

Leviathan Reach - Technology

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Part I

Rules and Information

Chapter 1

Buying Equipment

Legal equipment can usually be purchased from local shops or in the expansive Siren Corp catalogs (offering more than just Siren Corp equipment!). Very expensive items, those that require a license, or are otherwise specialized will require the buyer to find a dealer, work directly with a manufacturer, or other specialist to create it for them. Expensive but commonplace civilian gear is generally easy to purchase, but others may require more time and effort to arrange.

Black Markets

If an item is illegal to own, expensive to acquire, or rare, it may be available from one or more outlets in the underground economy – the black market.

Availability

Acquiring goods usually requires a Contact (pp. B44-B45) who knows how to reach the local black market merchants. Alternately, Streetwise (p. B223) can be used to locate new connections. These rolls are made secretly by the GM and a failure may result in unwanted attention from local law enforcement or criminal syndicates, while a critical failure may mean worse (perhaps a police “sting,” a criminal ambush, or defective goods).

Modifiers: Subtract the local Control Rating (p. B506) and Cultural Familiarity modifiers (p. B23); +1 if the area includes a major shipping port, is bordering a low-CR country, or has ineffectual (i.e., corrupt or undermanned) law enforcement; -3 in an unfamiliar area.

Markets

The term “black market” describes any business that operates illegally. Some sell proscribed services, while others circumvent tax or safety laws to undercut legitimate competitors. Within a black market, there may be various niches that cater to specific customers and require specialized Contacts (or skill penalties) to deal with. Some examples include:

Electronics: This can include prototype or custom-made computers, pirated copies of name brand software, and banned software. Failure means the product you bought

doesn't work as advertised or was fake. A critical failure may mean a knock on the door by the legal owner or patent holder – who's to say how they found you and why.

Medical: This can include cut-rate surgical, unlicensed implant clinics, stolen bionics (perhaps with the previous owner still attached), and cheap drugs or nanosymbionts. Failure means you don't find what you're looking for, or the seller can't provide the amount requested. A critical failure may leave you with scars, placebos, or worse.

Entities: Androids, robots, slaves, organs, and illegal clones (your own, or someone else's). Failure means you receive a defective product, or that having it around will be a risk to life and limb. A critical failure means you're the target of a raid or your new acquisition has a hidden homicidal streak.

Weapons: Stolen or smuggled firearms, banned ammunition, and purloined military vehicle and combat robots. Failure means you can only get an inferior version of what you were looking for. Critical failure means it will malfunction on first use, or that someone is tracking it. Caveat emptor

Prices

The black market operates in competition with the normal market for many goods. To sell goods readily available from legal channels, it can only compete by making things easier to acquire (which is rare), or by selling for a lower price (by not charging for taxes, selling cheap copies, or fencing stolen goods). Easily copied media and textiles can sell for as little as 5% of normal price, but most other items sell for 60% of normal price.

The black market is opportunistic: if an item is hard to acquire legally, it has an edge over the legitimate market and will exploit it ruthlessly. Successful haggling with the Merchant skill can bring the price down, but black market dealers rarely have any incentive to offer big discounts!

Local availability and demand is a major factor in the final price. The inhabitants of a war-torn country may sell military weapons at a huge discount to anyone with hard currency, while electronics and food are sold at outrageous markups. A rich, peaceful country with thriving black markets in cheap alcohol and pirated movies may not have LC3 or lower weapons available for any price.

Chapter 2

Wear and Care

Maintaining Gadgets

Simple objects don't require much maintenance. If an object costs less than \$50, it generally is simple enough that it will work indefinitely without need for repairs.

Some items – especially those that are complex or regularly placed under stress – may require periodic “maintenance checks.” Most of the time, this can be assumed to have happened during downtime (such as during long space voyages), but if, for whatever reason, it takes place “on screen” it requires a roll against a suitable technical skill, as described for the Maintenance disadvantage (p. B143). M

Missed or failed maintenance checks result in HT loss (if an item does not have a listed HT, assume 10). This HT loss is cumulative, and affects any HT rolls the equipment must make (see *Effects of Injury* p. B483 and *Slime, Sand, and Equipment Failure* p. B482).

