**Artificial Powered Exoskeleton**

**From The Black Vault Encyclopedia Project**

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An **artificial powered exoskeleton** is a self-[powered](http://www.theblackvault.com/wiki/index.php?title=Power_(physics)&action=edit&redlink=1) [exoskeleton](http://www.theblackvault.com/wiki/index.php?title=Exoskeleton&action=edit&redlink=1) typically intended for use by humans in [battle](http://www.theblackvault.com/wiki/index.php?title=Battle&action=edit&redlink=1), [construction](http://www.theblackvault.com/wiki/index.php?title=Construction&action=edit&redlink=1) and survival in dangerous environments.

The [United States](http://www.theblackvault.com/wiki/index.php?title=United_States&action=edit&redlink=1) [Defense Advanced Research Projects Agency](http://www.theblackvault.com/wiki/index.php?title=Defense_Advanced_Research_Projects_Agency&action=edit&redlink=1) and other organizations have researched exoskeletons for combat for decades, but progress has been limited and the actual utility of such systems in combat is still debated.

In the early 2000s a number of companies and research centers developed the first practical models of human exoskeletons. One of the main uses is enabling a [soldier](http://www.theblackvault.com/wiki/index.php?title=Soldier&action=edit&redlink=1) to carry heavy weights (50–100 kg) while running or climbing stairs. Most models use a [hydraulic](http://www.theblackvault.com/wiki/index.php?title=Hydraulic&action=edit&redlink=1) system controlled by an on-board computer. They can be powered by an [internal combustion engine](http://www.theblackvault.com/wiki/index.php?title=Internal_combustion_engine&action=edit&redlink=1), [batteries](http://www.theblackvault.com/wiki/index.php?title=Batteries&action=edit&redlink=1) or, potentially, [fuel cells](http://www.theblackvault.com/wiki/index.php?title=Fuel_cell&action=edit&redlink=1). Another area of application is medical care, nursing in particular. Faced with the impending shortage of medical professionals and the increasing number of people in [elderly care](http://www.theblackvault.com/wiki/index.php?title=Elderly_care&action=edit&redlink=1), several teams of Japanese engineers have developed exoskeletons designed to help [nurses](http://www.theblackvault.com/wiki/index.php?title=Nurse&action=edit&redlink=1) lift and carry patients.

Exoskeletons can also be applied in the area of rehabilitation of stroke or SCI patients. An exo-skeleton could reduce the number of therapists needed by allowing even the most impaired patient to be trained by one therapist, whereas now several are needed. Also training is more uniform, easier to analyze retrospectively and can be specifically customized for each patient. At this time there are several projects designing training aids for rehabilitations centers ([LOPES exoskeleton](http://www.theblackvault.com/wiki/index.php?title=LOPES_exoskeleton&action=edit&redlink=1), LOKOMAT and the gait trainer).

**Future speculation**

Many expect exoskeletons to become widely used in the future by the military and [police](http://www.theblackvault.com/wiki/index.php?title=Police&action=edit&redlink=1), and later by civilians as the technology becomes cheaper. However exoskeletons may have to compete for adoption with [cybernetics](http://www.theblackvault.com/wiki/index.php?title=Cyborg&action=edit&redlink=1) - enhancing the [human body](http://www.theblackvault.com/wiki/index.php?title=Human_body&action=edit&redlink=1) itself with [implants](http://www.theblackvault.com/wiki/index.php?title=Implant&action=edit&redlink=1) and [prosthetics](http://www.theblackvault.com/wiki/index.php?title=Prosthetics&action=edit&redlink=1). But advances in this field may also help exoskeletal research, in that direct links to the nervous system may be possible, meaning the mechanical parts may be considered part of the body, creating more fluent movement. They may also benefit people who have been disabled by crippling diseases like [ALS](http://www.theblackvault.com/wiki/index.php?title=Motor_neurone_disease&action=edit&redlink=1) and [multiple sclerosis](http://www.theblackvault.com/wiki/index.php?title=Multiple_sclerosis&action=edit&redlink=1).

