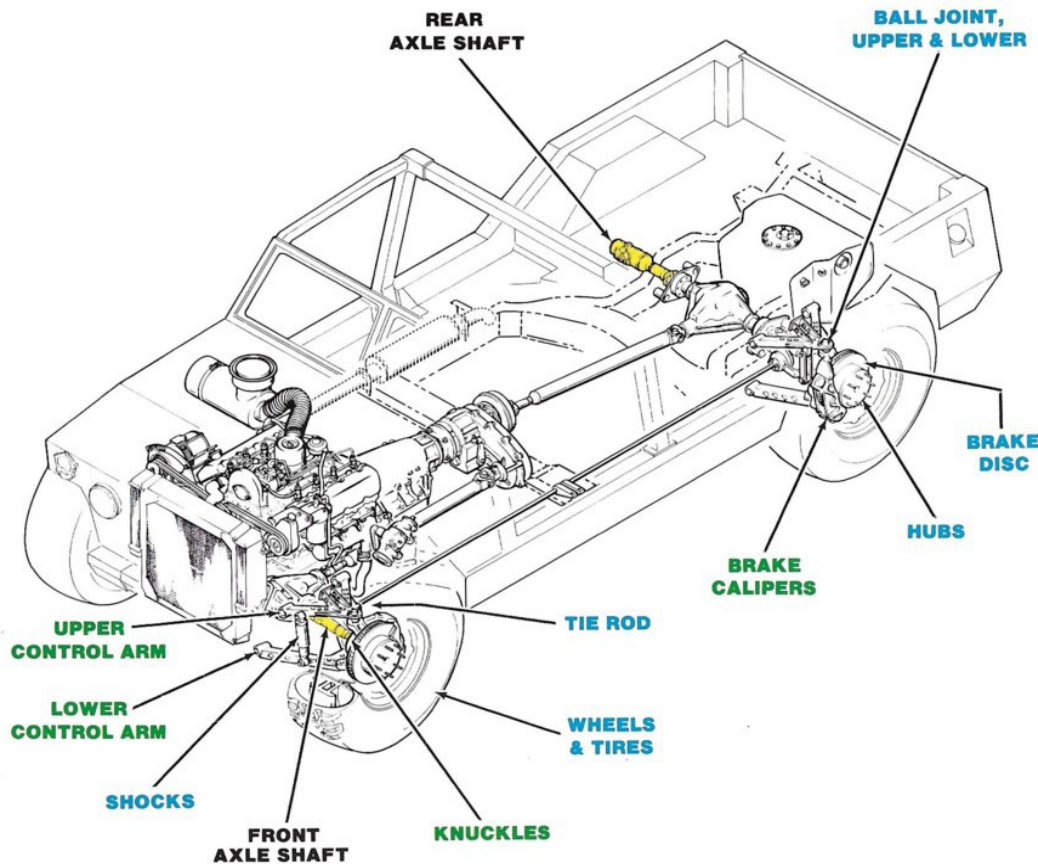
## DIFFERENTIALS

- Front differential capacity of 4,400 lb. ft. True Trac® front differential maintains traction when one wheel starts to slip — positive gear action, no friction plates to wear.
- Rear differential output capacity of 6,000 lb. ft. is adequate to handle loads such as a 3,600 pound payload S-250 shelter. No Spin® rear differential ensures positive traction under all conditions. Dependable, rugged automatic operation forward or reverse. Higher capacity differential and axles were used in the rear to handle the corresponding higher loads carried by the rear axle.

These durable components have been selected to last the life of the vehicle and to provide the lowest life cycle cost.



# MAINTAINABILITY & LOGISTICAL SUPPORT



Durable components were selected to minimize maintenance and replacement requirements and the basic vehicle was designed for ease of maintenance when necessary.

## EASY TO MAINTAIN

- Tilt forward hood and front engine placement provides walk-in access to the engine and accessories.
- The International Harvester engine has been carefully designed for easy maintenance. For example, the fuel injectors and glow plugs are located in the Vee so that the valve covers can be removed for inspection without removing the injector lines or glow plug harness.
- The engine has been designed for lower cost rebuild by incorporating replaceable prechambers and exhaust valve seats.
- Oil and fuel filters are located for easy servicing.

## ENHANCED LOGISTICAL SUPPORT

- TCM's basic HMMWV has the same chassis and body components for all mission roles which reduces training, spare parts, and manual requirements.
- Optimum interchangeability of chassis parts. Fifty-two parts are provided by only fourteen items as shown by the diagram. These high capacity components have been proven by over 60,000 miles of rugged durability testing.

