

# ME Grad Student Devoted to Making Life Better

Erick Froede has worked on innovations improving life for people in South Africa, Morocco, and Haiti

## South Africa



Erick Froede

For those of us with convenient access to hospitals or care clinics, it can be easy enough to take for granted our ability to seek medical care. Though it can be expensive, most of us have a medical treatment facility close enough nearby and access to relatively reliable transportation—public or otherwise—to get there.

This convenience is not available to much of the population in the Western Cape Province of South Africa.

Rural farmers there have no access to transportation, and clinics are few and far between. The South African government provides mobile clinics (MCs) fashioned out of trucks or vans, and those units are staffed with nurses who drive the MCs across the countryside providing health care to rural farm workers who have no other care access.

“While there are permanent clinics throughout the Western Cape, a significant percentage of the population lives in areas which are unreasonably far from these locations. Agricultural workers, who are largely tenants at their farm, do not typically have their own vehicle or the ability to take time off,” explains **Erick Froede**, a second year master’s student in mechanical engineering.

While this is a helpful solution in theory, it doesn’t always work the way it is intended. The current MCs in service have limited and outdated technology, and their lack of features make it difficult for the nurses to do their jobs efficiently.

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require regular treatment, such as high blood pressure and AIDS, cannot be addressed. Also, acute illnesses run the risk of becoming more serious and even life-threatening if ignored,” says Froede.

The Medical Research Council (MRC) of the Western Cape



“Before”: This is a photo of the inside of one of the mobile clinics in use before Froede and his team set about redesigning the vehicle.

Province of South Africa has launched an initiative with Global Engineering Teams (GET) and the University of Stellenbosch to improve the mobile clinics themselves, thereby improving the quality of care provided to rural farm workers and also the work environment of the traveling nurse practitioners.

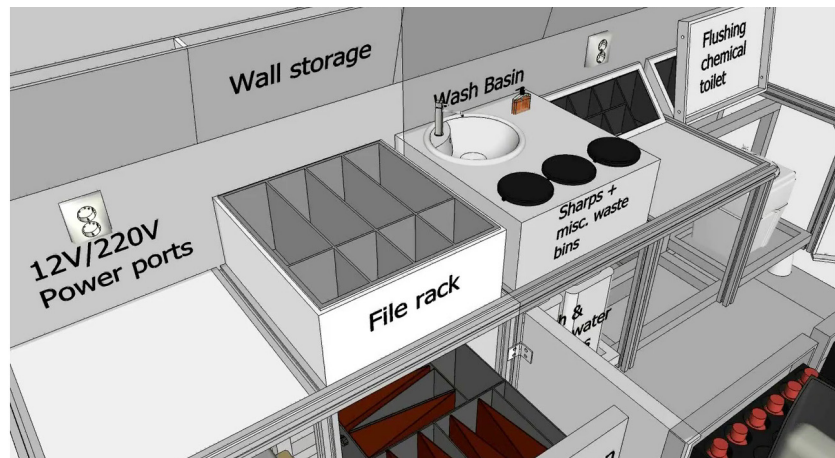
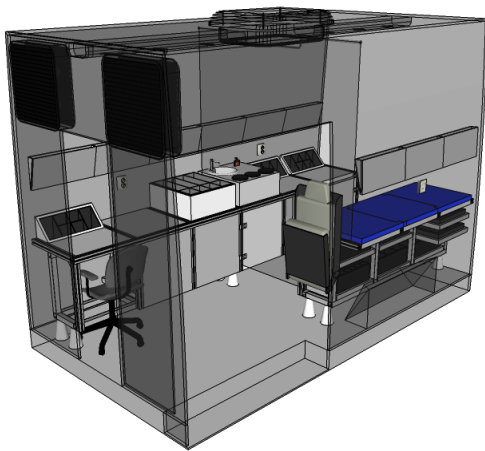
“The ability to produce something that makes a tangible difference is one of the greatest aspects of engineering,” says Froede.

Froede is leading the Team MRC effort through GET to design new specifications for the modern mobile clinic—a project which took him to Cape Town, South Africa, last April to learn about the clinics and the needs of the nurses and patients in the Western Cape Province.