As mentioned above, these rules do not apply to simple items, equipment in storage, or anything unused in a sealed case (or equivalent).

Repairing Gadgets

If a gadget breaks down, it requires either a minor or a major repair. Performing repairs requires the appropriate repair skill. Use:

- Armoury for weapons and defenses.
- Computer Operation for software problems.
- Electronics Repair for electronic devices

- for power transmission systems, power cells, and their interfaces.
- Machinist for manufacturing plants and tools.
- Mechanic for robots, power plants, and vehicles.
- Sewing for fabric (other than body armor).

Some complex systems may require more than one skill. Except for software repairs, appropriate tools are needed – see *Tool Kits* (p. 52).

Minor Repairs: Each attempt to repair damaged equipment that still has positive HP requires half an hour and a successful skill roll. See *Equipment Modifiers* (p. B345) and *Time Spent* (p. B346) for common modifiers. As well, if the device costs \$1,000 or less, roll at +1; if it costs \$10,001–\$100,000 at -1; \$100,001–\$1,000,000 at -2; & \$1,000,000 at -3. Success restores 1 HP times the margin of success.

Major Repairs: For equipment that has been reduced to zero or negative HP requires spare parts that cost 1d × 10% of its original price. These spare parts can also be fabricated using the Machinist skill and the proper tools. After obtaining these parts, use the rules above, except at an extra -2.

Powering Gadgets

Many gadgets require power. Near universally, these gadgets use the standardized power cells outlined in *Power Cells* (p. 10).

Chapter 3

Integrating and Modifying

These modifications can be added to just about any gadget that has both a specified cost and weight (i.e., not software, drugs, etc.)

Disguised

A gadget or weapon may be disguised as something else of similar shape, such as a laser rifle built into an umbrella. Double the cost for a mass-produced disguised item; multiply cost by 5 for a custom-built one.

Styling

Styling alters the device's appearance in as "fashionable" a manner as possible. All sorts of options are possible, including airbrushing, sculpted curves and designs, embedded gemstones, or even built-in lighting. It will cost 2 to 10 times as much depending on the complexity of the styling and possible reaction bonus for possessing it.

Rugged

Rugged gadgets are built to withstand abuse, harsh weather, and physical damage. Rugged systems incorporate modifications such as shock-mounted brackets, heavy-duty heat sinks, and redundant power supplies. A rugged gadget gets a +2 HT bonus and has twice its normal DR. Add 20% to weight and double the cost.

Cheap and Expensive Gadgets

Cheap gadgets use inexpensive materials, older electronics, etc. They are generally 1.5 times normal weight (excluding the weight of any power cells) but half normal cost.

Expensive gadgets use lightweight materials or have been deliberately designed to save weight. They are generally 2/3 normal weight (excluding the weight of any power cells) but cost twice as much.

Plug-in Gadgets

Electronic gadgets can plug into other gadgets, either directly or using data cables. This allows them to link their

functions, or to turn multiple functions on or off with a single Ready maneuver. Most often, this permits a computer to talk to (and control) multiple devices as peripherals, but other combinations can exist.

Linking devices usually takes between 10 seconds and a minute, assuming the gadgets are compatible. If they aren't, or if a particular combination is very complex, connecting them requires a toolkit and Electronics Operation roll. Useful devices for linking gadgets include optical cable (p. 23), cable jacks (p. 23), and microcommunicators (p. 23). A neural interface (p. 26) is a device for mentally linking a person to one or more gadgets.

Gadgets which use similar communicators, such as two gadgets both with radio or ir comms, can also be connected wirelessly. If the devices are compatible, this takes less time than physically connecting them, between 5 to 30 seconds. If they are not, make a roll as above, but at a -2 penalty.