ALL CORNERS	SIDE TO SIDE	DIAGONALLY
Tires	Axle Shafts, Front	Knuckles (L & R)
Wheels & Run-Flat Assembly	Axle Shafts, Rear	Upper Control Arms (L & R)
Hubs		Lower Control Arms (L & R)
Shocks		Brake Calipers (L & R)
Ball Joints, Upper		
Ball Joints, Lower		
Brake Discs		
Tie Rods		



# DESIGN FEATURES

Teledyne's design approach for the HMMWV started with the military user's needs. Numerous innovative features were developed and integrated to provide the military user with outstanding operational capabilities.

## SUSPENSION

The four-wheel independent suspension with our unique variable rate torsion bar system and high wheel travel — 10-1/2 inches front, 11-3/8 inches rear — smooths rugged terrain. This suspension system also enables the silhouette and cargo bed height to be reduced 6 to 8 inches over conventional designs.

## FRAME

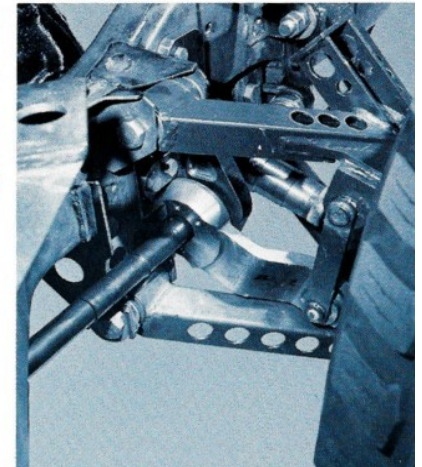
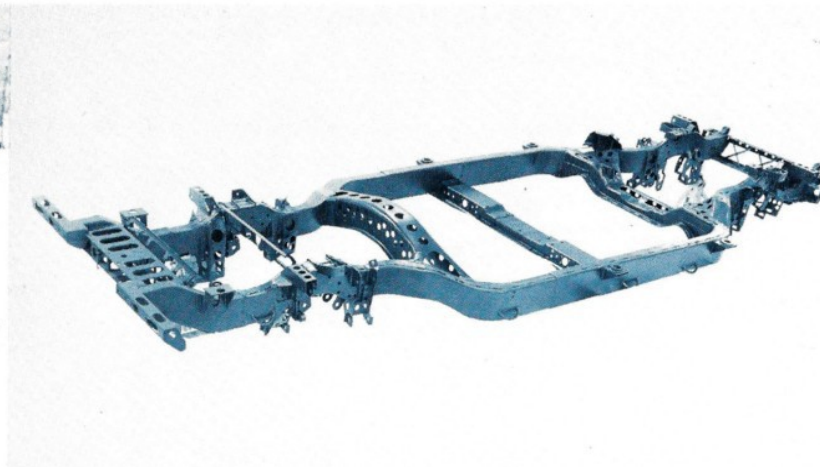
Our unique frame configuration features a wide center contour and full box construction of 80,000 psi high strength steel to minimize weight. Computerized finite element analysis was utilized to select the optimum design. Crew members are positioned low and inside the frame rails to further reduce the silhouette and provide protection for crew members in the event of side impact.

## BODY

Lightweight aluminum was selected to keep weight low and to eliminate body rust problems. Rear seats fold down to provide a large cargo bed. Body sides are configured to keep water out when fording to 30 inches.

## CENTER OF GRAVITY

An exceptionally low 24-inch vertical center of gravity was achieved by uniquely integrating the frame, suspension, power train, and body. The crew members sit inside the full width contoured frame rails, the independent suspension allows lowering the cargo bed 6-8 inches, the front differential is offset allowing the engine to be mounted lower, and the body is aluminum. Low center of gravity and 69.8-inch wheel stance eliminates the possibility of rollover in hard turns. The design approach also provides a high ground clearance for obstacle crossing, including an 18-inch high vertical step.



# VERSATILITY

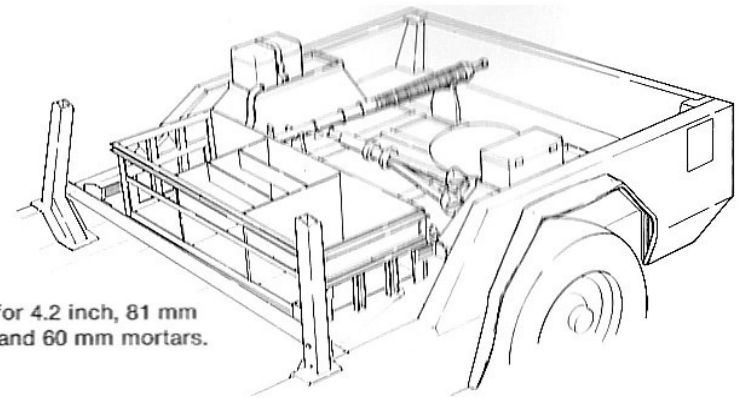
TCM's baseline HMMWV has been configured for mounting numerous kits which provides almost unlimited versatility for present or future missions. This design provides the flexibility of installing, changing or interchanging kits in the field. The basic vehicle has been designed to handle payload growth such as a 3,600 pound S-250 shelter for communications, command, and control roles. The high output diesel engine and high capacity power train readily moves these extra payloads up the mountain when needed.