**Powered armor and other combat applications in fiction**

In most portrayals of powered armor, the suit is usually not much larger than a human. In fact, it is more accurately described as a battle suit with mechanical and electronic mechanisms designed to augment the wearer's abilities. In addition to the benefits provided by the exoskeleton, other popular features include internal [life support](http://www.theblackvault.com/wiki/index.php?title=Life_support&action=edit&redlink=1) for hostile environments, protection from [environmental](http://www.theblackvault.com/wiki/index.php?title=Natural_environment&action=edit&redlink=1) hazards such as [radiation](http://www.theblackvault.com/wiki/index.php?title=Radiation&action=edit&redlink=1) and [vacuum](http://www.theblackvault.com/wiki/index.php?title=Vacuum&action=edit&redlink=1), [weapons](http://www.theblackvault.com/wiki/index.php?title=Weapon&action=edit&redlink=1) [targeting](http://www.theblackvault.com/wiki/index.php?title=Fire-control_system&action=edit&redlink=1) systems, [firearms](http://www.theblackvault.com/wiki/index.php?title=Firearm&action=edit&redlink=1) affixed directly to the suit itself, and transportation mechanisms that allow the wearer to fly, make giant leaps, or speed by on ground.

All of these systems are usually powered by some on-board, self-sufficient power source. [Masamune Shirow](http://www.theblackvault.com/wiki/index.php?title=Masamune_Shirow&action=edit&redlink=1)'s Landmates in [*Appleseed*](http://www.theblackvault.com/wiki/index.php?title=Appleseed&action=edit&redlink=1) used simple [internal combustion engines](http://www.theblackvault.com/wiki/index.php?title=Internal_combustion_engine&action=edit&redlink=1) installed into the thigh assembly of the armor. Still, more fantastic power sources have been introduced, for example, in [*Halo*](http://www.theblackvault.com/wiki/index.php?title=Halo&action=edit&redlink=1) and [*Halo 2*](http://www.theblackvault.com/wiki/index.php?title=Halo_2&action=edit&redlink=1), the [Master Chief](http://www.theblackvault.com/wiki/index.php?title=Master_Chief_(Halo)&action=edit&redlink=1)'s MJOLNIR armor is powered by miniaturized [fusion power](http://www.theblackvault.com/wiki/index.php?title=Fusion_power&action=edit&redlink=1) reactors. Similarly, in [*Final Fantasy: The Spirits Within*](http://www.theblackvault.com/wiki/index.php?title=Final_Fantasy:_The_Spirits_Within&action=edit&redlink=1), the suits are powered by single-celled organisms cultured in *Ovo Packs*.

Not all sci-fi exoskeletons are mechanical, as modification of biological systems can produce similar strength, such as the Skin exoskeleton in [Peter F. Hamilton](http://www.theblackvault.com/wiki/index.php?title=Peter_F._Hamilton&action=edit&redlink=1)'s novel [*Fallen Dragon*](http://www.theblackvault.com/wiki/index.php?title=Fallen_Dragon&action=edit&redlink=1), [Jim Shooter](http://www.theblackvault.com/wiki/index.php?title=Jim_Shooter&action=edit&redlink=1)'s [*X-O Manowar*](http://www.theblackvault.com/wiki/index.php?title=X-O_Manowar&action=edit&redlink=1) comic book, and the [*Guyver*](http://www.theblackvault.com/wiki/index.php?title=Guyver&action=edit&redlink=1) Japanese animation series.

The first citable examples of powered suits were the Fat Man underwater suits (with mechanical pantograph arms and a propulsion system), which debuted in *Tom Swift and His Jetmarine* ([1954](http://www.theblackvault.com/wiki/index.php?title=1954&action=edit&redlink=1)). The powered suit of [Robert A. Heinlein](http://www.theblackvault.com/wiki/index.php?title=Robert_A._Heinlein&action=edit&redlink=1)'s [1959](http://www.theblackvault.com/wiki/index.php?title=1959&action=edit&redlink=1) novel [*Starship Troopers*](http://www.theblackvault.com/wiki/index.php?title=Starship_Troopers&action=edit&redlink=1) can be seen as spawning the entire sub-genre concept of military "powered armor". A Japanese animated version of *Starship Troopers* was produced by [Sunrise](http://www.theblackvault.com/wiki/index.php?title=Sunrise_(company)&action=edit&redlink=1) with mechanical designs by [Studio Nue](http://www.theblackvault.com/wiki/index.php?title=Studio_Nue&action=edit&redlink=1), which presented a reasonable visual portrayal of how the suit operated (although the [OAV](http://www.theblackvault.com/wiki/index.php?title=Original_Video_Animation&action=edit&redlink=1) story differed greatly from the Heinlein novel).

