

# xOS 2 Exoskeleton

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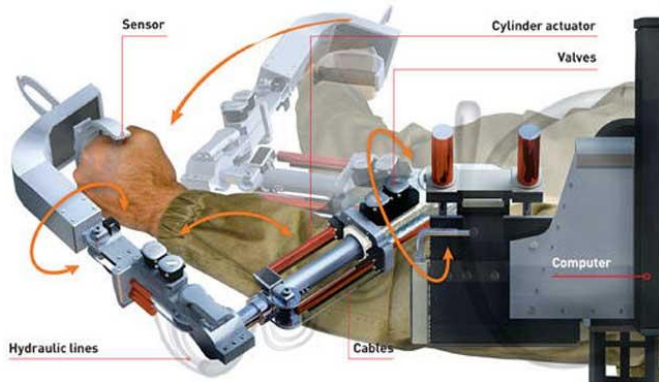
**Abstract**—This paper describes Raytheon-SARCOS' xOS 2 exoskeleton. It will detail how the suit is made, practicality for military use, and future hopes for the technology.

## I. INTRODUCTION

**T**HE xOS 2 is a military grade exoskeleton that, unlike the "Iron Man" suit, only uses arms and legs. This suit provide the soldier with extra strength while allowing for sensitivity for smaller forces. The intent is to have two separate types of the suit; a battle field version, and a logistical version.

## II. METHODS

The xOS 2 is a second generation suit that is nearly half as light as the first while maintaining its efficiency. It is made of titanium, however future models may be made from carbon fiber plates or carbon nanotubes, in order to preserve a light but strong material. Within the suit, there are many computers and sensors that read motion of the soldier and make the suit react. The computers also analyze motion tracking limb motion and range awareness so not to cause damage to itself. This can prevent damage to the human himself by stopping involuntary movements like sneezing and coughing. The computers relay signals to hydraulic pumps and actuators that then create the movement. The motors are multispeed so that the suit will move with appropriate speed and force. This picture depicts the parts working together.



## III. RESULTS

All this technology working together results in a suit weighing only 150lbs compared to the Hardiman suit made in the 1960's which weighed over 1,500lbs. It provides lift force of a 17:1 ratio, meaning a soldier can lift 170lbs while exerting the force of lifting only 10lbs. This is important because the packs soldiers travel with on the battle field usually weigh around that 170lb mark, so this would allow them to exert far less energy and to save it for more important tasks like the fighting itself. The battle field suit would only

require legs so the marching would not tire the soldier however the logistical suit would use both legs and arms in order to make a more "workhorse" style benefit. The exoskeleton allows one soldier to do the work of 3 in less time. This would make improvements in things like moving ammunition, loading missiles on aircraft, or even something as simple as loading water onto trucks. The following picture shows what a logistical suit may look like.



## IV. DISCUSSION

The biggest limitation of the xOS 2 is the power source. As of the most recent prototype, the only power is provided by a wire tether which greatly prevents range of work. In the future scientists hope to create a fuel pack placed around the lower back region. They do not want to make a battery power source because either it would be expensive to make batteries that could last, or it would be expensive to create a rechargeable system for the suit. Also, they fear breaching and explosion of the battery in a battlefield setting. Other future hopes include lesser weight, greater strength, lower cost, and possibly even aviation! The future version of the battle field suit will likely have arms as well so soldiers can wield heavier, more powerful weapons. Raytheon-SARCOS hopes to see the untethered version of the suit in use by 2035.

## REFERENCES

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