Most electronics can be preprogrammed for a few simple remote functions. Almost all electronics have a simple "clock" function, so they can be set to turn features on or off or activate various functions at a specific time, or upon receiving particular input.

For example, a recorder could be plugged into a communicator to play a message at a certain time, or upon receiving a specific signal, or to act as an answering machine. A detonator plugged into an inertial compass could go off when the subject reached a specific destination. Wireless connectivity is also possible: plug in a communicator set to a specific frequency, and you can talk to the device using a computer and communicator.

Devices that must be aimed are difficult to operate remotely. A gun with a communicator plugged into it could fire, but unless it also had a plugged-in sensor, the firer wouldn't know whether there was a target. And unless a gun with a sensor was attached to something like a powered tripod (p. 98), it could only be fired at someone who crossed its sights. Some pieces of gadget programming may not be possible due to limitations.

Combination Gadgets

Want to invent a device featuring an inertial locator, multi-mode ladar, and neutrino communicator in one handy unit? Here's how.

If the gadgets can be used all at once, the weight is that of the heaviest gadget plus 80% of the weight of the others, the weight savings being due to shared housing and components.

If only one of the combined gadgets can work at once, the weight is based on the highest weight among all gadgets plus 50% of the other gadget weights, due to shared electronics and mechanical parts. (Make this calculation using the empty weight of the gadget, after subtracting the weight of any power cells and ammunition.)

The same applies to cost, based on the costliest of the gadgets. LC is always based on the lowest LC among all component gadgets.

Combined gadgets may end up using several different power cells. To make them all run off the same size of power cell, adjust endurance based on relative cell size. Since a D cell is 10 times the power of a C cell, a gadget that switched to using C cells will operate for one-tenth as long. Don't forget that changing the types of power cells will modify the gadget's actual weight – subtract the weight of the old power cell(s), and add the weight of the new one(s).

Gear for Nonhumans

All equipment listed in this book are assumed to be designed for humans or humanoids. If equipment is designed for non-humans (Ravens, uplifted animals, non-humanoids androids...aliens?) it may have different controls or displays to accommodate the target species' hands or senses. The latter could be quite odd, such as olfactory readouts, colors or sounds in frequencies outside the human range of perception.

Such gadgets that are awkward to use will impose a penalty to skill equivalent to the Bad Grip disadvantage (-2 to -6). Gadget that requires missing senses or limbs may be unusable without technologies or advantages to emulate them. Adapting incompatible "alien" hardware is +10%-100% of the original cost (and possibly weight).

Hardware for nonhumans and robots generally have identical stats, but some stats may differ. The exception to this are devices where statistics vary based on size and surface area. See *Adjusting for SM* (below).

Adjusting for SM

Some gadgets note to "adjust for SM" after their weight, cost, and power requirement. This means the weight, cost, and number of power cells are multiplied by a factor depending on the user's Size Modifier. For ordinary-sized humans (SM 0) there is no change. However, if used by larger or smaller individuals, or if added to vehicles or robots with a higher or lower SM, multiply as follows:

SM	Modifier	SM	Modifier
SM -4	×1/20	SM +4	×20
SM -3	×1/10	SM +5	×50
SM -2	×1/5	SM +6	×100
SM -1	×1/2	SM +7	×200
SM +1	×2	SM +8	×500
SM +2	×5	SM +9	×1,000
SM +3	×10	SM +10	×2,000

Part II

Core Technologies

Chapter 4

Power

Power Cells

The most popular and common power cells in the universe are those produced by Andromeda Electric using Susanoo's storm in the Andromeda Galaxy. While there are non-AE power cells, they are uncommon.

There are several sizes of power cell, designated by letter from AA (the smallest) to F (the largest). Power cells increase in power exponentially. An A cell is 10 times as powerful as an AA cell, a B cell has 10 times the power of an A cell, and so on.

AA cell: These tiny cells operate devices which need minimal power. \$1, 0.0005 lb.

A cell: The size of a watch battery, or postage stamp-sized for flexible cells (see below). \$2, 0.005 lb.