## OPTIMUM CARGO BED LENGTH OF 92 INCHES

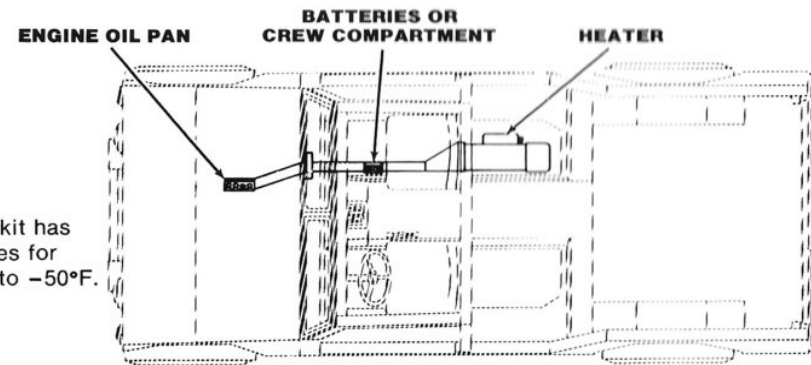
- Easily transports 87-inch long S-250 shelter without rear overhang.
- Accommodates 90-inch ambulance litters.
- Seating for an entire squad with troop seat kit installed.

## FUTURE ROLES

The baseline configuration readily accepts other mission requirements including GLLDS, Stinger Air Defense missiles system, and the Hellfire missile system.



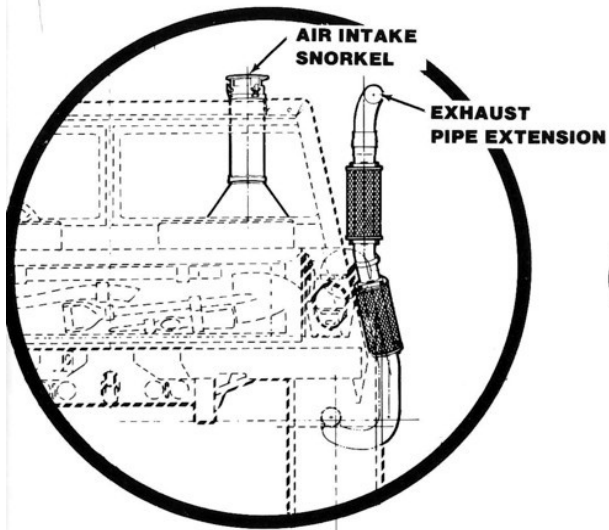
Mortar kits for 4.2 inch, 81 mm (illustrated) and 60 mm mortars.



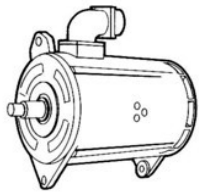
Arctic heater kit has 2 output modes for temperatures to  $-50^{\circ}\text{F}$ .



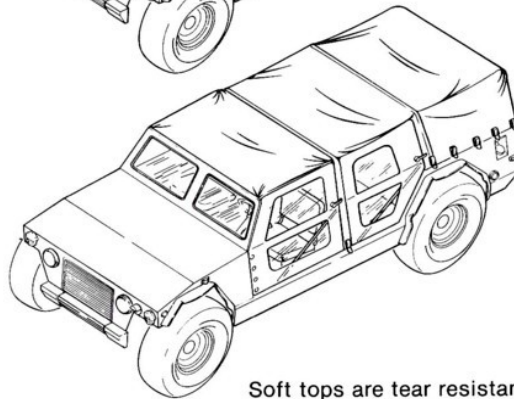
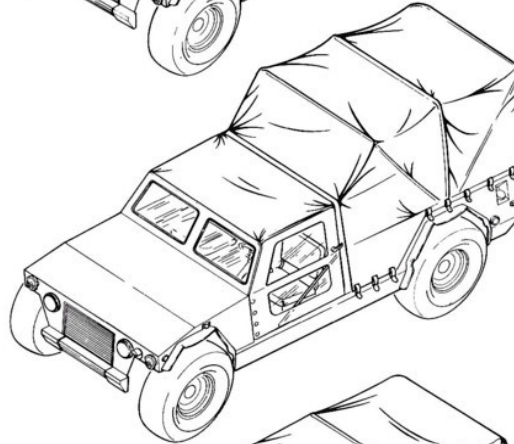
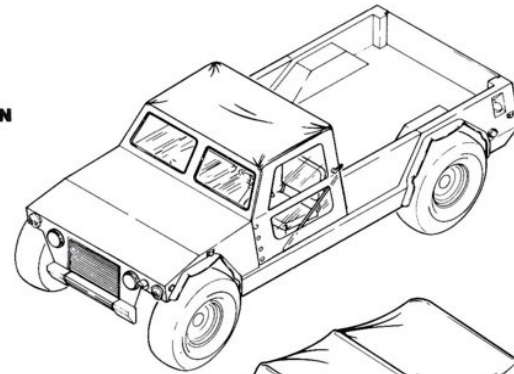




Fording to 30 inches is provided by the basic vehicle and to 60 inches with kit.

