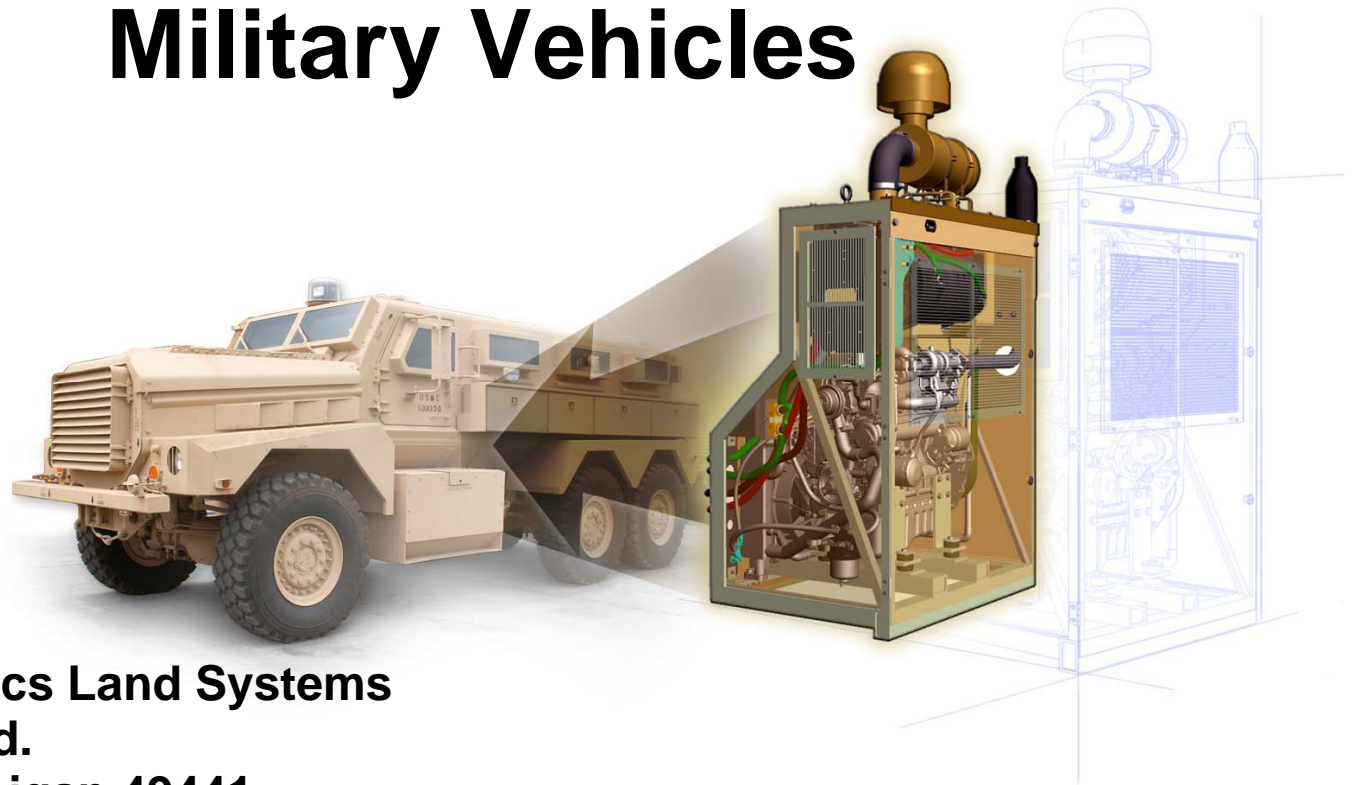


# Auxiliary Power Unit (APU) for Military Vehicles



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# APU Program Summary

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- **Developed under contract to Marine Corps Systems Command in 2007. Spin-off of On Board Vehicle Power (OBVP) program for 30 kW export power and 10 kW power on the move for HMMWV1123.**
  - OBVP system portability study to Mine Resistant Ambush Protected (MRAP) vehicles
  - Portability study change in scope from AC power to 28VDC power
  - OBVP MRAP solution evolved into the APU
- **APU Brass Board and Pre-Production hardware fabricated and tested in 2008**
  - Brass Board accumulated 144 hours run time
  - APU Pre-Production hardware government testing is ongoing