[Science fiction](http://www.theblackvault.com/wiki/index.php/Science_fiction) authors utilize the idea of personal self-powered exoskeletons, usually referred to as **powered armor** or more commonly **power armor**. They are often [robotic](http://www.theblackvault.com/wiki/index.php?title=Robot&action=edit&redlink=1) in nature. Examples include:

**In literature**

* The novel [*Starship Troopers*](http://www.theblackvault.com/wiki/index.php?title=Starship_Troopers&action=edit&redlink=1) details the tactics involved with powered armor. It was also apparently the first work of fiction that widely popularized the concept.
* Standard issue battle armor in [Joe Haldeman](http://www.theblackvault.com/wiki/index.php?title=Joe_Haldeman&action=edit&redlink=1)'s book [*The Forever War*](http://www.theblackvault.com/wiki/index.php?title=The_Forever_War&action=edit&redlink=1) is an [exoskeleton](http://www.theblackvault.com/wiki/index.php?title=Exoskeleton&action=edit&redlink=1) using [logarithmic](http://www.theblackvault.com/wiki/index.php?title=Logarithm&action=edit&redlink=1) force amplification.
* Biological suits known as *skins* are mentioned in Peter Hamilton's novel [*Fallen Dragon*](http://www.theblackvault.com/wiki/index.php?title=Fallen_Dragon&action=edit&redlink=1).
* Very advanced suits based on nanotechnology and a very advanced computer assistance system are depicted in [*Legacy of the Alldenata*](http://www.theblackvault.com/wiki/index.php?title=Legacy_of_the_Alldenata&action=edit&redlink=1) by John Ringo.
* [Armor](http://www.theblackvault.com/wiki/index.php?title=Armor_(novel)&action=edit&redlink=1) by John Steakley is a very good example of powered battle armor.

**In comics and manga**

* The [Marvel Comics](http://www.theblackvault.com/wiki/index.php?title=Marvel_Comics&action=edit&redlink=1) [superhero](http://www.theblackvault.com/wiki/index.php?title=Superhero&action=edit&redlink=1) [Iron Man](http://www.theblackvault.com/wiki/index.php?title=Iron_Man&action=edit&redlink=1), who wields a specialized suit of armor of his own design, is arguably the most popular [American](http://www.theblackvault.com/wiki/index.php?title=United_States_of_America&action=edit&redlink=1) superhero who uses powered armor. Other characters in his long-running [comic book](http://www.theblackvault.com/wiki/index.php?title=Comic_book&action=edit&redlink=1) series have also used such armor, including [War Machine](http://www.theblackvault.com/wiki/index.php?title=War_Machine&action=edit&redlink=1), [Titanium Man](http://www.theblackvault.com/wiki/index.php?title=Titanium_Man&action=edit&redlink=1) and [Crimson Dynamo](http://www.theblackvault.com/wiki/index.php?title=Crimson_Dynamo&action=edit&redlink=1).
* Other notable powered armor users in Western comics include the [supervillain](http://www.theblackvault.com/wiki/index.php?title=Supervillain&action=edit&redlink=1) [Doctor Doom](http://www.theblackvault.com/wiki/index.php?title=Doctor_Doom&action=edit&redlink=1), [Steel](http://www.theblackvault.com/wiki/index.php?title=Steel_(comics)&action=edit&redlink=1), the [Batman](http://www.theblackvault.com/wiki/index.php?title=Batman&action=edit&redlink=1) (in his [*Dark Knight Returns*](http://www.theblackvault.com/wiki/index.php?title=Batman:_The_Dark_Knight_Returns&action=edit&redlink=1), [*Kingdom Come*](http://www.theblackvault.com/wiki/index.php?title=Kingdom_Come_(comic)&action=edit&redlink=1), [*Knightfall*](http://www.theblackvault.com/wiki/index.php?title=Knightfall&action=edit&redlink=1), and [*Batman Beyond*](http://www.theblackvault.com/wiki/index.php?title=Batman_Beyond&action=edit&redlink=1) iterations), [X-O Manowar](http://www.theblackvault.com/wiki/index.php?title=X-O_Manowar&action=edit&redlink=1), and [Guardian](http://www.theblackvault.com/wiki/index.php?title=Guardian_(Marvel_Comics)&action=edit&redlink=1).
* In Japanese [manga](http://www.theblackvault.com/wiki/index.php?title=Manga&action=edit&redlink=1) [*Gantz*](http://www.theblackvault.com/wiki/index.php?title=Gantz&action=edit&redlink=1), the characters wear a powered suit like exoskeleton, which gives them enormous strength and protection.
* The [Franco-Belgian comics](http://www.theblackvault.com/wiki/index.php?title=Franco-Belgian_comics&action=edit&redlink=1) heroine [Yoko Tsuno](http://www.theblackvault.com/wiki/index.php?title=Yoko_Tsuno&action=edit&redlink=1) wore one in *Aventures électronique's' (*Electronic Adventures*),the 4th graphic novel of her adventures.*
* The [webcomic](http://www.theblackvault.com/wiki/index.php?title=Webcomic&action=edit&redlink=1) [Schlock Mercenary](http://www.theblackvault.com/wiki/index.php?title=Schlock_Mercenary&action=edit&redlink=1) includes a variety of powered armor, ranging from 'mini-tanks' down through various sorts of articulated hard suits, to the 'low-profile' carbonan fiber armor that is nearly indistinguishable from ordinary uniforms. All forms of power armor in the series to date has had some flight capacity, owing to the ubiquitous [artificial gravity](http://www.theblackvault.com/wiki/index.php?title=Artificial_gravity&action=edit&redlink=1) technology shown throughout the strip.

