

# Flex-Foot Cheetah

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**Abstract—** The Flex-Foot Cheetah is a user friendly, non-mechanized prosthetics made of carbon fiber for runners with transtibial or transfemoral amputations. It is even durable enough to be used by professional athletes.

## I. INTRODUCTION

**M**ANY devices to aid patients with amputations do not compare to a natural body. The Flex-Foot Cheetah may be one of the few devices that may be better, or equivalent to, than the human body. The device was created for amputees (with transtibial or transfemoral amputations) who wish to run.



## II. METHODS

The Flex-Foot Cheetah is a prosthetic made of carbon-fiber-reinforced polymer (carbon fiber). It can be used for transtibial, below the knee, or transfemoral, above the knee, amputees. It attaches posterior to an adaptor, which can be tightened as needed, that slips over the remaining amputated leg.

After observing the biomechanics of running, or gait analysis, a runner's heel does not touch the ground, so this prosthetic does not have a heel. The main source of contact is with the toes. This device has an adjustable toe shape and tread plate attached to the bottom of the foot.

Its J shape, based on a cheetah's back legs, and the properties of carbon fiber, allow the prosthetic to compress, which stores energy and absorbs stress. This is referred to the stance phase. When the runner moves the leg forward off of the ground, the Cheetah returns to its original shape to release the stored energy to propel him or herself forward. This is referred to as the swing phase.

## III. DISCUSSION

The Flex-Foot Cheetah, overall, is a very successful

product. This device is lightweight, less than two pounds each, and it can support over 300 pounds. The attachment system makes it user friendly. It also closely mimics a normal gait without the use of sensors, microprocessors, or motors.

The biggest issue with the Cheetahs is that they cost \$15,000 to \$18,000 per prosthesis and it is often not covered by health insurance. Another issue is the controversial topic of using them in competition against able-bodied runners. The International Association of Athletics Federation (IAFF) banned them from competition. They tested the Cheetah and concluded that they used less energy, had less vertical motion, and used less mechanical work than an able-bodied leg. (The Court of Arbitration for Sports later overruled it because the IAAF did not consider all functions and factors of the Cheetah.)

Although they are only used for running, the Cheetah may be the future for prosthetics: different prosthetics for different activities, just like wearing different shoes. Because of its simplistic design, there are not many ways to change the price of the prosthetic, but getting more insurances to cover them would help. Overall, the Flex-Foot Cheetah gives amputees a chance to do activities just like a normal able-bodied patient.

## REFERENCES

- [1] "Cheetah." *Össur*. Web. 1 Nov. 2011. <<http://www.ossur.com/?PageID=13462>>.
- [2] "Oscar Pistorius." *Wikipedia*. Web. 1 Nov. 2011. <[http://en.wikipedia.org/wiki/Oscar\\_Pistorius](http://en.wikipedia.org/wiki/Oscar_Pistorius)>.
- [3] "Oscar Pistorius - Independent Scientific study concludes that cheetah prosthetics offer clear mechanical advantages." *International Association of Athletics Federations*. Web. 3 Nov. 2011. <<http://www.iaaf.org/news/printer,newsid=42896.htm>>.
- [4] Viejo, Aliso. "Össur News." *Össur*. Web. 1 Nov. 2011. <<http://www.flexfoot.com/?PageID=13032&NewsID=1139>>.
- [5] Zettler, Patricia. "Is it Cheating to Use Cheetahs?." *Boston University International Law Journal* 27 (2009): 368-403. *Boston University*. Web. 3 Nov. 2011
- [6] "Carbon-fiber-reinforced polymer." *Wikipedia*. Web. 9 Nov. 2011.