B cell: The size of a pistol cartridge or 21st century AA battery. \$3, 0.05 lb.

C cell: The most common type of power cell. Most equipment designed for larger or smaller cells often include an adapter for C-cell operation. Each cell is about the same size as a pistol magazine. \$10, 0.5 lb.

D cell: Often worn as a power pack, they're about the size of a thick paperback book. \$100, 5 lb. LC4.

E cell: About the size of a backpack. \$2,000, 20 lb. LC4.

F cell: About the size of a compact car engine. \$20,000, 200 lb. LC4.

Flexible Cells

Andromeda Electric also sells flexible variants of their power cells. They are attached like stamps and peeled off when exhausted. Gadgets noted as using flexible cells use them *instead* of normal power cells; they're also embedded into smart labels, smart paper, and similar disposable items. AA and A cost the same but larger sizes are 4 times the normal cost.

Non-Rechargeable Power Cells

Normal cells and flexible cells are rechargeable, but there are also non-rechargeable cells. They last twice as long (or provide twice as many shots) but may not be recharged. They are otherwise identical.

Replacing Power Cells

It takes three seconds to replace an A, B, or C cells with a new one, or 5 seconds to replace a tiny AA or hefty D or E cell, or 20 seconds to replace an F cell. Cells can only be replaced if the user is strong enough to light them out.

Fast-Draw (Ammo) skill can be used to reduce the time for cells loaded into weapons. A successful skill roll reduces the replacement time by one second.

Exploding Power Cells

AE Power Cells contain the volatile energy of Susanoo's storm. As a result, they can explode if destroyed. When they explode, they act as an explosive of the same weight as the cell with REF of 2. The explosion does crushing explosion surge damage.

Jury-Rigging Power cells

Even though devices are designed for a specific size of cell, different cells can be jury-rigged to work. Ten cells that are one size category smaller can substitute for a single larger cell. This requires a roll against Electrician-2 and 10 minutes of work per attempt; critical failure damages the gadget.

Given the prevalence of AE's cells, their design has become the standard and even other company's cells will work in products designed for them. The exception to this is when dealing with older cells. Rolls to use them are at an additional penalty which varies based off the age of the cell.

Generators

Fission Generators

Semi-Portable Fission Reactor: A small fission reactor that fits in a truck bed. \$100,000, 1,000 lb. Typically provides external power for 5 years before refueling and maintenance; Refueling and maintenance is \$50,000. LC2.

Fusion Generators

Semi-Portable Fusion Reactor: A small nuclear fusion reactor. Fuses hydrogen into helium. \$200,000, 100 lb. Its

internal fuel supply lasts for up to 20 years; refueling and maintenance is \$20,000. LC3.

Energy Collection

Solar Panels

Solar Power Array

Semi-portable array of solar panels that provides external power. It takes a minute to deploy and covers about 400 square feet. \$10,000, 500 lb. These sizes are based on earth-like levels of sunlight; multiply cost and weight by relative light levels for other environments. LC4

Solar Paint

Cheap plastic solar cells that can be painted onto any surface, including clothing or rooftops. A coating of solar paint is only 20% of the cost and weight of regular solar panels, but requires twice the surface area and has no DR. LC4

Beamed and Broadcast Power

Devices may operate on beamed or broadcast power coming from a central station. Generally, they must remain

within line of sight. This is commonplace in the Andromeda Galaxy as AE has set up widespread infrastructure. Other planets may have something similar set up as well.

If needed, the cost of this power per month is generally equal to 1% the cost of a customer's power receivers

Beamed Power

Constructed like power cells, these weight the same as the normal power cell they are replacing. They operate indefinitely as long as it is in the line of sight of the transmitter. If sight is interrupted, the receiver's backup system provides power for 1/10th as long as the normal power cell. Cost is the same, but only D cells or larger are available. Beamed power transmitters are usually 10 times the cost and double the weight of an equivalent power cell per mile or fraction of a mile of range; they power one system at a time.

