***Exoskeletons***

**Is this the Shape of GIs to Come?**

**The Military Gets Mightier**  
by Mark Ward

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The US military is planning to turn soldiers into supermen by fitting them with powered exoskeletons.

The research arm of the US military is spending $50m to develop new technologies that will improve the speed, strength and endurance of soldiers.

The research program is aiming to give soldiers better protection against enemy fire, the ability to tote bigger guns, run faster, communicate better and help them avoid friendly fire.

The first trials of the technology are expected within the decade.

Power play

This month, the US Defense Advanced Research Projects Agency (DARPA) is expected to sign contracts to kick off the project to develop powered exoskeletons for its ground troops.

The contract signings follow a year of meetings and assessments run by DARPA to find the most promising technologies.

So far, DARPA, the main research and development organization for the US Department of Defense, has not said which ideas it favors, but it has set out the broad goals of the program which calls for technologies that can help troops:

\* carry heavier packs;   
\* march faster over longer distances;   
\* lift heavier objects and use larger weapons;   
\* leap extraordinary heights and/or distances.

Dr Ephrahim Garcia, coordinator of the exoskeleton project, said its demands were "formidable" and much of the initial research was speculative to prove concepts rather than develop finished products.

"The controls, the power requirements, the human interface to the machine are all things that we do not know if we can do yet," he said. "There is a huge challenge here."

He added that the exoskeletons must be something that troops can wear and use without thinking rather than something they have to operate.

Suited up

The powered suits will help soldiers carry and use larger weapons and to take heavier loads into battle. Currently, soldiers carry a pack that is no more than a third of their body weight and usually take far less into combat.

Field trials have shown that troops typically dump anything too bulky or heavy to carry for long distances.

The exoskeletons will also have to be almost silent to operate and use fuel very efficiently. And soldiers must be able to use them for at least 24 hours before needing to refuel.

Early work sponsored by DARPA has used pneumatic muscles or deformable magnets to power artificial limbs or suits that soldiers could wear. Trials of a Springwalker system helped its developers travel at speeds in excess of 24 km/h (15 mph).

Stuck in the mud

The exoskeletons are expected to include a sensor web that expands a soldier's field of vision, passes on information about battlefield conditions, using GPS or thermal cameras, helps to co-ordinate groups of other soldiers and lessens the chance of being hit by friendly fire.

Conducting fabrics could be used to swap data between sensors, and wireless networks could pass information between squads or soldiers.

The suits could also act as body Armour or have physiological monitoring systems that let officers know the health of the troops under their command.

Field trials of mock-ups of future systems on soldiers running a cross-country course revealed the limitations of some approaches.

Visors on helmets that could double as screens got in the way of rifle sights or made the headgear bulky and unstable. Other sensors or power packs distributed around the body of a soldier got in the way when combatants were crawling and made it harder for them to hide.