

## Body Builders

By Katherine McIntire Peters

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*The military is breaking new ground in amputee care.*

**F**rom behind the wheel of his black Infinity sports coupe, Maj. Andrew Lourake points out a prime parking space in front of his office building at Andrews Air Force Base to a visitor following in a car behind him. He chooses for himself the only other parking space available, which is some distance away. It would be easy to overlook this courtesy but for one fact: The one-time pilot of Air Force Two is missing his left leg.

It didn't occur to Lourake to take the closer parking space. When he leads the way to his second-floor office, he takes the stairs. He is happy to demonstrate how his high-tech artificial leg works. Computer chips and sensors control the leg's knee and ankle so that Lourake's gait appears natural, something he wouldn't be able to achieve with a conventional mechanical leg. Climbing stairs is among the least of his concerns these days, however. Lourake is much more focused on returning to the cockpit of the transport and passenger aircraft he used to fly and convincing the dozens of amputees who have recently returned from combat in Iraq and Afghanistan that their lives are most definitely not over.

Lourake, whose leg was amputated in June 2002, became just six weeks later the first U.S. serviceman to be fitted with the C-Leg system, a new type of prosthesis manufactured by the German company Otto Bock. Lourake had meticulously researched the market and he was convinced the C-Leg would allow him to resume his old life. The military wasn't yet offering the prosthesis so Lourake asked for and received authorization to go to a private prosthetist in Northern Virginia to be fitted for the \$45,000

leg. Partly because Lourake's experience was so positive, the military now routinely fits above-the-knee amputees with the leg, which is widely considered to be the best of a new class of prostheses that rely on computer chips to simulate knee movement. To meet the military's growing demand for the prosthesis, Otto Bock stepped up production of the C-Leg last year and moved U.S. troops to the top of the waiting list, earning widespread appreciation from military personnel.

Lourake's amputation was the culmination of a three-year losing battle to save his leg after a motorcycle accident, and it preceded the wave of amputations resulting from military operations in Afghanistan and Iraq. His experience and his willingness to share his feelings about it with others has makes him "one of the most effective peer counselors we have," says an official at Walter Reed Army Medical Center in northeast Washington, where most military amputees are treated and where Lourake regularly volunteers. Once or twice a week he drives to the hospital to meet with amputees. He goes armed with a stack of folders he's stuffed with information about amputees, and he brings along the biggest morale booster he knows: his wife. "It really helps these guys to see that it's possible to be an amputee and also be married to a beautiful girl," he says. "She provides the same kind of support to their wives and families [that] I provide to them."

When he's not at Walter Reed or working his desk job at Andrews, where he coordinates special projects for the commanding general, Lourake is working to regain his flight status. He has put in hundreds of hours of physical therapy to regain his strength and balance. In January, he completed a battery of tests the Air Force will use to evaluate his fitness for flight. "From a physical and functional standpoint, I don't think the [evaluation] could have gone any better. I'm sure I met or exceeded all their minimum standards," Lourake says. The evaluators' recommendation will be forwarded up through the Air Force chain of command and,

ultimately, Air Force Chief of Staff John Jumper will decide Lourake's future in the cockpit.

"Hell, I've waited this long, what's a few more weeks," says Lourake.

## MEDICAL BREAKTHROUGHS

War has long spurred scientific and technological advances that have changed the world for the better. The cure for yellow fever sprang from military necessity - too many soldiers were dying of or incapacitated by the disease during the Spanish American War. Modern psychiatry owes a debt of gratitude to the lessons learned from the treatment of shell-shocked veterans in World War I. Medical necessity led to the mass production of penicillin in World War II. The war on terrorism, as waged in Afghanistan and Iraq, already is leading to breakthroughs in the treatment of amputees. Between October 2001 and mid-January 2004, the Amputee Center at Walter Reed treated 74 amputees: 19 upper-extremity amputees, including three who lost both arms; 53 lower-extremity amputees, including eight who lost both legs; and two triple amputees. The fact that there are so many amputees is in one sense a positive sign. "Body armor is saving a lot of lives," says Dr. Jeff Gambel, a specialist in rehabilitation and physical medicine at Walter Reed and an Army lieutenant colonel. "Soldiers are surviving injuries that would have killed them in the past. If there's a downside, it's that we're seeing more serious injuries to limbs."

Before the United States invaded Afghanistan, the majority of amputees treated at Walter Reed were older diabetics with sedentary lifestyles. The spike in young, physically fit, active amputees has created an exceptional opportunity in the field of prosthetics, and manufacturers and military medical professionals are stepping up to the challenge. Unlike most private health insurance companies, Defense officials have vowed to provide injured troops with the best prostheses on the market as quickly as possible.

The competition for the military's business is sparking a revolution in the technology now being used in artificial limbs. Mechanical arms able to

perform limited, sequential movements are being replaced with myoelectric elbows and hands that can respond to brain signals and perform simultaneous functions. Computer chips in knees can measure movement and make adjustments 50 times per second, allowing lower-limb amputees to walk with a natural gait, climb and descend stairs more easily, and ride a bicycle with ease.

Joseph Miller, the chief prosthetist at Walter Reed, says the recent incorporation of microprocessors into prostheses and advances in materials have dramatically improved the outlook for amputees. "We are also receiving some of the first systems available in the world," Miller says. Soldiers who have lost their arms have been the first to use an electronic elbow, called the U3, manufactured by Motion Control Inc. in Salt Lake City, which allows for simultaneous elbow and hand movements.

"That's a huge advance for our industry. We received the first three models, and we've now had several patients out with this system," Miller says. Walter Reed staff is working with scientists and manufacturers to help them learn from the troops' experiences with the new technologies and make improvements.