Broadcast Power

This relatively recent innovation from Andromeda Electric works similarly to beamed power, but does not require line of sight for transmission. Broadcast receivers are 10 times as expensive as normal power cells and can come in any size, not just D and up. Broadcast power transmitters are generally double the cost and weight of an equivalent power cell per yard of radius.

Chapter 5

Computers

Hardware

Every computer has a "Complexity" rating. This is an abstract measure of processing power. Each Complexity level represents a tenfold increase in overall capability over the previous level.

A computer's Complexity determines what programs it can run, and may be a prerequisite for certain options, such as Sentient. Software also has a Complexity rating, and can only run on a computer of that Complexity level or higher; e.g., a Complexity 2 program requires a Complexity 2 computer or better.

Complexity determines how many programs a computer can run simultaneously. It can run two programs of its own Complexity, 20 programs of one Complexity level less, 200 programs of two Complexity less, and so on.

Computers are rated for their data storage in petabytes.

Computer Models

These are standard sizes of ordinary computers that lack any sort of self-awareness.

These systems include the processor, the power supply, the casing, and a storage system, plus an operating system. Computers may also have a cable jack (p. 23) and micro-communicator (p. 23) at no extra cost, although these may also be omitted in order to isolate the computer for security purposes.

Displays and controls are not included. Even so, the computer can be used "as is" via a neural interface (p. 26), or installed into a robot body or vehicle. Also, if the computer is equipped with AI software, users can interact with it just by talking to it. Otherwise, they should be equipped with a terminal (p. 13) or a communicator.

Tiny Computer

The smallest multi-purpose computer in regular use. It is Complexity 3 and stores 1 PB. \$50, 0.05 lb., 2A/20 hr. LC4.

Small Computer

It has Complexity 4 and stores 10 PB. \$100, 0.5 lb., 2B/20 hr. LC4.

Personal Computer

Average computer found in almost every middle-class household. It has Complexity 5 and stores 100 PB. \$100, 5 lb., 2C/20 hr. or external power. LC4.

Microframe

High-end cabinet-sized machine. It has Complexity 6 and stores 1,000 PB. \$10,000. 40 lb., external power. LC3.

Mainframe

It has Complexity 7 and stores 10,000 PB. \$100,000, 400 lb., external power. LC3.

Macroframe

Massive computers. They have Complexity 8 and store 100,000 PB. \$1,000,000, 4,000 lb., external power. LC3.

Megacomputer

A computer the size of a building. It has Complexity 9 and stores 1,000,000 PB. \$10,000,000. 40,000 lb., external power. LC2.

Customizing Hardware

Various options are available to customize computer hardware. Multiple options can be chosen, but each option can only be taken once. Modifiers to Complexity, cost, etc. apply to the hardware statistics. Cost and weight multipliers are multiplied together. Complexity and LC modifiers are additive, but LC cannot go below LC.

Compact: Double the cost, halve the weight. Halve the number of power cells and the operating duration

Fast: This option cannot be combined with Slow or Genius. +1 Complexity. Multiply the cost by 20.

Genius: This option cannot be combined with Fast or Slow. +2 Complexity. Multiply the cost by 500 and reduce LC by 1.

Hardened: +3 to HT to resist electromagnetic pulses, microwaves, and other attacks that target electrical gadgets. Double the cost, double the weight.

High-Capacity: Run 50% more programs simultaneously. Cost is 1.5 times normal.

Printed: Printed on a flexible surface, such as fabric or even skin. Requires 4 sqft per pound of weight. Must use solar cells or flexible cells for power. Breaking the surface destroys the computer. This option is not compatible with quantum computers. -1 Complexity, and storage is reduced to TB instead of PB.

Quantum: Drastically reduces the time required to perform certain processes. Multiply the cost by 10, and double the weight. -1 LC.

Slow: This option cannot be combined with Fast or Genius. -1 Complexity and 1/10th storage. Divide cost by 20.