**In television and film**

* In the movie [*Aliens*](http://www.theblackvault.com/wiki/index.php?title=Aliens_(1986_film)&action=edit&redlink=1) ([1986](http://www.theblackvault.com/wiki/index.php?title=1986&action=edit&redlink=1)), mechanized exosuits are used in loading cargo for spaceships, as well as Ripley's duel with the queen alien. A military version of this loader can be seen in the video game [*Aliens versus Predator 2*](http://www.theblackvault.com/wiki/index.php?title=Aliens_versus_Predator_2&action=edit&redlink=1).
* The Hardman gear Raimi wears in the [1994](http://www.theblackvault.com/wiki/index.php?title=1994&action=edit&redlink=1) movie [*Death Machine*](http://www.theblackvault.com/wiki/index.php?title=Death_Machine&action=edit&redlink=1).
* The [Armored Personnel Units](http://www.theblackvault.com/wiki/index.php/Armored_Personnel_Unit) seen in [*Matrix Revolutions*](http://www.theblackvault.com/wiki/index.php?title=Matrix_Revolutions&action=edit&redlink=1) ([2003](http://www.theblackvault.com/wiki/index.php?title=2003&action=edit&redlink=1)), although these walk the line between powered armor and giant robots.

**In animation**

* In the American action cartoon series [*Centurions*](http://www.theblackvault.com/wiki/index.php?title=Centurions&action=edit&redlink=1), the Centurions used a [uniform](http://www.theblackvault.com/wiki/index.php?title=Uniform&action=edit&redlink=1) like powered exoframes with several hard points, which enabled them to be with merged with multiple weapon systems.
* Exoskeletal vehicles named "[E-frames](http://www.theblackvault.com/wiki/index.php?title=E-frame&action=edit&redlink=1)" were one of the central aspects of the American animated television series [*Exosquad*](http://www.theblackvault.com/wiki/index.php?title=Exosquad&action=edit&redlink=1).
* Exoskeletal suits named "EMACS" (*Energized Monster Armed Containment Suit*) or simply *power suits* were a standard weapon in the animated cartoon series [*Monster Force*](http://www.theblackvault.com/wiki/index.php?title=Monster_Force&action=edit&redlink=1).
* Many [Japanese animation](http://www.theblackvault.com/wiki/index.php?title=Japanese_animation&action=edit&redlink=1) featuring mechanical objects also have humans controlling gigantic exo-skeletons, such as [*The Vision of Escaflowne*](http://www.theblackvault.com/wiki/index.php?title=The_Vision_of_Escaflowne&action=edit&redlink=1), [*Bubblegum Crisis*](http://www.theblackvault.com/wiki/index.php?title=Bubblegum_Crisis&action=edit&redlink=1), [*Gundam*](http://www.theblackvault.com/wiki/index.php?title=Gundam&action=edit&redlink=1) or [*Ghost in the Shell: Stand Alone Complex*](http://www.theblackvault.com/wiki/index.php?title=Ghost_in_the_Shell:_Stand_Alone_Complex&action=edit&redlink=1). Although many of these are not exactly exoskeletons because of their non-humanoid forms, the main principle is identical. *(See below.)*