# APU Product Specification

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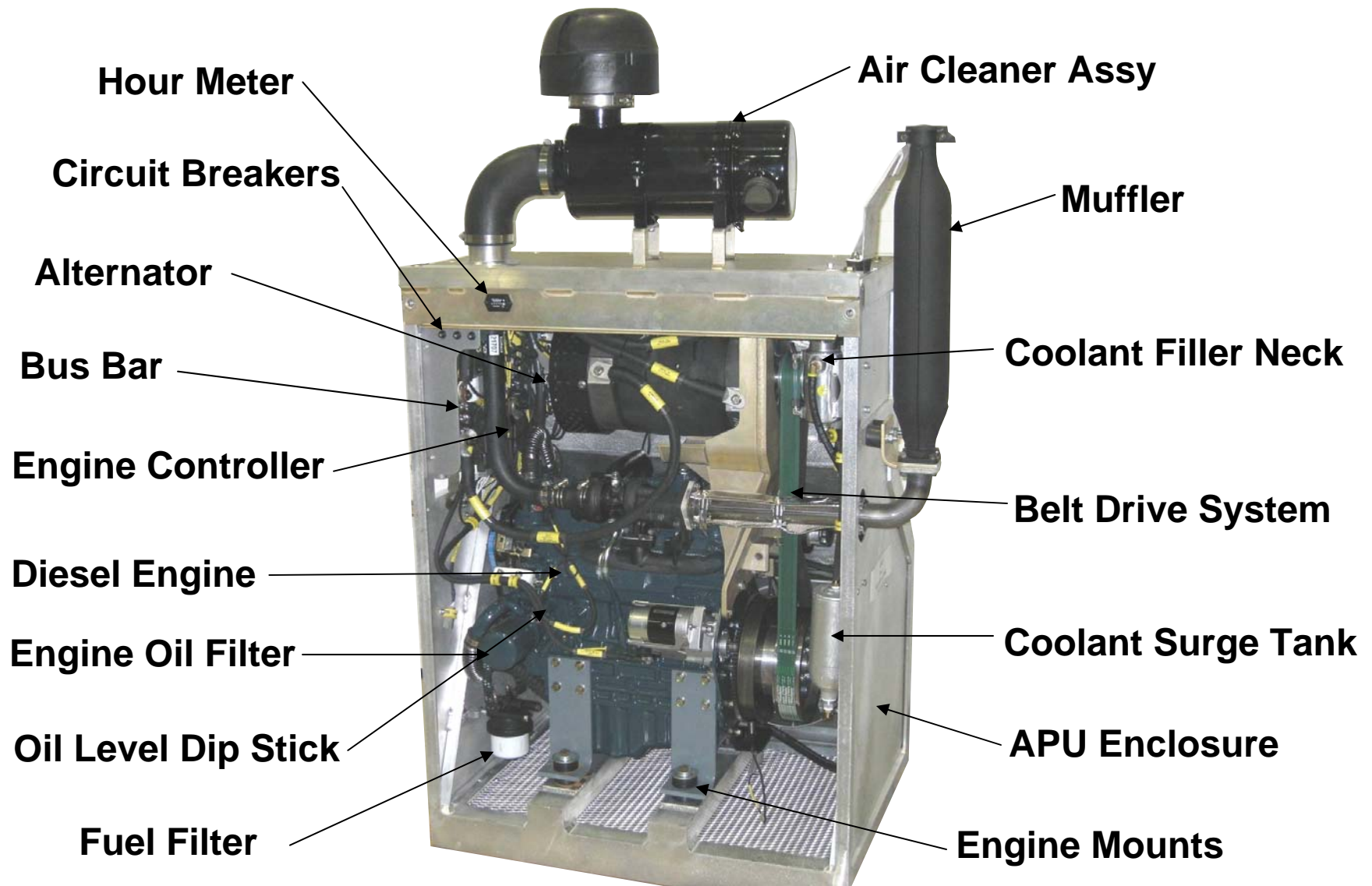
- **Rated power: 14.2kW at 0-12,000 ft, 508A, 28VDC**
- **Ambient Operating Temperatures: -25° to 131°F**
- **Weight: 650 lbs.**
- **Size: 38”(L) x 63” (H) x 25” (W)**
- **Fuel: DF-2, JP-8, Ultra Low Sulfur Diesel (ULSD)**
- **Coolant: Water-Ethylene Glycol (WEG) or Water-Propylene Glycol (WPG)**
- **Sand and Dust: Complies with MIL-STD-810F**
- **Emissions: Complies with EPA Interim Tier 4**
- **Fuel Consumption: 1.2 gal/hr at 10kW, 1.7 gal/hr at 14kW**