Data Storage: Additional built-in data storage can be purchased for \$1 and 0.0001 lb. per additional PB.

Terminals

The standard types of terminal are:

Datapad: Tiny color video screen with built-in touch screen, resembling a cellphone. Can be built into a computer or be separate (or even worn similarly to a wrist-watch). Includes a microcommunicator, a cable jack, a speaker/microphone, and a mini-camera. Any tasks requiring use of the keyboard and screen for lengthy or complex periods are at -2 to skill. It has a data-chip removable drive. \$10, 0.05 lb. 2A/20 hr. LC4.

Head-Up Display (HUD): A 3D video display integrated into glasses or a helmet visor, or designed to be projected onto a windscreen. A HUD can also be printed onto a flat surface. Many vehicles, suits, sensor goggles, and the like incorporate a HUD at no extra cost. If bought separately: \$50, neg., uses external power. LC4.

Sleeve Display: A square of touch-sensitive digital cloth woven into the fabric of clothing, uniforms, and body armor. It has a built-in speaker. \$50, neg, Af/10 hr. LC4.

Portable Terminal: A small but functional color video display and multi-system interface (keyboard, mouse, speakers, mic, video camera), typical of laptop computers. Also used as a remote control for many types of devices, such as sensors, communicators, and drones. It's adequate for most tasks, though time-consuming or graphics-intensive tasks require a desktop workstation (see below) to avoid a -1 penalty. It has both data-chip and removable drives. \$50, 0.5 lb., 2B/20 hr. LC4.

Workstation Terminal: A complete desktop, vehicular console, or office system with the same capabilities as a portable terminal. It has a larger keyboard, a full-size 3D monitor, a document scanner/printer, and a hook-up for VR. \$500, 5 lb. C/10 hr. or external power. LC4.

Computerized Crew Station: This is a high-end workstation with controls that can be reconfigured, multi-function programmable displays, and a padded, adjustable seat. Generally, these stations are required for controlling complex systems in vehicles like spaceships and in power stations. \$2,000, 50 lb., uses external power. LC4.

Holographic Crew Station: As the computerized crew station, but that uses holographic projection to immerse the

user in 3D imagery. \$10,000, 50 lb., uses external power. LC4.

Multisensory Holographic Crew Station: As the computerized crew station, but the controls and displays can be configured for nonhuman senses—for example, ultrasonic, infrared, or even olfactory outputs. \$50,000, 100 lb.; uses external power; LC4.

Holoprojection: Any terminal can also be made using a holoprojector instead of a screen. This is generally a mini holoprojector (see p.).

Software

A system can be programmed to do just about anything, but good programming is expensive.

Programs

Programs are rated for their cost, LC, and Complexity, which determines what systems they can run on. Descriptions of programs are found in relevant sections. See Encryption, Sensies, Tactical Programs, and Virtual Reality.

Software cost may vary depending on the nature of the program and its provenance (shareware, pirated, demo copy, open-source, etc.). Many programs have free versions, not all of which are legal. Free programs often lack novice-friendly interfaces and manuals, so a Computer Operation roll is generally required to find, install, or use them.

Software Cost Table

Complexity	Cost
Complexity 1	\$1
Complexity 2	\$3
Complexity 3	\$10
Complexity 4	\$30
Complexity 5	\$100
Complexity 6	\$300
Complexity 7	\$1,000
Complexity 8	\$3,000
Complexity 9	\$10,000
Complexity 10	\$30,000
Complexity 11	\$100,000
Complexity 12	\$300,000
Complexity 13	\$1,000,000

Software Tools

IQ-based technological skills generally require software to function at full effectiveness when performing any task involving research, analysis, or invention. Software tools are also generally needed or useful for skills such as Accounting, Artillery, Market Analysis, Strategy, Tactics, and Writing.

Basic programs are incorporated into dedicated systems integrated into the devices used to perform the skill and provide no bonus.

Good-quality programs give a +1 bonus. These are Complexity 4 for Easy skills, Complexity 5 for Average, Hard or Very Hard skills.

