

NAVSEA Green Command Van

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On August 29, 2005, the devastation caused by Hurricane Katrina completely altered the perceived capabilities that were thought necessary to respond to a national level disaster. As a part of the National Response, NAVSEA's Supervisor of Salvage and Diving (SUPSALV) provided marine salvage services to the Gulf coast in Louisiana, Mississippi, and Alabama. SUPSALV's Command Van was installed in power-deprived Empire, Louisiana to support field personnel coordinating the salvage operations. The van's crew quickly learned that the small diesel generator supplying power to the van required nearly a full tank of diesel fuel for every 12 to 16 hour day of operations. Because southern Louisiana's infrastructure was severely damaged by Hurricane Katrina, obtaining fuel for the generator became a logistical challenge, forcing the crew to reallocate personnel needed for its mission so that they could locate and supply the essential diesel fuel. In this case, the resupply task involved a 120 miles daily round trip through the severely damaged southern Louisiana. At the conclusion of this operation, it was apparent that a self-sustaining Command Van would be better able to support its crew in an off grid environment.



Figure 1. The complete exterior setup: Command Van with wind turbines, satellite, antennas and solar panels.

The command van is a part of the Emergency Ship Salvage Material (ESSM) system maintained at the ESSM Headquarters facility in Cheatham Annex, Williamsburg, VA. The ESSM HQ team was assigned the task to design and build a new Command Van that would provide the same services using much less energy and have advanced solar and wind energy generation capability. After two years of research, the team successfully developed a van that incorporated the latest technology for power generation and storage while also utilizing the most efficient products available in the commercial market to lower the overall power consumption.

Equipping the Van

To fully support field operations, there could be no compromises in the van's communications suite. This equipment includes wide band VHF, satellite phone, dual-band cellular repeater, digital HD

televisions with the ability to interface with computers and a Network Interface Device (NID). The NID gives the van the ability to receive telephone service from whichever relevant carrier is operating in the disaster area (i.e. AT&T, Verizon, etc). One way the designers were able reduce power consumption was by utilizing LEDs for all lighting and monitors. Depending on field requirements, additional equipment can be supported (i.e. fax machine, printers, computers, etc) with the caveat that the more equipment added to the van, the more power it will consume.



Figure 2. Work stations, media components including HD satellite TV, DVD recorder with digital tuner, CB and VHF radios.

Power Systems

The biggest design change in the Command Van was its ability to generate and store power. While the van can be powered by traditional methods, ie. diesel generator or auxiliary power connection (shore power), integrated green energy generators were added to reduce dependency on the surrounding infrastructure. They include a photovoltaic solar panel array that pivots to actively track and collect the sun's energy and two 1KW wind generators. In addition to the new power generating components, 16 lithium iron magnesium phosphate battery modules along with an advanced battery monitoring and electrical distribution system allow energy storage during high winds or direct sunlight for use during low energy collection periods. These batteries are stored beneath the seats inside the van to reduce impact on interior space available. The lithium ion batteries were chosen because of their almost unlimited use/charge capability, rapid recharge characteristics, as well as their ability to maintain a 12 V power output until the end of their duty cycle which reduces the likelihood of damaging equipment when operating on battery power.



Figure 3. View looking toward the Van entrance showing additional work areas, microwave oven, power converter meter (on right wall), storage areas, and seats that store the Li ion batteries. The advanced battery monitoring and electrical distribution system is housed in the locker to the right of the van's entrance.

One of the last considerations for the design team was for habitability. During a mission, the crew would need the capability to store at least 72 hours of food and maintain habitable room temperature in the van regardless of where the van is deployed. With that in mind a 26 SEER AC/heat pump and a high efficiency refrigerator were installed. The vans walls were insulated with high R value insulation and double pane marine windows were added. When tested against the old Command Van design, the new van's improved insulation system significantly reduced the amount of energy it consumed in maintaining its interior temperature. Additionally, each electrical component was evaluated to ensure it did not generate large amounts of heat. Every piece of equipment was considered carefully before it was installed in the van which ultimately has limited storage and resources onboard.

Overall, some of the bigger differences in characteristics when comparing van designs can be seen in the below table. The original Command Van consumed power at approximately 4-5 kW per hour while the new Command Van consumes power at 0.75-1.5 kW per hour. The advantages of switching designs will become very evident when the van is used in the field; lower fuel costs and the convenience in not having to regularly refuel. The Green Command Van will not only provide the Nation with support during times of crisis, it is the first step in a process to make the Navy crews more self sufficient while performing their critical tasks.

Green Command Van Specifications:

Van	Insulation	Power Use (A/C)	Battery	Fuel Capacity
Old	Fiberglass (limited)	19-24 amps	None	10 gal per day
New	High R value	3.6-7.2 amps	16 Lithium 12 V	12-16 gal for 15-20 days

Dimensions:

8 ft, 8 in (tall) X 8 ft (wide) X 20 ft (long) - (shipping dimensions)

Power Generation

Solar: 1,840 W/hr

Wind: 2,000 W/hr

Energy Storage Capacity:

2,208 Amp-hrs at 24 V DC

Operating Times:

Battery Only Mode: 2.5 days at average load for 10 hrs/day

Solar/Wind Generation: 5-7 days at average load for 10 hrs/day

Solar/Wind Generation (energy conservation mode): unlimited days for 10 hrs/day

Command Van Equipment:

Communications Equipment: VHF, satellite, wireless internet hub, network interface device, computer work stations and an HD monitor (36 in)

Habitability: combination A/C and heat pump, small high efficient refrigerator, first aid kit, eye wash station, small CO₂, coffee pot, and microwave