# System Description

- Diesel powered generator system with Commercial Off The Shelf (COTS) components
- Stand alone system independent of the vehicle except for fuel supply and batteries for starting
- Provides 508A, 28VDC directly to vehicles power distribution system to augment vehicle power
- Operates as load following for best fuel consumption rate and reduce wet stacking
- Manufactured by General Dynamics Robotics Systems
- Export power capability through vehicles NATO slave



# APU



# APU Engine

- **Kubota V1505-T, turbocharged, 44.2 HP diesel engine**
- **COTS hardware, in production since 1991**
- **Weight: 251 lbs**
- **Size: 24"9(L) x 24.5"(H) x 17"(W)**



# APU Generator

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- **C.E. Niehoff 570A, 28VDC Alternator**
- **COTS hardware**
- **Weight: 115 lbs.**
- **Air cooled with self contained cooling fan**
- **Rated for ambient air temp - 65° to 200°F**
- **1500 – 8000 RPM**
- **Belt driven**





# APU Cooling System

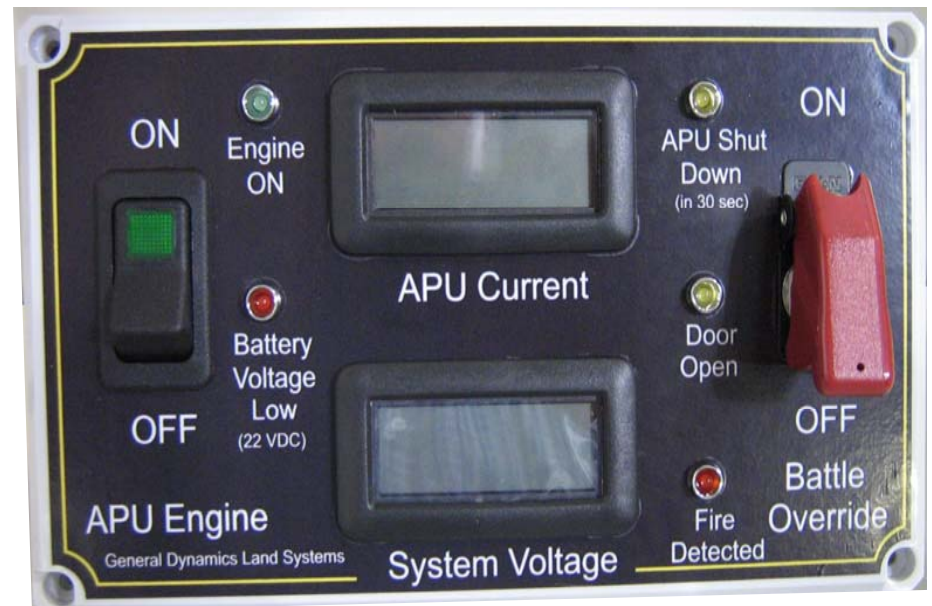
- Closed loop cooling system
- Variable speed COTS fans, reverse direction at periodic intervals to clean radiator core
- Custom sized
- Weight: 30 lbs.
- Size: 26"(L) x 15.5"(H) x 4.2"(W)