Fine-quality programs give a +2 bonus. These are Complexity 6 for Easy skills, Complexity 7 for Average, Hard, or Very Hard skills.

Artificial Intelligence

An artificial intelligence (AI) is a sentient or sapient computer system. AIs range from barely-sentient insect-level intelligence to godlike minds, though most (especially those used in robots) are sapient. Sapient AIs are also classed as dedicated, non-volitional, or volitional.

Dedicated AI: This is a simple AI program that lacks initiative or personality. It is incapable of learning and is at most a "smart tool." Complexity is $(IQ/2)+1$. LC4.

Non-Volitional AI: An AI capable of understanding natural speech, learning technological skills, and learning by itself. It, however, lacks initiative and is essentially an automaton. Most would not consider them to be persons. Complexity is $(IQ/2)+2$. LC4 unless their IQ 15+, then LC3.

Volitional AI: "Strong AI" with just as much initiative and creativity as a living creature of equivalent intelligence. Complexity is $(IQ/2)+3$. LC4 if IQ 6-8, LC3 if IQ 9-14, LC2 if IQ 15-19, or LC1 if IQ 20+.

Databases

Chapter 6

Robots and Total Cyborgs

A *robot* is a computer-controlled machine capable of perceiving and manipulating its environment. While many robots exist simply to serve their designed purpose, Androids are robots with volitional AI who are considered people in their own right.

Various robots are described in this book. They can be found in the chapters relevant to their function, e.g., combat robots in the Weaponry part. Racial templates are provided for machines that are suitable as player characters, or which may be associated NPCs (such as allies). Other robots are described as animals or equipment.

Robots are also characterized by the type of intelligence inhabiting them. Any given robot body can have different types of intelligence depending on its software, or the replacement of its directing computer with a cyborg brain.

Digital Intelligences

The most typical robot is a machine controlled by a digital intelligence: a sapient self-aware computer program.

The complexity of the computer hardware and the software will set a limit on the robot's IQ.

Most digital intelligences are Artificial Intelligences (p. 14), or AIs. For robots that do only what you tell them to do, install a non-volitional AI. For robots that have free will, also known as androids, install a volitional AI. Note, though, that in most civilized societies Androids are considered living beings and have the associated rights.

Digital intelligences can also be mind emulations created from uploading human (or other) brains as detailed in Chapter 8. See *Uploading* (p. TODO) and *Mind Emulation ("Ghost") Programs* (p. TODO).

For traits associated with different digital intelligences, see *Machine Intelligence Lenses* (p. TODO).

Drones

A robotic drone is a remotely-controlled machine that is not sentient: it has IQ 0. It usually has a computer onboard that handles some autonomic functions, such as helping to stabilize a walking or flying drone, but a drone isn't self-aware. Drones are also known as remotely-piloted vehicles (RPVs) or teleoperated robots.

Drones are popular as a physical form of telepresence, an alternative to the digital telepresence of VR.

With the correct command codes, any robot body – even one housing an AI or cyborg – can be teleoperated as a drone.

A drone's computer runs a simple software program (Complexity 3) that controls its body and communication systems. A robot body that is *only* being used as a drone has the drone lens – see *Machine Intelligence Lenses* (p. TODO).

Cyborgs

A cyborg is a fusion of biological and machine parts. There are two classes of cyborg:

Partial Cyborgs are living creatures whose bodies contain mechanical or electronic parts. They do not qualify for the Machine meta-trait. Someone with an artificial heart, bionic leg, or a neural interface implant is a partial cyborg. These cybernetic modifications are covered in *Cybernetics and Uploading*.

Total Cyborgs are robot bodies that house a living brain and (sometimes) parts of the spinal cord. Aside from this, they are machines. A total cyborg has a computer that controls many of its functions, but the guiding intelligence is the biological brain. In the case of a total cyborg, the robot's computer is reduced one size (e.g., a personal computer becomes a small computer) and a cyborg brain case inserted.

