



## Mobile Labs in the Field



**Large mobile research labs can be interconnected, with each of the trailer modules providing specialized testing, diagnostic, or operational capabilities. Photo: Facilities Solutions Group. [Click here to enlarge.](#)**

All types and sizes of labs can now go to the samples, rather than the other way around, to improve response times, flexibility, costs, and health safety concerns.

While they're often not very visible, mobile research laboratories have become an invaluable resource for government, industry, medical, military, and homeland security applications. These labs-on-wheels come in all sizes and configurations. Some are offered as a service, some are off-the-shelf versions, while others are heavily customized, decked out with everything from custom fume hoods to BSL-3 suites.

The common thread among all of these variations is that they're mobile, they can move at a moment's notice; they're air-transportable; they have controlled environments; and they can even come with qualified staffs. Many state and federal government agencies now include mobile labs as a standard part of their equipment requirements. State government agencies, for their part, use them on a regular basis for environmental monitoring and management applications, and for onsite analyses during a natural disaster or terrorist attack. The Environmental Protection Agency (EPA), Drug Enforcement Administration (DEA), U.S. Customs and Border Protection (CBP), Federal Bureau of Investigation (FBI), U.S. Geological Survey (USGS), Dept. of Homeland Security (DHS), Dept. of Energy (DOE), and all branches of the military are actively involved in the development and use of advanced mobile laboratories.



**One of the first trailer modules is shown in Saudi Arabia with pop-out side panels extended, more than doubling the interior floor space of the mobile lab. Photo: Facilities Solutions Group, Gulf Care Intl. [Click here to enlarge.](#)**

### The basic systems

Mobile labs can generate their own electrical and HVAC requirements—even for small fume hood systems. They also can access stored electrical power when available for greater efficiencies. Refrigerators and freezers are available for standards and sample storage. Moreover, some units can be operated under negative pressure to avoid the potential for cross contamination between separate analysis areas within the mobile lab. For van- or truck-based configurations, the lab and driver can have individually controlled ventilation systems, depending upon the specific application.

Most of the materials used in these labs are stainless steel, with standard laboratory cabinetry and benches (although most are limited in their depth). Eye-wash and shower systems are available as needed, along with sinks and waste containment systems. Gas cylinder storage is also available, along with front and rear stabilizing jacks for quasi-stationary mobile labs.

A large number of mobile labs are used for environmental applications, and as such, most of their instrumentation is based upon those types of materials analysis protocols. These, then, contain various combinations of sample prep, analytical instrumentation (i.e., GC, GCMS, HPLC, XRF, ICP, GFAA, mercury analyzers), climate control systems, and specialized equipment for EPA methodologies, including wet chemistry. They also can have customized computer systems, LIMS systems, and the ability for electronic data transfers.

Stainless steel glove boxes, biosafety cabinets, and BSL-2/3 systems with pass-through sample systems can also be custom installed. Samples can be received directly into a high-containment glovebox from outside the mobile lab and never be removed from containment. Transfers to instrumentation can be made through primary containment techniques, and autoclaves can also be installed to create a safe path for the samples or waste to leave the containment line.

A variation on the mobile lab are the modular labs that can be transported and drop-shipped at research locations and integrated into an existing lab facility for enhanced or temporary capabilities. These suppliers, like TechSpace, Inc., Monona, Iowa, provide all the same capabilities as mobile lab suppliers, except on a slightly larger scale. Their support systems (electrical, plumbing, and HVAC) are often integrated into those of the existing facility or with stand-alone systems.



**Sample preparation capabilities in BSL-3 type secure mobile lab can be certified for use in testing bio-hazards in the field. Photo: E-N-G. [Click here to enlarge.](#)**

#### Lease or buy

The decision about whether to use a mobile lab service or purchase/custom-build your own mobile laboratory is generally easier than other lease-or-buy decisions. These decisions are mostly based on the anticipated usage-how often do you expect to use a mobile lab and how fast do you want one available?

If you expect to use a mobile lab on an on-going basis, such as for monitoring a hazardous waste site, the cost analyses of lease vs. buy are simple to calculate. You generally can get competitive bids from local service suppliers and take the time to pick out the system that meets all of your analytical requirements. If you expect to use a mobile lab only occasionally, but when you need it you want it right away, then your only choice is to purchase or build your own custom system. It should be noted, however, that although mobile lab services are available, they're not like just renting a car-their availability may be limited when you most want it, especially in disaster situations.

In the end, whether you decide to either construct your own or buy from a mobile lab supplier, there are several configurations and suppliers to choose from. These systems can be based on modules attached to truck frames, fifth-wheel trailers, standard or raised-roof vans, or trailer-truck containers. Many mobile lab suppliers have extensive experience in mobile chemical and biological applications and have supplied systems to industrial companies, utilities, and state, federal, and military agencies. While basic configurations are available from these suppliers, once the size and type are determined the specific

equipment that's needed can be selected and installed. Some mobile lab suppliers, like E-N-G Mobile Systems, Concord, Calif., have long-standing relationships and experience with analytical instrument suppliers, like Agilent Technologies. The experience provided by these suppliers of turnkey systems minimizes the potential issues that may arise from operating a mobile lab.

#### The next step

Almost all existing mobile lab applications, even the drop-ship containerized systems, are still primarily single-use and single-unit systems. There are needs being evaluated that expand those mobile applications into multi-unit integrated mobile systems with specialized laboratories. The integrated systems being evaluated have all the mobility and speed of installation as the individual systems, but with the diversity and specialization of stationary labs.