#### MAJOR INVESTMENT

The patients at Walter Reed are remarkable in several ways. Military amputees generally were physically fit and healthy before losing their limbs, which helps enormously in the rehabilitation process. But they tend to have other complications related to their wounds, which can make the rehabilitation process much trickier.

"When blasts occur, they create very dirty wounds," says Gambel. Wounds can't just be surgically closed as they might be in the event of a car crash or manufacturing accident. Depending on how salvageable the tissue is, wounds have to be cleaned repeatedly and multiple surgeries are usually necessary, which can greatly prolong rehabilitation. "Often, soldiers have a lot of injuries: broken bones, nerve damage, there's the potential for infection. There is no typical case. They're all unique," Gambel says.

There are positive sides to their healing as well, he adds. "They are very fit to begin with and very motivated. That's important because a lot of energy is required to operate a prosthesis." For that reason, even before their wounds have begun to heal, patients are put in physical therapy to begin rebuilding strength.

Amputee treatment at Walter Reed is notable for providing patients with multiple prostheses as early as possible - something that private insurers rarely, if ever, will cover. Typically, a private insurer will pay for the most basic prostheses - a mechanical arm or leg. Only after patients adapt to the basics can they move on (if at all) to more advanced prostheses.

At Walter Reed, the staff believes that starting off patients with the most advanced prosthetic system will benefit them much more in the long run. At the same time, because some of the high-tech prostheses cannot be used in all circumstances (most cannot function if they get wet, for instance), patients also are fitted with less sophisticated artificial limbs. For example, there are times when an upper-extremity amputee might want to wear a cosmetic arm - an arm without much functional use, but one that is lightweight and easy to wear. In addition, most of the computerized prostheses need to have their batteries recharged periodically. Lourake wears a mechanical leg for swimming and running (the C-Leg's continual self-adjustment is ideal for walking but not for running) and the C-Leg for just about everything else.

With some of the new artificial limbs costing as much as \$80,000 apiece, being outfitted with multiple prostheses by the government is a major benefit for the patients. Miller says he's under no pressure to keep costs down: "Fortunately, that's not an issue I have to worry about. We're entirely focused on getting these guys fitted with whatever will work best for them." The Amputee Center at Walter Reed is undergoing a \$2 million expansion, thanks in large part to support provided by former Army Chief of Staff Gen. Eric Shinseki. Shinseki, himself an amputee as a result of injuries he

received in Vietnam, retired from the Army's highest post last spring. The Army will substantially expand the treatment and rehabilitation facilities, allowing the troops to learn to use their prostheses under a wide range of circumstances. "You can have the best prosthesis in the world, but if you don't know how to use it properly, it's worthless," says Gambel. The new rehab center will feature various terrains and will include areas where troops can practice water sports and rock-climbing. Troops who want to continue their military service will be able to field-test their abilities before rejoining their units. Manufacturers will be able to fine-tune their products.

### 'UNCOMFORTABLE ADJUSTMENT'

Lourake's journey into life as an "amp," as amputees refer to themselves, began on Halloween night in 1998, when a motorcycle accident left him with a badly broken leg. He was taken to a hospital emergency room in Baltimore where he waited 10 hours for surgery as staff there responded to other emergencies. In the course of his treatment, he picked up a staph infection, which eventually seeped into his bones, turning what should have been a four-month recovery from a broken leg into a three-year battle against bacteria. Nineteen surgeries later, with his leg permanently fused and still in great pain, Lourake conceded. Amputation turned out to be the easiest of all his operations.

Before surgeons removed his left leg above the knee in June 2002, Lourake exhaustively researched his options for a prosthesis. He discovered the C-Leg, which was newly on the market. When the Air Force agreed to pay for him to receive it, he made an appointment with a civilian prosthetist in Northern Virginia. Six weeks after his surgery, his wife drove him to the office and he was fitted for the C-Leg.

"I had made a deal with myself that I wasn't going to leave that office on crutches. I was going to walk out, and I would stay there as long as it took to make that happen," he says. Three hours later, he walked from the office to his car without using crutches. It was a short, excruciating walk, but a walk nonetheless. Lourake's come a long way since then. He

bicycles, runs and works out regularly. He takes the stairs without flinching, and has made very few accommodations for his amputation. "It's an uncomfortable adjustment," says Lourake of learning to use a prosthesis. "But as [Baltimore baseball workhorse] Cal Ripken once said, 'I'm comfortable being uncomfortable.' "

While Lourake is eager to return to flight status, something he's hopeful will happen this spring, he has been deeply gratified by his work at Walter Reed. He's keenly aware that he has something special to offer the newly injured troops who return from the battlefield almost daily. The man who loves to fly more than just about anything else has found new purpose in helping dozens of his military peers adjust to a life with one or more artificial limbs. He gives all the amputees his home number and tells them to call any time, day or night, for any reason at all - and they do. He knows about the shattered hopes and shaken confidence that come with losing a limb. He has experienced the disorienting and overwhelming physical pain in a foot that no longer exists, a complex, hard-to-treat condition known as phantom pain, which is common to amputees.

"There's no two-legged person that can walk in and tell an amputee what life is going to be like," Lourake says. The pain, the frustration, the anguish are impossible to understand if you haven't been through it. But in most ways, Lourake says, his life is remarkably similar to what it was before, minus the flying. "I've made very few adjustments to my house. I work out and run," he says. He greatly appreciates the fact that the military has provided a level of care few private health insurers would provide and only the very wealthy could afford.

His message for new amputees is that life goes on in ways wonderful and ordinary, and that losing a limb does not mean losing one's identity, a fact that may explain why his passion for flying has not waned. He's installed a flight simulator and a set of rudder pedals on his home computer. His C-

Leg is programmed to operate in two modes: Mode one is for walking; mode two is for flying.