

MPH

MOBILE PARTS HOSPITAL

Long lead times and high costs of procuring and inventorying replacement parts have reduced equipment readiness rates, resulting in soaring Operations and Support costs for the Army. This happens despite the fact that the DoD maintains repair part inventories at a cost of over \$60 billion annually. The Army's Mobile Parts Hospital (MPH), a project initiated by the U.S. Army TACOM's National Automotive Center (NAC), exists to offset this imbalance by producing spare parts near the point of need and reducing the time invested in the part procurement process. Instead of our soldiers having to wait weeks or even months for the part they need, the MPH can get the part to them in a matter of days or even hours.

HOW MPH WORKS...

MPH is a self-contained, self-sustaining mobile mini-manufacturing center that can:

- Send and receive digital manufacturing-ready data
- Create manufacturing-ready data
- Reverse engineer individual repair parts with scanning devices and simulation hardware
- Produce the part and electronically qualify and verify it before the part is released for use

MPH TODAY...

Current efforts demand that the following be demonstrated on a mobile platform:

- On-demand manufacturing of small individual parts
- Remote site extraction, control, and insertion of part data to allow for on-site manufacturing
- Creation of a parts database to provide the technical information for the field manufacture of parts

THE FUTURE OF MPH...

Phase II of the project will result in:

- On-demand manufacturing of larger parts while increasing the number of parts in the database
- Refining technology to create 3-D part data when no engineering data is provided
- Insertion of maturing manufacturing technology
- Demonstration of a more advanced mobile platform

NAC PARTNERS AND THEIR ROLE IN MPH: TACOM (Warren, MI)

Is the federal government's program manager for this project. TACOM's role is to advance and apply enabling technologies in the areas of simulation and modeling and repair part imaging.

Illinois Institute of Technology Research Institute (IITRI) (Warren, MI)

Provides program and system integration, part selection, new fabrication technologies, and part validation.

Focus: HOPE (Detroit, MI)

Supplies the command and control center for MPH and develops the reverse engineering and rapid machining methods for the project.

CAMP (Cleveland, OH)

Assists IITRI and Focus: HOPE with advanced engineering support.

NATIONAL AUTOMOTIVE CENTER

MPH

MOBILE PARTS HOSPITAL

The NAC is currently working on many projects that are part of the Army's 21st Century Truck Initiative aimed at integrating commercially viable advanced technologies into commercial and military vehicles to enhance safety, performance, and fuel efficiency while reducing operating costs and emissions.

MPH combines the latest manufacturing infrastructure and technologies in a mobile unit that can readily travel to any destination. Both standard and unique replacement parts can be manufactured from technical data and computer numeric control code. If needed, parts can be reverse engineered with laser point scanning technologies.

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ARMY PARTNERSHIPS IN MOTION



NAC

MOBILE PARTS HOSPITAL

The Mobile Parts Hospital (MPH) is the automotive equivalent of the Mobile Army Surgical Hospital used to stabilize soldiers before sending them out of theater for more complex care. MPH's goal is to provide the same kind of initial treatment to a vehicle so its crew is protected and can finish the mission before going back to the normal maintenance line for repair.



The second manufacturing component aboard MPH is the laser sintering machine. Instead of removing material, this unit creates solid objects from powdered materials by adding layer upon layer of material.

As the process begins, a roller mechanism automatically spreads a thin layer of powdered material across the build area. Using CAD data, a laser selectively draws a cross-section of the object on the layer of powder. As the laser draws the cross section, it selectively heats and fuses, or "sinters" the powder, creating a solid mass. The system repeats these steps, forming layer upon layer, until the object/part is complete. The technology uses metal, ceramics, plastics, and rubber-like materials to create the needed replacement part.

Coryne Forest, program manager, welcomes visitors to the MPH. In mini-tours conducted around the country, visitors learn how the Army is making workable replacement parts out of plastic, ceramic, metal, and rubber-like materials. "We can make replacement parts in hours instead of days and weeks. If we don't have the part data on hand, we can reverse engineer the part in a reasonable amount of time," says Forest.



The third workstation is the laser scanner. MPH is a mobile design, simulation, and mini-manufacturing center capable of sending and receiving digital manufacturing-ready data over the Internet or private Wide Area Networks (WAN), using landlines or satellite. When digital data is unavailable, the MPH is capable of creating manufacturing-ready data on demand. It is also equipped with reverse engineering and simulation hardware and software to reverse engineer individual parts. The part data is used to create CNC code that runs the milling machine or an .stl file that is used by the sinter station to produce the part.

The MPH has three workstations: a traditional CNC milling machine center, a selective laser sinter station, and a laser scanner. It also has computer and communications equipment including a satellite link.

The milling machine has been slightly modified to act as a lathe, so turning operations are possible. The machining center removes material from solid stock using a variety of cutting tools. The tools are computer controlled so results are consistent and precise, an important aspect if the replacement part is to work properly.



An MPH team member demonstrates a newly created part. This particular part, a serpentine pulley, can be produced by the MPH in less than two hours. It allows the non-functional HMMWV to return to service much faster than by using the conventional supply chain.