Case in point, the Kingdom of Saudi Arabia (KSA) recently identified a need to upgrade its advanced healthcare treatment facilities and services throughout the country, and in particular, its rural areas. Because of the large number of population centers spread out over wide regions of the KSA, Gulf Care International, Chicago, a strategic business development company specializing in advanced healthcare projects was contracted by the KSA to design and manufacture an advanced healthcare technology, services, laboratory, and treatment solution on a mobile platform that could be shared by regions, rather than each region building expensive fixed structures.



**Larger, general purpose mobile lab can be used for chemical, biological, nuclear, radiological, and explosives testing in the field. Labs are available with all**

The mobile platforms for this application were designed to include laboratory/pharmacy capabilities, imaging, surgical suites, ICU, ER, or any specialty that you might find at an advanced hospital. The specific modules could then be easily connected into an integrated system that could function as a complete turnkey mobile advanced hospital and research laboratory available to deliver a wide range of services in any location or emergency.

#### Design considerations

The KSA application had several size constraints and internal storage requirements. Some of these were solved with expandable sides on a semi-trailer truck compartment:

- Limited permanent storage footprint meant that 1,000 ft<sup>2</sup> of an expanded lab

**necessary systems including BSL-3. Photo: E-N-G. [Click here to enlarge.](#)**

had to fit within 430 ft2 of compressed space-the floor is an accordion that expands on location.

- Collapsed vs. expanded configuration dictated that anything along the wall of

the lab could not extend beyond 16.25 in.

- The footprint of all benchtop equipment needed to be less than 16 in deep on fixed casework.
- Extensive supplies lists were developed for all equipment and functions, down to the smallest detail.
- Everything had to be stored properly within the strict storage limitations of the system.
- Significant attention was paid to items such as electrical hookups and equipment footprints.
- Building a lab of this sophistication was not possible just 10 years ago-the dramatic reduction in device size and a corresponding increase in equipment capabilities have now made this possible.

### Design check list

Whether you're looking to customize a mobile lab or contract out for a mobile lab service, there are a number of questions that you should ask yourself before making a decision on which route to take. This design methodology for the laboratory should include:

- Determine what laboratory tests need to be performed.
- Estimate the required capacities and throughput.
- Develop an initial equipment list to meet the test specs.
- Match equipment capabilities to the required tests.
- Compare the size required to the size you're getting.
- Determine the utility needs for each piece of equipment.
- Develop a short list candidate and see if it's available.
- Determine if the warranty is serviceable in the projected operating site.
- Are spare parts quickly available?
- Determine the equipment training requirements and who will do the training.
- Determine if overall weight will be a problem.

### Mobile laboratories:

(\*- manufacturers, \*\*- service organization)

- \*\* Battelle, Columbus, Ohio, [www.battelle.org](http://www.battelle.org)
- \* Canberra, Meriden, Conn., [www.canberra.com](http://www.canberra.com)
- \*\* Centrum Analytical Laboratories, Riverside, Calif., [www.centrum-labs.com/mobile/mobile1.htm](http://www.centrum-labs.com/mobile/mobile1.htm)
- \*\* Del Mar Analytical, Irvine, Calif., [www.dmalabs.com/service-mobile.aspx](http://www.dmalabs.com/service-mobile.aspx)
- \* EAI Corp., Abingdon, Md., [www.eaicorp.com](http://www.eaicorp.com)
- \* E-N-G Mobile Systems, Concord, Calif., [www.e-n-g.com](http://www.e-n-g.com)
- \*\* Enviro-Test Laboratories, Edmonton, Alberta, [www.envirotest.com/services/mobile.htm](http://www.envirotest.com/services/mobile.htm)
- \* GERMFREE, Ormond Beach, Fla., [www.germfree.com/mobile.htm](http://www.germfree.com/mobile.htm)
- \* Gulfcare International/Mobile Medical, St. Johnsbury, Vt., [www.mobile-medical.com](http://www.mobile-medical.com)
- \*\* Integrated Environmental Services, Atlanta, Ga., [www.iescylinders.com/MobileLab.html](http://www.iescylinders.com/MobileLab.html)
- \* L3 Communications/Wolf Coach, Auburn, Mass., [www.wolfcoach.com/military\\_pages/mobile\\_lab.html](http://www.wolfcoach.com/military_pages/mobile_lab.html)
- \* MedCath Corp., Charlotte, N.C., [www.medcath.com](http://www.medcath.com)

- \* Medical Coaches, Oneonta, N.Y.,  
[www.medcoach.com](http://www.medcoach.com)
- \*\* Mobile Analytical Laboratories, Odessa, Texas,  
[www.mobilelabs.com](http://www.mobilelabs.com)
- \*\* New Age/Landmark, Benton Harbor, Mich.,  
[www.newagelandmark.com](http://www.newagelandmark.com)
- \*\* On-Site Technologies, Westfield, Mass.,  
[www.stl-inc.com/labs/onsite/ost\\_index.htm](http://www.stl-inc.com/labs/onsite/ost_index.htm)
- \* Sentinel Mobile Laboratories, Plainville, Conn.,  
[www.mobilelab.com](http://www.mobilelab.com)
- \*\* Southwest Research Institute, San Antonio, Texas,  
[www.swri.edu](http://www.swri.edu)
- \* TechSpace Inc., Monona, Iowa,  
[www.techspaceinc.com](http://www.techspaceinc.com)
- \*\* TEG, Rancho Cordova, Calif.,  
[www.tegenv.com/lab.htm](http://www.tegenv.com/lab.htm)

**-Tim Studt**

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