**In Mecha**

[Mecha](http://www.theblackvault.com/wiki/index.php?title=Mecha&action=edit&redlink=1) from [*Starship Troopers*](http://www.theblackvault.com/wiki/index.php?title=Starship_Troopers_(OVA)&action=edit&redlink=1) (1988).]] [Japanese](http://www.theblackvault.com/wiki/index.php?title=Japan&action=edit&redlink=1) [animation](http://www.theblackvault.com/wiki/index.php?title=Animation&action=edit&redlink=1) ([anime](http://www.theblackvault.com/wiki/index.php?title=Anime&action=edit&redlink=1)) and [comics](http://www.theblackvault.com/wiki/index.php?title=Comics&action=edit&redlink=1) ([manga](http://www.theblackvault.com/wiki/index.php?title=Manga&action=edit&redlink=1)) often feature powered armor in the [***mecha***](http://www.theblackvault.com/wiki/index.php?title=Mecha&action=edit&redlink=1) subgenre; both the subgenre and the suits are called "mecha". Most mecha are not human-enhancing exoskeletons so much as human-operated [robots](http://www.theblackvault.com/wiki/index.php?title=Robot&action=edit&redlink=1). The distinction between smaller mecha and their smaller cousins (and likely progenitors), the powered armor suits, is blurred; according to one definition, a mecha is piloted while a powered armor is worn. Anything large enough to have a cockpit where the pilot is seated is generally considered a mecha. Both Masamune Shirow's "Landmates" featured prominently in [*Appleseed*](http://www.theblackvault.com/wiki/index.php?title=Appleseed&action=edit&redlink=1) and the form-fitting "Hard suits" of [*Bubblegum Crisis*](http://www.theblackvault.com/wiki/index.php?title=Bubblegum_Crisis&action=edit&redlink=1) are examples of powered armor that is worn. Conversely, the "Armored Trooper" of [Armored Trooper VOTOMS](http://www.theblackvault.com/wiki/index.php?title=Armored_Trooper_VOTOMS&action=edit&redlink=1) are an example of piloted powered armor-sized mecha.

