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Artificial exoskeleton takes the strain

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A human exoskeleton, which could help soldiers and fire-fighters carry heavy loads, is about to take its first public steps.

Called the Berkeley Lower Extremity Exoskeleton, or BLEEX, it is part of a Defense Advanced Research Projects Agency venture designed to help foot soldiers carry heavier loads over even longer distances, by connecting robotic supports to their legs to reduce the load.

Besides helping soldiers, it could also assist medical personnel carrying wounded people from disaster areas, or fire fighters in hauling heavy equipment up countless flights of stairs.

The Berkeley Lower Extremity Exoskeleton can be used to carry an extra 32 kilograms (Image: US Berkeley)

A human "pilot" straps the exoskeleton's legs to their own and dons a large rucksack that contains the engine, control system and a space for the payload, says project leader Homayoon Kazerooni.

Centre of gravity

Although the device itself weighs a hefty 50 kilograms, the pilot should not notice this because the machine takes its own weight, with the control system ensuring that the centre of gravity is always within the pilot's footprint.

In addition to its own weight, it will carry a 32 kilogram payload within the backpack. To the pilot this would feel like they were carrying just 2 kilograms, says Kazerooni.

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Later this year they will begin trying a new more compact engine that is more than twice as powerful and should make it possible to carry loads of nearly 60 kilograms. "If the payload goes even higher then the pilot takes the extra weight," he says.

Hands free

"The key element is that the pilot needs no joystick, keyboard or buttons to operate it," says Kazerooni, leaving your hands free for other tasks.

This is because the entire control system is designed to ensure it moves in concert with the person wearing the exoskeleton. "You just push your leg and it moves," he says.

To drive the powerful hydraulics necessary for heavy lifting BLEEX has a small purpose built combustion engine built into it. On a full tank the system should be able to run for as long as two hours.

But there are plans to try a quieter, cleaner type of engine. This kind of motor would run on hydrogen peroxide, which expands rapidly without combusting when it comes into contact with a catalyst.

The system will be demonstrated at the DARPA Technical Symposium in Anaheim, California, between 9 and 11 March.

Duncan Graham-Rowe

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