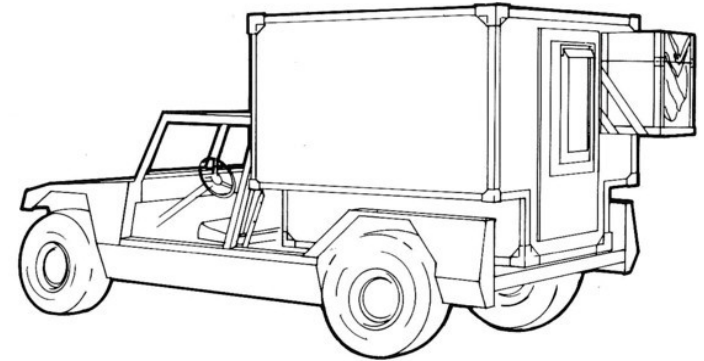


100 Amp alternator kit replaces the basic 60 amp alternator.



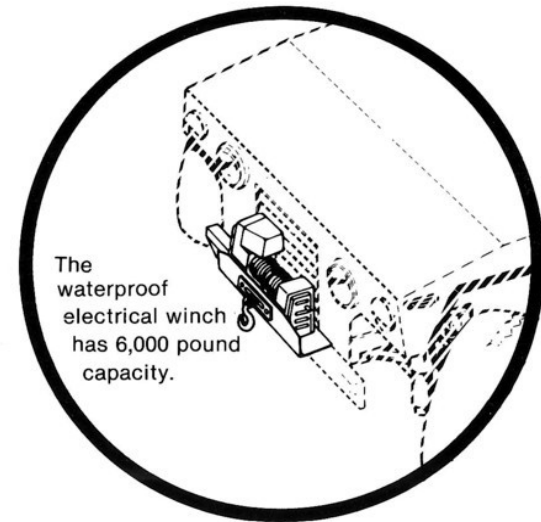
Soft tops are tear resistant, coated nylon fabric.

With troop seats the vehicle accommodates an entire squad.



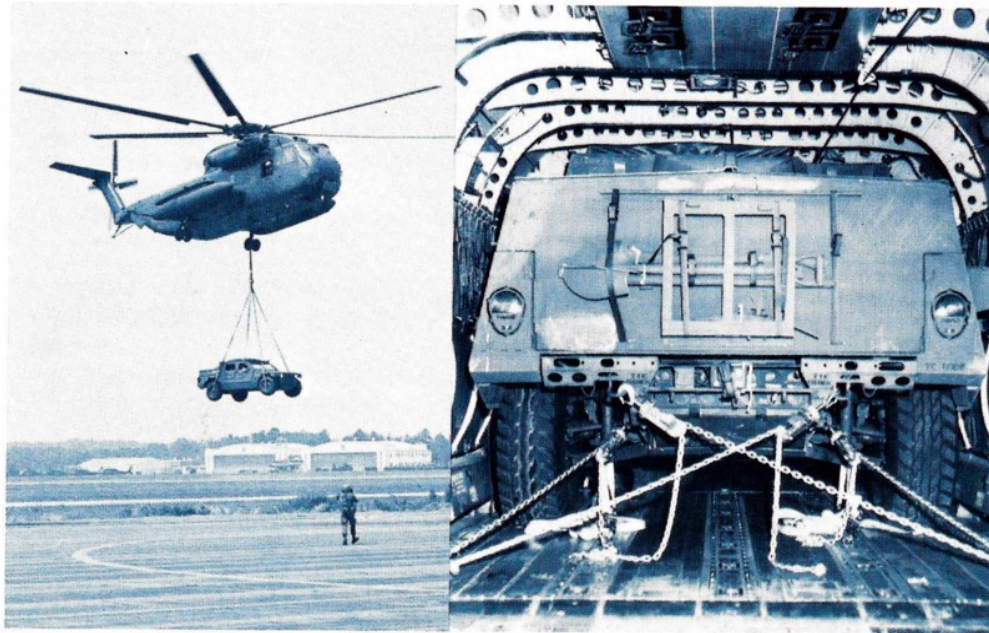
In addition to transporting the S-250 shelter, combinations of communications/intelligence systems can be installed on the vehicle including:

- |                              |                           |
|------------------------------|---------------------------|
| AN/VRC-47, AN/GRC-160 & KY38 | AN/TSC 102                |
| AN/VRC-47 & KY38/ or KY57    | AN/GRC 206                |
| KY67                         | 2 GRC-106 (w/100 amp kit) |
| AN/GRC 160                   | VSC-2 (w/100 amp kit)     |





# TRANSPORTABILITY



Strategic and tactical deployment criteria established TCM's HMMWV weight and dimensional limits.