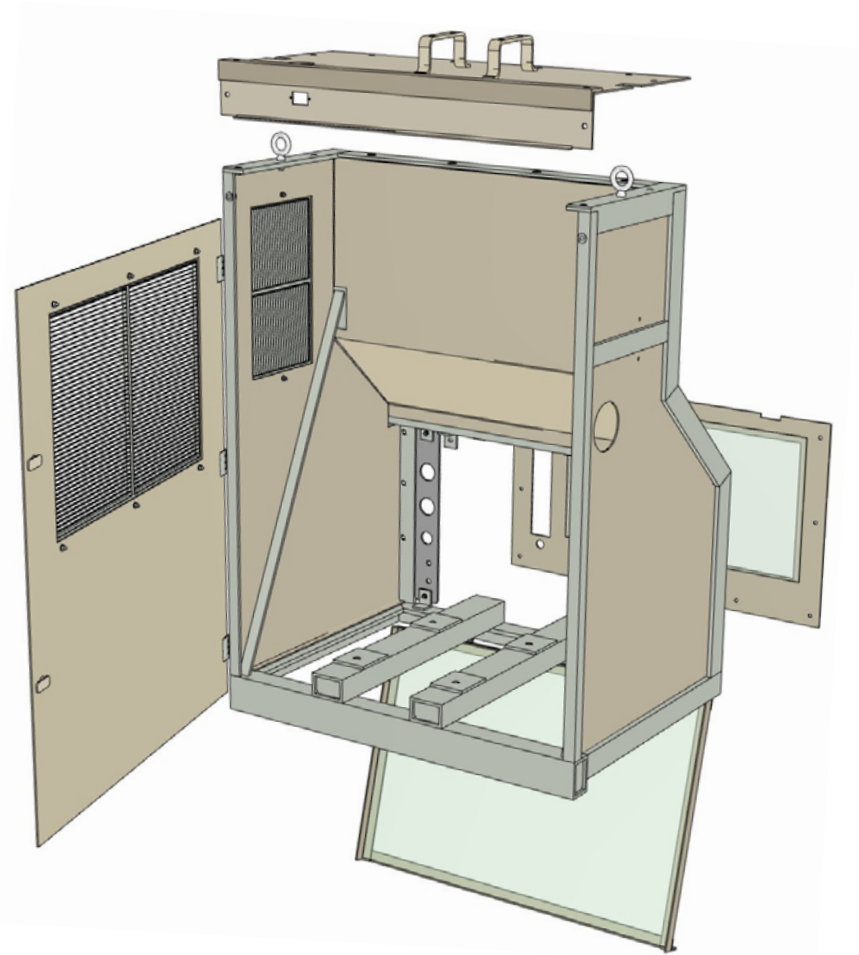
# APU Controls

- Remotely located inside vehicle
- On/Off switch, normal operating and warning lights, voltage and amperage indicators
- Battle Override to disable automatic shut down due to high coolant temp or low oil pressure



# APU Enclosure

- **Lightweight aluminum structure or optional armored enclosure**
- **Large door on front, removable top, bottom and back panels for easy access for maintenance**
- **Door locks for security**



# APU Operation

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- **Operated from inside vehicle with remote MMI panel**
- **Once started, operation is automatic**
- **Load following and slaved to vehicle voltage regulator. Automatically controls APU engine RPM to match alternators output to that of the demand from the vehicle. Load following helps reduce wet stacking and improves fuel economy**
- **Automatic precautionary engine shutdown 30 seconds after a high coolant temp or low oil pressure is detected**
- **Battle override to disable automatic precautionary shutdown**

# APU Maintenance

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- **Maintenance checks, fluid level checks and fill points are accessible at front of APU**
- **Clear access to system for maintenance and systems inspection/checks from large front door and access panels**
- **All major components can be removed and replaced while the APU is on the vehicle without needing to remove other major components first**
- **Reliability prediction of 1213 hours Mean Time Between Failures (MTBF) generated from Nonelectric Parts Reliability Data (NPRD)**

# Summary

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- **Production ready APU with COTS major components**
- **Independent of vehicle engine, APU failure or destruction will not affect vehicle mobility or performance**
- **Can be Reconfigured for other military vehicles without changing COTS hardware**