Survivor Assistance through Technology Transfer in Tanzania

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Landmines from a former separating the Chobe region of Botswana from the upper Okavango and Zambezi Rivers. The Phantei'angwe riverbank the Kasane-Okavango-Zambezi Transfrontier Conservation Area (KaZa TFCA) has been reduced to a fraction of its size by the landmine barrier. Surpassing 130,000, the elephant herd is increasing by approximately 5 percent each year, an unsustainable growth rate given the current confines. The growing herd is disturbing local communities and destroying the surrounding environment by overgrazing the area.

Working with Conservation International, Roots of Peace plans to implement a program to open elephant access corridors, conserve wildlife and stimulate economic development. Roots of Peace will head a demining operation to remove landmines from historic elephant foraging areas, coordinating with the government of Angola, the provincial government of Cuando Cubango, and the U.N. Development Programme-Angola. Conservation International will then work on ecosystem development based on wildlife conservation within the Luanda Reserve. It is expected that the return of the elephants to these historic habitats will stimulate the economy through an increase in tourism in the area.

**Harvesting Hope**

The landmine situation in Angola has had a major impact on the socioeconomic state of the country. Landmines and UXO have blocked roads, bridges and access to farmland, resulting in an inability to meet domestic food requirements. Blocked access has also made it hard to provide medical attention and education on HIV/AIDS and mines, specifically in the war-torn provinces of Huambo, Bie and Benguela. Roots of Peace and World Vision seek to combine demining and redevelopment efforts, stimulating the economy and agricultural development. The project consists of three phases:

1. **Clearing and rebuilding roads, bridges and other priority areas.**
   
   Roots of Peace will conduct a mine survey including mapping and education efforts. The organization will also demine and reconstruct roads and bridges, opening access to regions in need of assistance.

2. **Strengthening agri-business development and improving food security.**
   
   World Vision will focus on its already established Pro-Rural! model program, as well as food security through subsistence farming.

3. **Producing and exporting high-value crops.**
   
   Roots of Peace and World Vision will work together on this aspect of the project, executing a plan to grow and market high-value crops.

**Bringing Back Security**

Each project will raise US$10 million over the next three years. The long-term impact of the projects will be great, helping the people of Angola return to a self-sufficient lifestyle and preserving the environment. Working collaboratively with other organizations, the projects headed by Roots of Peace are expected to boost safety, security and stability of these regions.

*See Endnotes, page 109*

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**Angola Project**

*by Megan Wertz*

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**Survivor Assistance through Technology Transfer in Tanzania**

This article describes how cutting-edge technology is being developed and disseminated in landmine-affected countries. Focusing particularly on the Tanzania Training Center for Orthopedic Technologies, the authors examine how a process of appropriateness, resource-effective casting is being advanced and then shared through training workshops. Improved technology and its successful transfer are vital to better assisting landmine survivors, a goal the Center for International Rehabilitation is working to achieve.

*by Mary Stanton and Kim D. Reisinger*

**Center for International Rehabilitation**

Although Tanzania does not have a significant landmine problem, the nation serves as home to the most recognized prosthetic and orthotic training institution in Africa. The Tanzania Training Center for Orthopedic Technologies (TATCOT) trains practitioners from all parts of Africa, who are then able to provide prosthetic and orthotic services to survivors of landmine and other war-related injuries in their home countries. Based in Moshi, Tanzania, TATCOT is currently the only training center in the developing world that has received Category 1 certification from the International Society for Prosthetics and Orthotics.

To disseminate innovations in prosthetic technology to landmine-affected nations, the Center for International Rehabilitation has been conducting a series of hands-on training workshops in training centers and rehabilitation clinics around the world. In collaboration with TATCOT, the CIR organized and implemented a four-week workshop to train professionals in the use of the CIR Transtibial Prosthetic Casting System in June 2004. The objective of the workshop was to transfer the knowledge developed at the CIR to faculty and students in order to improve the quality of care available to landmine survivors throughout Africa.

The casting system, developed by CIR Research Director Yonghong Wu, M.D., provides an appropriate, resource-effective solution for prosthetic socket fabrication. The system uses local materials to fabricate a prosthetic socket and artificial limb in less than one hour. As a result, a landmine survivor can visit a clinic and leave with a custom-made prosthesis in a matter of hours. The success of prosthetic service provision and training in landmine-affected areas depends largely on the technology used and the degree to which it fits with the local environment.

**Appropriate Prosthetic Technology**

It has been well-established that high-tech Western prosthetic technologies are not always suitable for developing countries. The International Society for Prosthetics and Orthotics stressed the use of appropriate technology as its Consensus Conference in Cambodiad and Tanzania, defining appropriate technology as a “system providing proper fit and alignment based on sound biomechanical principles [that] suits the needs of the individual and can be maintained by the country at the most economical and affordable price.” There are a significant number of efforts underway to develop appropriate prosthetic technologies for landmine-affected countries; however, many have been designed and produced without accounting for key factors such as the environment, local resources and culture.