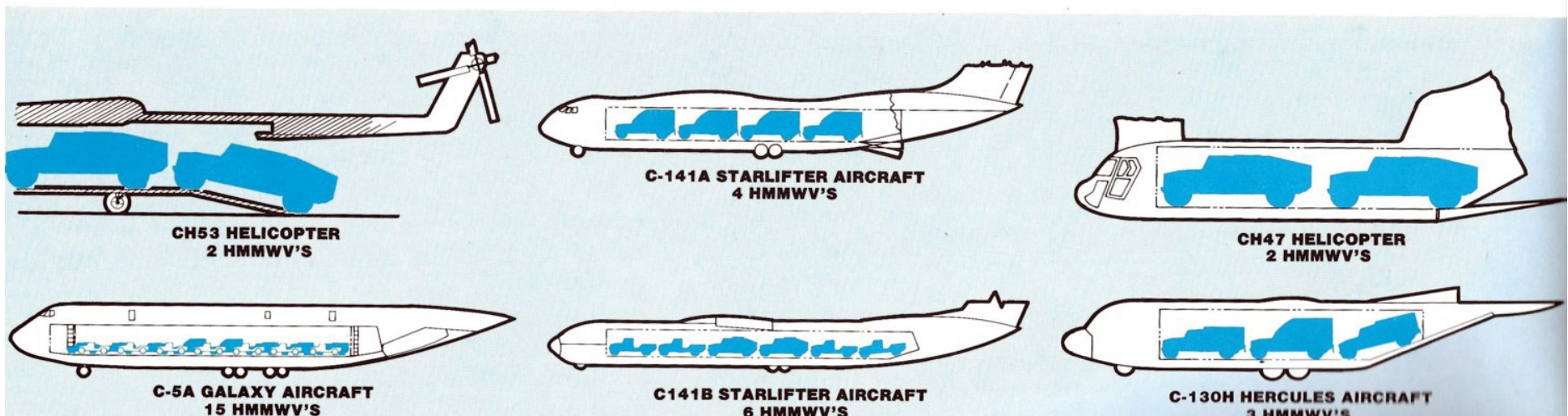
**CURB WEIGHT** has been kept to 5,000 pounds by utilizing modern, efficient power train components, high strength steel frame, and an aluminum body.

## DIMENSIONS

- The low height of only 69 inches easily fits within helicopter restraints.
- Body width was kept to 80 inches and the sides are tapered for faster and easier helicopter loading and unloading. The vehicle drives out ready for combat.
- The overall height reduces to under 50 inches to further enhance strategic deployment by double decking. This can be accomplished within 20 minutes by removing the roll bars, lowering the windshield, and removing the steering column brackets.
- The overall length was kept below 195 inches with winch to allow loading of two vehicles into CH-47 and CH-53 helicopters. The rear towing pintle features a swing-away storage position for a shorter vehicle length during transport.

## AIR DROP

- Air drop and low altitude parachute extraction system (LAPES) capabilities have been designed into all versions.





# HUMAN FACTORS & SAFETY

Human factors and safety engineering formed an integral part of TCM's HMMWV design. Comfort, vision, accessibility, ease of operation, and safety have been provided in the optimum combination.

## HUMAN FACTORS

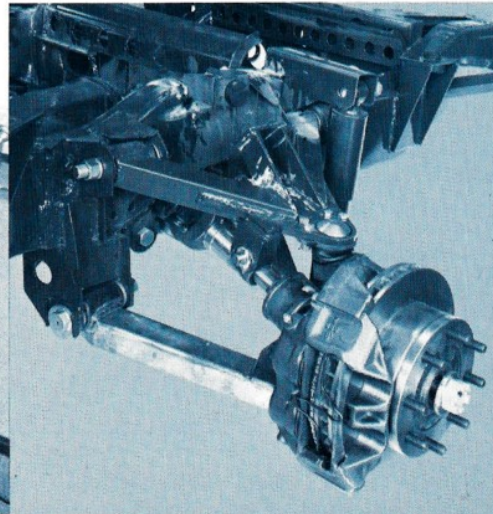
- All crew positions, instruments and controls were designed to comfortably accommodate 5th percentile female through 95th percentile male soldiers. The front seats are contoured for added comfort.
- Excellent frontal visibility has been achieved by designing a downward taper into the front part of the hood.
- Variable ratio power steering, 3-speed automatic transmission, power brakes, and low center of gravity make the vehicle easy to drive and handle.
- Four side doors provide for fast and easy crew ingress/egress.
- All crew members can easily move from one position to another. By positioning the engine forward of the firewall, the tunnel height has been kept low. Also noise and vibrations

into the crew area are minimized.