GET is an educational network of universities dedicated to projects that bring graduate-level engineers together from across international boundaries. Penn State is currently the only U.S. partner in a network that includes the Technische Universitaet Berlin, the Universidad de Chile, the University of Botswana, and the University of Stellenbosch.

“The purpose of Global Engineering Teams is to bring together students from around the world to solve real-life, sponsor-driven projects,” says Froede, who also holds a baccalaureate degree from Penn State. “The program, involving virtual teaming and cross-cultural communication, closely models the challenges of an increasingly globalized world.”

Froede and his teammates—**Bryan Lewis**, a second year Ph.D. student in mechanical engineering at Penn State, and two first year ME graduate students from the University of Stellenbosch, **Hendrik Bosman** and **Barend deVilliers**—have developed a final prototype design for a vastly improved mobile clinic that will improve the efficiency of the MC nurses and, ultimately, the health of the agricultural workers in the Western Cape.



"After": Above left is a three-dimensional model of the entire redesigned interior of the mobile medical clinic. At right is a closeup of one side of the workstation, designed in a modular fashion to make the best use of all the space available.

"There is a wide variety of problems inherent in the current mobile clinic design [in use]. These include extreme temperatures during the summer and winter, lack of storage space for patient files and medication, unreliable vehicles that break down and permit dust to enter the cabin, and more," describes Froede. "Through interviews and surveys conducted directly with field nurses, combined with feedback from government and academic advisors, our team has created a design that will overcome the large majority of these barriers and result in a next generation solution."

Rotary International has generously provided funds to create the prototype vehicle that Froede and his team have designed. In mid-September, the team traveled to Berlin, Germany, with a detailed overview of the project and a final prototype design and presented their final product.

The team selected a new vehicle platform—a Volkswagen Crafter 35, selected equipment for the inside of the mobile clinic, and designed the entire workspace, integrating the equipment using anthropometric analysis to allow for an ergonomic design.

"The new clinic is vastly different from the previous solution and is unique from any clinic on the market," reads the project poster's conclusion. "The new clinic features a more robust vehicle, spacious interior, modern equipment, and a modular design to satisfy the needs of different users."

**Dr. Matthew Parkinson**, associate professor of engineering design and mechanical engineering at Penn State, and **Dr. Cornie Scheffer** of Stellenbosch University serve as mentors to this project. If you are interested in participating in the GET program as a student or as a sponsor, please contact Parkinson by e-mail at [parkinson@psu.edu](mailto:parkinson@psu.edu).

## Morocco

The Mobile Medical Clinic is not Froede's first foray into human-

itarian engineering projects. As a graduate student here at Penn State, he has also been involved with the Baobab Penn State University Initiative, dedicated to designing and manufacturing Baobab processing machines to improve the current method of fruit separation, thereby increasing productivity and contributing to the financial security of Baobab workers.

Froede's involvement with the Baobab project included helping to design the fourth generation of the Baobab separating machine and migrating that technology to the Ecole Mohammed d'Ingenieurs, an engineering university in Rabat, Morocco.

"The transfer was accomplished by working with four Moroccan mechanical engineering students who helped us complete the prototype using locally sourced parts, labor, and tools," explains Froede. "This was the first time the machine was built in Africa and represented a major milestone."

You can learn more about the Baobab PSU Initiative by visiting [www.baobabpsu.com](http://www.baobabpsu.com).

## Haiti

Froede has also been involved in a collaboration between Penn State and Corvinus University in Budapest, Hungary, focused on the development of a chlorinator device to address Haiti's water security needs.

"Our team created a combined engineering and economic solution that involved an inexpensive treatment device, sanitary water containers, and a business plan to support the community's needs," says Froede. "By partnering with Roots of Development, a non-governmental organization working with the village of Nan Plim located on the island of La Gonave, we were able to create a sustainable, regionally appropriate, and culturally acceptable result."

You can learn more about the Roots of Development project by visiting [www.rootsofdevelopment.org](http://www.rootsofdevelopment.org).