Furthermore, many new technologies continue to rely on older methods and resources that still require a fully operational prosthetic clinic. It is necessary to develop new products and fabrication methods that do

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not rely heavily on electricity, which can be unstable in war-torn countries. These produc- 
processes may not require advocates to move to urban areas to obtain a prosthetic.

In response to the continued need for appropriate technologies, the CIR oper- 
ates a Rehabilitation Engineering Research Center on Improved Technology Access for 
Landmine Survivors. Funded by the U.S. Department of Education’s National Institute on 
Disability and Rehabilitation Research, the CIR carries out research and development, 
education, and technical adaptation. Much of the CIR’s work has focused on the develop- 
ment of assistive technology and prosthetic solutions for landmine survivors. CIR- 
related products and methods are designed for global applications; although research- 
ers must work with limited resources, the new technology still adheres to the 
high biomechanical standards for rehabilitation services.

The CIR has also developed mul- 
tilingual training modules for use in technology transfer workshops and the CIR’s distance-education program. Throughout all landmine-affected coun- 
tries and regions, there are not enough qualified prosthetists to meet the demand; con- 
sequently, greater numbers of technicians must be trained in order to meet the need for prosth- 
thesis-related services. The CIR’s goals is to help meet this need by providing educa- 
tional materials and workshops to improve training opportunities for students and professionals in the targeted areas.

Development of the CIR

Along with the need for more training, another barrier to increas- 
ing prosthetic service delivery is the time-consuming, laborious process of the prosthetic socket. In many parts of the world, tra- 
ditional prosthetic socket fabrication involves using a plaster of Paris cast that is still 
being used for the fabrication of the socket. In addition to the long cast- 
ning and socket fabrication methods, there are many steps involved in the prosth- 
thesis process that can be time-consuming. In the CIR’s workshop, the process is streamlined.

CIR workshops, exemplifies how appropriate technology can be used to maximize time, 
and money resources at rehabilitation clin- 
i-cs. Using vacuum power and sand in place of 
plaster, the system produces a positive 
model of the residual limb of a transtibial (above-knee) amputee for prosthetic socket fabrication in less than one minute. The 
practitioner can modify the positive model immediately in preparation for the forma- 
tion of the customized prosthetic socket. The system drastically reduces the amount of 
labor involved in the process of prosthetic fabrication process; it also utilizes 
recyclable sand, lowering material costs.

Technology Transfer: Training

In Action

As the main regional prosthetic and or- 
thotic training center for eastern Africa, 
TATCOT offers a Bachelor of Science in prosthetics and orthotics, as well as one- 
to-three-year diploma and certificate programs in prosthetics and orthotics and a one- 
year course for wheelchair technicians. According to the United States Agency for International Development, graduates of 
TATCOT are currently employed in more than 19 countries. Additionally, the International Committee of the Red Cross 
created a program with the Tanzanian government that includes the provision of prostheses for up to 50 amputees each year.

The CIR’s training approach involves direct, hands-on interaction among the workshop leaders and practitioners in attend- 
ance. By traveling directly to TATCOT, CIR’s experts were able to explain the cur- 
etory technology and gain a better understand- 
ing of TATCOT’s resources and needs.

The school’s objective of providing improved training and increasing the number of or- 
thopedic practitioners in Africa2 aligned well with the CIR’s goals for distributing its technology throughout the parts of the world affected by landmines. Twenty-four participants from TATCOT and centers throughout Tanzania attended the training workshop. Handicap International sent one of its field managers, also a trained or- 
thopedic technologist, from Sierra Leone to participate in the workshop. Led by Dr. Wu, the training covered a review of existing technologies, a demonstration of the system and interactive work with participants. Participants were divided into small groups to work on patient evalua- 
tion, casting and socket forming.

During the second half of the work- 
shop, the participants learned about proper prosthetic alignment and assem- 
by and evaluated the use of the patients that they had served. The workshop concluded 
with an open discussion about the system and its applications in the clinical setting. Participants had the opportunity to ex- 
change information, share their experiences and gain new methodologies for the treat- 
ment of landmine survivors.

Future Progress

Through post-workshop reports from TATCOT, the CIR learned that the parts- 
cipants continue to use the system periodic- 
ally. TATCOT Director and International Society for Prosthetics and Orthotics Res- 
ident Harold Shangali has been working to 


Earth-friendly Explosives?

Researchers in the United States report they have developed “green” chemicals that can serve as a viable replacement for lead-based materials used as primary explosives to detonate all types of explosives. Primary explosives ignite powerful secondary explosions and are, while relatively weak, very sensitive. More problematic, according to recent studies, are toxic plumes released when lead-based explosives are fired.

Chemists have long struggled with finding safe chemicals to replace primary lead-based explosives because of a need for a proper balance between stability and sensitivity. One of the major obstacles to developing a suitable replacement has been that the new chemicals lose sensitivity when wet.

Currently the chemicals used to make traditional lead-based primary explosives involve high levels of risk; therefore, most manufacturers opt to import those components. The new “green” chemicals, however, are not active until dried, and can be stored indefinitely in their wet form. The use of “green” chemicals could lead to safer and more controlled production, make explosives less sensitive, while also eliminating collateral toxic plumes.

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