## SAFETY

- In addition to meeting Federal Motor Vehicle Safety Standards, other inherent safety features have been designed into the vehicle.
- The 24-inch vertical center of gravity eliminates the possibility of rollover in hard turns.
- Crew members are protected by a steel safety cage connected to the full width frame members.
- Crew members are seated inside the full width frame members for protection in the event of a side impact.
- The 4-wheel independent suspension with variable rate torsion bar system provides a smooth and stable ride cross-country or highways.
- Ventilated disc brakes located at each wheel provides safe stopping from 20 mph in less than 20 feet.

Together these unique human factors and safety features add up to unsurpassed combat effectiveness.





# PERFORMANCE & MOBILITY

Exceptional vehicle performance has been achieved by careful selection of the engine, power train components, and axle ratios. The key factor is the 6.9 liter diesel engine which produces 170 HP @ 3,300 RPM and peak torque of 310 lb. ft. The engine high torque output at low RPM's provides rapid acceleration capability demanded for battlefield survival. Fuel economy is excellent with the modern diesel engine.

Other performance capabilities are summarized in the chart. By selecting a high capacity diesel engine and power train components, excellent performance is maintained even up to a payload of 3,600 pounds.

PERFORMANCE	2,500 POUND PAYLOAD	3,600 POUND PAYLOAD
Top Speed	70.0 MPH	70.0 MPH
Speed on 5% Grade	63.0 MPH	59.0 MPH
Speed on 60% Grade (Low Range)	10.6 MPH	9.5 MPH
Acceleration (0-30 MPH)	5.9 Sec.	6.79 Sec.
Acceleration (0-50 MPH)	15.3 Sec.	17.67 Sec.
Gradeability	60% Fore & Aft / 40% Side	Same
Range	300+ Miles	300+ Miles

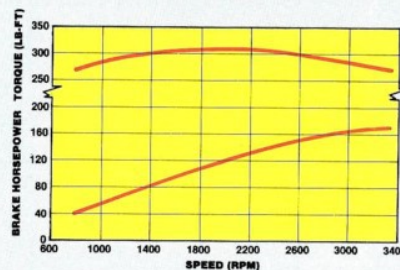
The low center of gravity and the 4-wheel independent suspension with variable rate torsion bar system complements the power train performance for superior mobility cross-country and highways.

The vehicle has a high ground clearance for crossing obstacles and can climb an 18-inch high vertical step.

The engine is positioned at the front which provides optimum weight distribution for soft soil mobility.

Maximum traction is maintained on all terrain surfaces through the use of a positive locking rear differential and a torque biasing front traction differential. The 4-wheel drive transfer case positively drives both the front and rear wheels. Wheel spin-out is eliminated.

The vehicle designed provides a new standard for military performance and mobility for years ahead.



Horsepower and torque performance for the IH 6.9 L engine based on SAE J270 standards.





# AMBULANCE

Three ambulance kits have been developed to provide front line support to combat units. All three versions may be installed at the Direct Support level onto the baseline configuration. The independent suspension provides a smooth and stable ride for patients and attendants.

- The maxi-ambulance features an easy to clean fiberglass interior, ballistic protection, gas spring assisted hinge-up rear compartment door, and fold-down rear steps. It has four litters. The upper litters can be lowered to carry ambulatory patients. It can be transported inside current military aircraft.
- The mini-ambulance features a 2-position top which when raised has the same crew and patient carrying capability as the maxi-ambulance. When the top is lowered, it can be transported inside CH-47 and CH-53 helicopters.
- The soft-top ambulance utilizes the same enclosure as the troop transport version which reduces logistical requirements. It can also transport up to 8 patients. It can be transported inside CH-47 and CH-53 helicopters.





# WEAPONS CARRIER



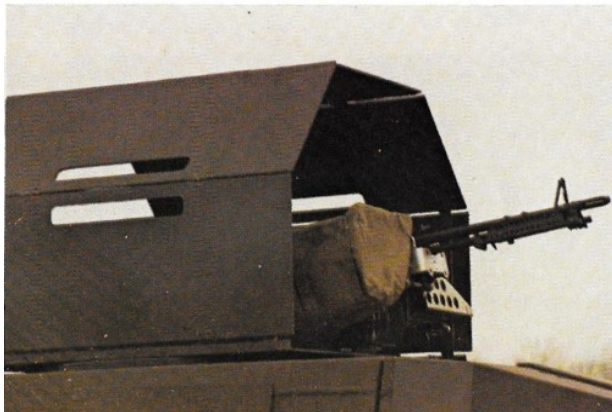
TCM's HMMWV weapons carrier version is a versatile fighting machine which carries a crew of four and a complete weapons system. A structural enclosure with lightweight ballistic panels protects the gunner, other crew members, and weapons. A pop up cupola provides added protection to the gunner. Design interfaces have been provided for TOW missile system, M60 7.62 mm machine gun, M2 50 caliber machine gun, and Mark 1 40 mm automatic grenade launcher.