**In Video Games**

* In [Terra Nova: Strike Force Centauri](http://www.theblackvault.com/wiki/index.php?title=Terra_Nova:_Strike_Force_Centauri&action=edit&redlink=1), a 1st person tactical game by [Looking Glass Studios](http://www.theblackvault.com/wiki/index.php?title=Looking_Glass_Studios&action=edit&redlink=1), powered armor is the centerpiece, featuring many types of powered armor and loadout combinations. Among those found in electronic games, Terra Nova's powered armor suits are also the ones most similar to the drop suits and powered armor found in Robert Heinlein's novel, [Starship Troopers](http://www.theblackvault.com/wiki/index.php?title=Starship_Troopers&action=edit&redlink=1).
* [Gordon Freeman](http://www.theblackvault.com/wiki/index.php?title=Gordon_Freeman&action=edit&redlink=1)'s Hazardous Environment ([HEV](http://www.theblackvault.com/wiki/index.php?title=Gordon_Freeman&action=edit&redlink=1)) Suit from [*Half-Life*](http://www.theblackvault.com/wiki/index.php?title=Half-Life&action=edit&redlink=1) and [*Half-Life 2*](http://www.theblackvault.com/wiki/index.php?title=Half-Life_2&action=edit&redlink=1) is an exoskeleton originally designed for extra-dimensional survival, exploration and possibly combat due its projectile resistant [active armor](http://www.theblackvault.com/wiki/index.php?title=Active_armour&action=edit&redlink=1) and weapons recognition systems.
* The [*Half-life*](http://www.theblackvault.com/wiki/index.php?title=Half-life&action=edit&redlink=1) expansion pack [*Opposing force*](http://www.theblackvault.com/wiki/index.php?title=Opposing_force&action=edit&redlink=1) featured [*Adrian Shephard*](http://www.theblackvault.com/wiki/index.php?title=Adrian_Shephard&action=edit&redlink=1) of the [*HECU*](http://www.theblackvault.com/wiki/index.php?title=HECU&action=edit&redlink=1) wearing a power vest, powered Armour designed as a high tech bullet proof vest to absorb the damage of attacks. It is assumed that in the story context this is a new or newly mainstream technology funded by the government for the military.
* The [*Half-Life*](http://www.theblackvault.com/wiki/index.php?title=Half-Life_(computer_game)&action=edit&redlink=1) [mod](http://www.theblackvault.com/wiki/index.php?title=Mod_(computer_gaming)&action=edit&redlink=1) known as [*Natural Selection*](http://www.theblackvault.com/wiki/index.php?title=Natural_Selection_(computer_game)&action=edit&redlink=1) features a full armor suit, an advanced technology that Marines can acquire, which absorbs much damage for the wearer, is powered so the wearer maintains agility almost equal to an unencumbered person, and can be repaired when damaged.
* The [*Half-Life 2*](http://www.theblackvault.com/wiki/index.php?title=Half-Life_2&action=edit&redlink=1) [mod](http://www.theblackvault.com/wiki/index.php?title=Mod_(computer_gaming)&action=edit&redlink=1) known as [*Dystopia*](http://www.theblackvault.com/wiki/index.php?title=Dystopia_(computer_game)&action=edit&redlink=1) features power armor for its Medium class, and complete exoskeletons for its Heavy class. Additionally, all classes can equip themselves with "leg boosters", which increase jump height and brace against high falls.
* In [*Deus Ex*](http://www.theblackvault.com/wiki/index.php?title=Deus_Ex&action=edit&redlink=1), the Majestic 12 Commando units wear power armor (dubbed 'obsidian' armor by their creators) that is outfitted with two 7.62mm machineguns and two rocket launchers.
* In [*Deus Ex: Invisible War*](http://www.theblackvault.com/wiki/index.php?title=Deus_Ex:_Invisible_War&action=edit&redlink=1), the [Templar](http://www.theblackvault.com/wiki/index.php?title=Deus_Ex:_Invisible_War_characters&action=edit&redlink=1) Paladins wear Power Armour to combat their biomodified foes.
* [Samus Aran](http://www.theblackvault.com/wiki/index.php?title=Samus_Aran&action=edit&redlink=1) from the [*Metroid*](http://www.theblackvault.com/wiki/index.php?title=Metroid&action=edit&redlink=1) series of video games wears an exoskeleton, the [Power Suit](http://www.theblackvault.com/wiki/index.php?title=Items_in_the_Metroid_series&action=edit&redlink=1) designed by the [Chozo](http://www.theblackvault.com/wiki/index.php?title=Chozo&action=edit&redlink=1) and enhanced with an attached arm cannon, which grants her the ability to roll into a ball around 1 meter in diameter and/or perform very high spinning jumps. in addition, it allows her to survive almost indefinitely underwater, as well as in the vacuum of space. the suit is modular in design, allowing the incorporation of additional weapons detection equipment, movement enhancements, and protective shielding.
* The [*Fallout*](http://www.theblackvault.com/wiki/index.php?title=Fallout_(computer_game)&action=edit&redlink=1) [computer role-playing game](http://www.theblackvault.com/wiki/index.php?title=Computer_role-playing_game&action=edit&redlink=1) series is notable for its use of powered armors in [retro](http://www.theblackvault.com/wiki/index.php?title=Retro&action=edit&redlink=1)-['50s](http://www.theblackvault.com/wiki/index.php?title=1950s&action=edit&redlink=1) style.
* Warriors in the [*Tribes*](http://www.theblackvault.com/wiki/index.php?title=Tribes_(video_game)&action=edit&redlink=1) series have access to several types of powered armor.
* The super-soldier [Master Chief](http://www.theblackvault.com/wiki/index.php?title=Master_Chief_(Halo)&action=edit&redlink=1) in the [video game](http://www.theblackvault.com/wiki/index.php?title=Video_game&action=edit&redlink=1) series [*Halo*](http://www.theblackvault.com/wiki/index.php?title=Halo:_Combat_Evolved&action=edit&redlink=1) is clad in energy-shielded and strength-enhancing armored suit weighing nearly one thousand pounds, called the [MJOLNIR battle armor](http://www.theblackvault.com/wiki/index.php?title=MJOLNIR_battle_armor&action=edit&redlink=1), that can allow him to turn over armored vehicles, quickly dispatch foes in melee combat, and house starship-grade AI to allow him to override enemy electronic defenses. The character is so heavily associated with the suit that he is never depicted outside of the armor, though at both the end of *Halo* and the start of [*Halo 2*](http://www.theblackvault.com/wiki/index.php?title=Halo_2&action=edit&redlink=1), the Master Chief is helmetless, with his head offscreen.
* Also, the [Clone Commandos](http://www.theblackvault.com/wiki/index.php?title=Clone_Commandos&action=edit&redlink=1) in [*Star Wars: Republic Commando*](http://www.theblackvault.com/wiki/index.php?title=Star_Wars:_Republic_Commando&action=edit&redlink=1) sport a version of powered armor (though it is more armor than power).
* Exoskeletons have surfaced in many other [video games](http://www.theblackvault.com/wiki/index.php?title=Video_game&action=edit&redlink=1). Some examples would be certain marines from [*Unreal II: The Awakening*](http://www.theblackvault.com/wiki/index.php?title=Unreal_II:_The_Awakening&action=edit&redlink=1) and *MAX Units* from [*PlanetSide*](http://www.theblackvault.com/wiki/index.php?title=PlanetSide&action=edit&redlink=1).
* [Terran Marines](http://www.theblackvault.com/wiki/index.php?title=Terran_Marines&action=edit&redlink=1) from the game [Starcraft](http://www.theblackvault.com/wiki/index.php?title=Starcraft&action=edit&redlink=1) wear powerful suits of power armor for protection. It allows both space and ground operations.
* After extensive research, troops in the computer game [X-Com](http://www.theblackvault.com/wiki/index.php?title=X-Com&action=edit&redlink=1) have access to power armor that allows damage resistance and flight.
* In the mmorpg [Neocron 2](http://www.theblackvault.com/wiki/index.php?title=Neocron_2&action=edit&redlink=1) high level players have access to several types of power armor.
* In the Video Game series, Metal Gear Solid, a character Cyborg Ninja possesses a powerful exoskeleton which has stealth camouflage.
* In video games like [Quake 4](http://www.theblackvault.com/wiki/index.php?title=Quake_4&action=edit&redlink=1), [Doom 3](http://www.theblackvault.com/wiki/index.php?title=Doom_3&action=edit&redlink=1) and [Space Hulk](http://www.theblackvault.com/wiki/index.php?title=Space_Hulk&action=edit&redlink=1) the fictional [Space Marines](http://www.theblackvault.com/wiki/index.php?title=Space_Marines&action=edit&redlink=1) wear power armor to withstand superior enemy alien projectiles.
* In Eugen System's RTS [Act of War: Direct Action](http://www.theblackvault.com/wiki/index.php?title=Act_of_War:_Direct_Action&action=edit&redlink=1), Task Force Talon's signature unit is the SHIELD Unit (Super High Infantry Electronic Defense Unit), which is a powered armor combat exoskeleton outfitted with a GAU-19 20mm Vulcan Cannon and a Javelin Missile Launcher. These units have medium armor and used mostly as fast hit-and-run raiders that can take down helicopters in large groups, but do not fare too well against tanks and heavy artillery. These units can be upgraded with a millimetric radar system to allow their pilots to detect stealth units.

**In other media**

* In the [BattleTech](http://www.theblackvault.com/wiki/index.php?title=Battletech&action=edit&redlink=1) universe, genetically engineered [Clan](http://www.theblackvault.com/wiki/index.php?title=Clans_(BattleTech)&action=edit&redlink=1) soldiers are bred for strength and other qualities to wear Elemental powered armor. Elemental armor also provides advanced medical technologies to keep the wearer alive in case of severe injury or trauma during combat. Following the Clan Invasion, many other governments began to deploy Battle Armored suits, but often of lesser quality then the original Elemental Armour.
* Powered armor is heavily used in [science fiction](http://www.theblackvault.com/wiki/index.php/Science_fiction) [role-playing games](http://www.theblackvault.com/wiki/index.php?title=Role-playing_game&action=edit&redlink=1), such as [*Rifts*](http://www.theblackvault.com/wiki/index.php?title=Rifts_(role-playing_game)&action=edit&redlink=1), to allow weak and mundane [humans](http://www.theblackvault.com/wiki/index.php?title=Human&action=edit&redlink=1) to compete in combat with supernatural and super-powerful adversaries. Two common examples of Powered Armor (or just Power Armor) in that series are the 10 foot [Glitter Boy](http://www.theblackvault.com/wiki/index.php?title=Glitter_Boy&action=edit&redlink=1), which is covered in a coat of mirror-like, laser-resistant alloys; and the jet flight capable Strategic Armor Military Assault Suit (commonly called the [SAMAS](http://www.theblackvault.com/wiki/index.php?title=SAMAS&action=edit&redlink=1) or Sam as a nod to [Samus Aran](http://www.theblackvault.com/wiki/index.php?title=Samus_Aran&action=edit&redlink=1)).
* [Games Workshop](http://www.theblackvault.com/wiki/index.php?title=Games_Workshop&action=edit&redlink=1)´s science fiction world [*Warhammer 40,000*](http://www.theblackvault.com/wiki/index.php?title=Warhammer_40,000&action=edit&redlink=1) includes [Space Marines](http://www.theblackvault.com/wiki/index.php?title=Space_Marines_(Warhammer_40,000)&action=edit&redlink=1) who wear ancient powered armors that are revered to the point of worship, so precious is their lost technology. Recently, [Games Workshop](http://www.theblackvault.com/wiki/index.php?title=Games_Workshop&action=edit&redlink=1) Created the [Tau](http://www.theblackvault.com/wiki/index.php?title=Tau_(Warhammer_40,000)&action=edit&redlink=1) Race, which take clear visual inspiration from the Mecha genre in the models, the "Crisis" suits falling somewhere between powered armor and mecha.
* In the storyline of [Magic the Gathering](http://www.theblackvault.com/wiki/index.php?title=Magic_the_Gathering&action=edit&redlink=1), the planes walker [Urza](http://www.theblackvault.com/wiki/index.php?title=Urza&action=edit&redlink=1) devises power armor for himself and several other planes walkers in order to allow them to invade and survive [Phyrexia](http://www.theblackvault.com/wiki/index.php?title=Phyrexia&action=edit&redlink=1).