## STABLE WEAPONS PLATFORM

The torsion bar suspension, low center of gravity, and structural enclosure eliminates vehicle movement when firing the TOW missile or the 50 caliber machine gun. This minimizes round dispersion for maximum combat effectiveness. Shoot on the move capability is provided by the unique suspension.

## 360° ARC OF FIRE

A ring mount provides capability to fire in any direction from the vehicle. A quick release latch which can be operated with one hand allows the ring to be rotated.





#### **GUNNER'S EFFECTIVENESS**

The ring has been positioned over the gunner's seat which is directly behind the driver. The gunner's seat bottom was designed to be flipped up so that for high angles of fire the gunner can stand on the floor. For lower angles of fire, the seat back was designed to fold down level with the cargo deck height to provide maximum target engagement for all conditions.

#### **FOUR SIDE CREW DOORS**

Provides for fast exit and entry required during combat. Time required to go from the stowed mode for the TOW to the ground launch mode is reduced.

#### **REAR CARGO DOORS**

Gas cylinder assisted clamshell rear doors are hinged along the side to protect the loader during reloading TOW missiles into the launcher.

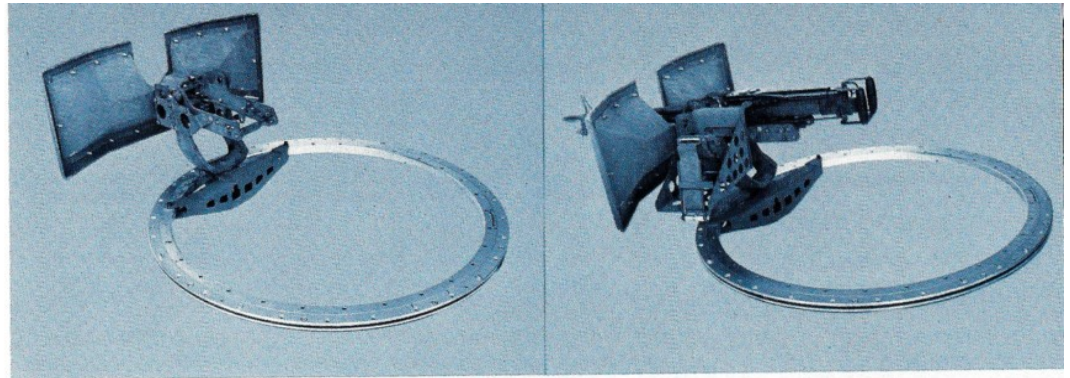
#### **UNIVERSAL WEAPONS MOUNT**

This mount was designed to fit onto the same ring as the TOW and accepts the 7.62 mm machine gun, 50 caliber machine gun, and 40 mm automatic grenade launcher. The mounting lugs have been positioned for best balance and absorbing recoil forces for each weapon.

#### **MISSILE STOWAGE RACKS**

Missiles storage is away from the crew at the rear. The missiles have been oriented across the vehicle to enhance crew safety.

The weapons carrier provides the military user an added dimension for combat effectiveness and mission versatility.





# PRODUCTION CAPABILITY



Teledyne's new facility near Seneca, South Carolina was designed specifically for maximum HMMWV production efficiency.

## LOCATION ADVANTAGES

- Abundant skilled labor supply
- Labor surplus area
- Excellent work ethic
- Excellent transportation — rail and highway
- Abundant utilities
- Excellent manufacturing support available
- Near Clemson University