**Other alternatives**

An alternative sci-fi concept to the powered armor would be the **skinsuit**, a very thin (hence the name) and flexible powered armor variant. The skinsuit can be used as an environmental-protection suit, similar to [spacesuit](http://www.theblackvault.com/wiki/index.php?title=Spacesuit&action=edit&redlink=1) (for example, in the [Honorverse](http://www.theblackvault.com/wiki/index.php?title=Honorverse&action=edit&redlink=1) universe), or may have some artificial muscle that increases strength, resistance and endurance, but in that case sacrifices environmental protection, sensory equipment, and built-in weaponry. The suits seen in the [anime](http://www.theblackvault.com/wiki/index.php?title=Anime&action=edit&redlink=1) and [manga](http://www.theblackvault.com/wiki/index.php?title=Manga&action=edit&redlink=1) versions of [*Spriggan*](http://www.theblackvault.com/wiki/index.php?title=Spriggan_(manga)&action=edit&redlink=1) and *Gantz* or skull suit from [*Metal Gear Solid 2: Sons of Liberty*](http://www.theblackvault.com/wiki/index.php?title=Metal_Gear_Solid_2:_Sons_of_Liberty&action=edit&redlink=1) would be prime example of this form of armor. The military uniforms in the webcomic [*Schlock Mercenary*](http://www.theblackvault.com/wiki/index.php?title=Schlock_Mercenary&action=edit&redlink=1) are almost universally skinsuits, utilizing [buckminsterfullerene](http://www.theblackvault.com/wiki/index.php?title=Buckminsterfullerene&action=edit&redlink=1) tubule-weave cloth and incorporating [antigrav](http://www.theblackvault.com/wiki/index.php?title=Anti-gravity&action=edit&redlink=1) systems to allow a soldier flight capabilities.

As with powered exoskeletal armor, it is become apparent that even the skinsuit will become a possibility in the near future: The [Massachusetts Institute of Technology](http://www.theblackvault.com/wiki/index.php?title=Massachusetts_Institute_of_Technology&action=edit&redlink=1) has reopened research into the [space activity suit](http://www.theblackvault.com/wiki/index.php?title=Space_activity_suit&action=edit&redlink=1), a type of spacesuit that equalizes pressure through mechanical pressure as the suit with the breathing gas and [DARPA](http://www.theblackvault.com/wiki/index.php?title=Defense_Advanced_Research_Projects_Agency&action=edit&redlink=1) is researching using carbon nanofiber tubes as artificial muscles for powered uniforms as opposed to an exoskeleton rig.

**External links**

* [Video, images and articles about the Bleex exoskeleton project](http://bleex.me.berkeley.edu/bleex.htm)
* [Berkeley Bleex press release](http://www.berkeley.edu/news/media/releases/2004/03/03_exo.shtml)
* [Wired Magazine](http://www.theblackvault.com/wiki/index.php?title=Wired_Magazine&action=edit&redlink=1) Issue 13.01 | Jan 2005 - [Tetsujin](http://wired.com/wired/archive/13.01/ironmen.html), the world's first exoskeleton weight-lifting competition
* [Mecha in AK](http://www.ananova.com/news/story/sm_1252537.html)
* [SpringWalker Walking Aid](http://www.springwalker.com/)
* [Japanese nurse assisting skeleton](http://www.newscientist.com/article.ns?id=dn1072)
* [HAL project](http://sanlab.kz.tsukuba.ac.jp/HAL/indexE.html)
* [The Rise of the Body Bots](http://www.spectrum.ieee.org/oct05/1901), [*IEEE Spectrum*](http://www.theblackvault.com/wiki/index.php?title=IEEE_Spectrum&action=edit&redlink=1)

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