## UNIQUE FACILITY FEATURES

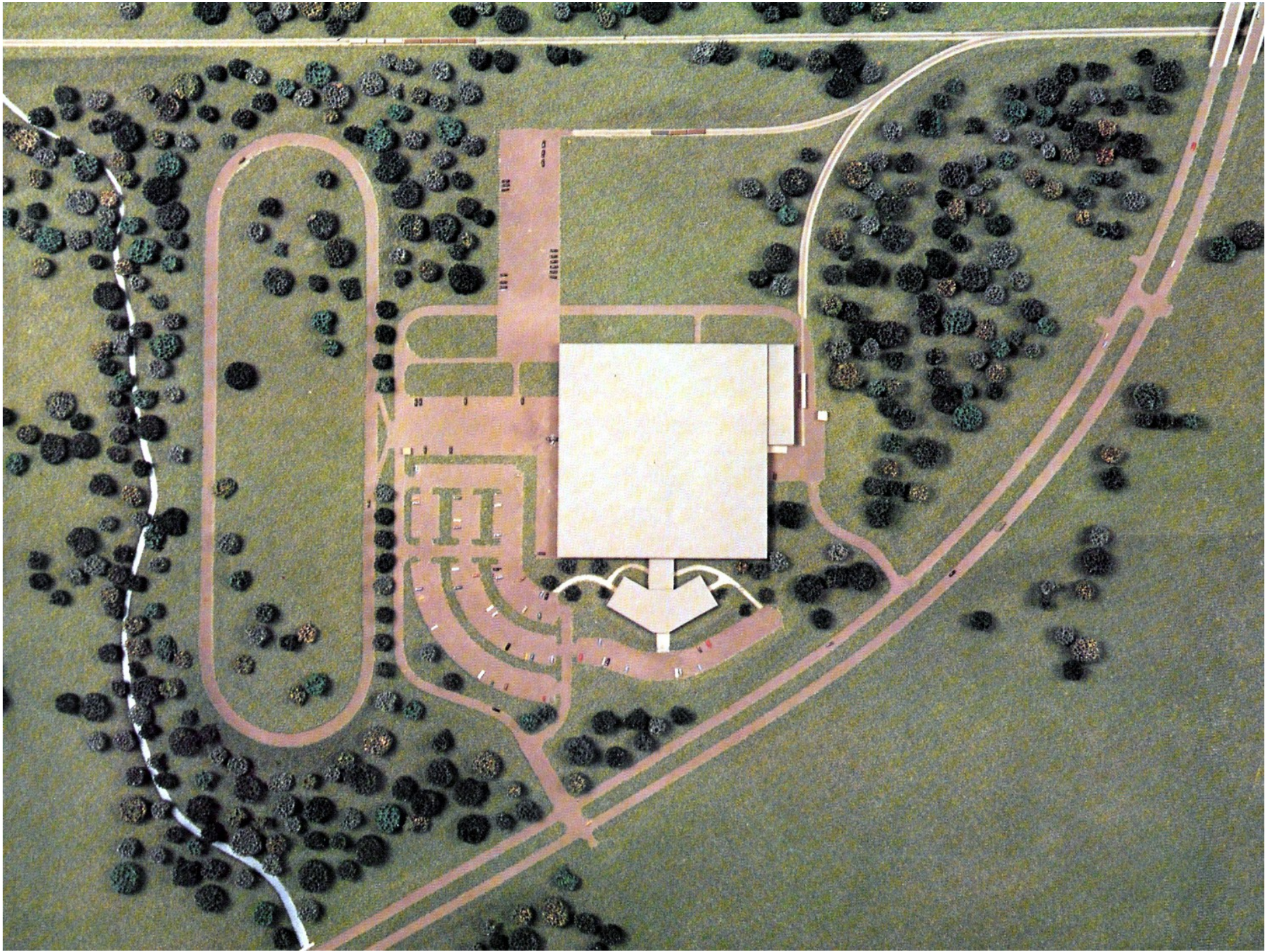
- Capacity of 50,000 vehicles per year.
- Air-conditioned brick and block manufacturing building designed for HMMWV assembly with planned expansion capability.
- All new modern equipment.
- Latest state-of-the-art assembly and delivery conveyor systems.
- Modern all new paint system designed for applying chemical-resistant coatings.
- Efficient materials flow.
- Modern material handling equipment.
- 88-acre site with planned expansion room.
- Vehicle test track, including cross-country.

An all new, modern facility designed and dedicated exclusively for low cost, high quality vehicle production with built-in high production capacity.

Teledyne provides unique advantages as a potential HMMWV supplier to the U.S. Military:

- All American manufactured components.
- Top management control within the U.S.A.
- American corporate ownership.







# SPECIFICATIONS

## DIMENSIONS

WHEELBASE .....	130.0 IN.
LENGTH (OVERALL) .....	191.67 IN.
LENGTH (CARGO BED) .....	92.0 IN.
WIDTH .....	82.3 IN.
HEIGHT .....	69.0 IN.
HEIGHT (REDUCEABLE) .....	50.0 IN.

## WEIGHTS

CURB WEIGHT .....	5,000 LBS.
PAYLOAD .....	2,500 LBS.
GROSS VEHICLE WEIGHT RATING .....	8,860 LBS.

## SPECIAL FEATURES

- Low center of gravity and silhouette
  - Stability and control
  - Survivability
  - Safety
  - Achieved with wide center frame and four-wheel independent suspension
- Variable rate four-wheel independent suspension
  - Soft ride under all load conditions
  - Protects onboard equipment
  - Allows full utilization of power train
- Meets desired (not minimum) performance
  - 170 horsepower engine
  - 6.0 second acceleration, 70 mph top speed
- Survivability
  - Skid plates and high ground clearance
  - Run flat tires
  - Heavy duty cooling system
  - Explosion proof fuel tank
  - Ballistic protection provided with armor and supplemental armor kits
- Kit compatibility
  - All kits adapt to the basic vehicle
  - Common chassis for all versions except for alternator and freon compressor
- Maintainability
- Easy access to power train and suspension components with easily removable front tilt hood