No special lens is required for a total cyborg: use the unmodified racial template, except that the computer is one size smaller than indicated. Some robot bodies aren't big enough to contain a human-sized brain case; see the individual descriptions. The cyborg brain rules (p. 150) specify the space required.

Chapter 7

Machines as Characters

Robot characters are created by choosing (or designing) a robot body template. The robot templates throughout represent general classes of machines rather than particular models.

Each template comes with a set of lenses that represent particular designs. Each robot template must include a machine intelligence lens (below). Other lenses are optional. Many robots are built to resemble a living creature, and have a biomorphic lens (p. 16). Most robot templates include a series of age lenses representing design improvements from advancing technology.

Machine Intelligence Lenses

Als and mind emulations are digital intelligences; cyborg brains are for total cyborgs. In all cases below, listed Complexity is set by racial average IQ, not based on individual IQ.

Cyborg Brain (0 points): A living brain is housed inside the machine. The robot template's computer is reduced one size to make room. See Total Cyborg Brain Transplants (p. 150) for the size of brain case that the machine can hold.

Drone (-255 points): IQ-10 [-200]; Dead Broke [-25], Re-programmable [-10], Social Stigma (Subjugated) [-20]; Taboo Trait (Fixed IQ). This is a Complexity 3 program.

Mind Emulation (+5 points): This digital intelligence simulates the functioning of a living brain. Some mind emulations may be sapient copies or “uploads” of human minds – see Uploading (pp. 219-220). A mind emulation has Digital Mind [5] and the taboo trait (Complexity-Limited IQ). It requires computer hardware and software with a Complexity equal to or greater than its $(IQ/2)/+4$, rounded up.

Non-Volitional AI (-38 points): This program lacks self-direction, initiative, creativity, and empathy. It ignores orders from anyone but its master. It is Indomitable [15], with the meta-trait AI [32] and Automaton [-85], and the taboo trait (Complexity-limited IQ). It requires computer hardware and software with a Complexity equal to or greater than its $(IQ/2)+2$, rounded up.

Volitional AI (+32 points): This sentient program has as much self-initiative and creativity as a living creature of equivalent intelligence. It has the meta-trait AI [32] and

the taboo trait (Complexity-limited IQ). This means it requires computer hardware and software with a Complexity equal to or greater than its $(IQ/2)+3$, rounded up.

Weak Dedicated AI (-83 points): This non-volitional AI is also incapable of self-improvement. It might seem to learn by storing and remembering data, but it cannot assimilate information and use that knowledge in new ways. It has Cannot Learn [-30], the meta-trait AI [32] and Automaton [-85], and the taboo trait (Complexity-limited IQ). This means it requires computer hardware and software with a Complexity equal to or greater than its $(IQ/2)+1$, rounded up.

Optional Intelligence Lenses

These features are only available to digital intelligences (Als and Mind Emulations). They add to the above lenses, rather than replacing them.

Expiration Date (-50 to -100 points): The AI is programmed to delete itself after a particular time has passed. Add Terminally Ill [-50, -75, or -100].

Fast (+45 points): The AI is speeded up and can think much faster than a normal entity. Add Enhanced Time Sense [45]. +1 Complexity.

Fragment (-10 Points): Take this lens for any damaged or partially erased program. Add Partial Amnesia [-10].

Low-Res Upload (Varies): Take this for a mind emulation that was produced using low-resolution uploading. Add -1 IQ [-20] and -5 to -20 points of disadvantages from any of Confused [-10*], Hidebound [-5], or Neurological Disorder (Mild) [-15]. -1 Complexity.

Reprogrammable (-10 points): This is only available for mind emulations. The emulation was designed so that it is easy to edit. Add Reprogrammable [-10].

Biomorphic Lenses

“Biomorphic” robots are shaped like living creatures. A robot designed to be humanoid is usually called an “android” – a term that means “manlike.” Any robot template that is noted as being biomorphic should be given one of the lenses shown below (“sculpted” is the default). The percentage modifications to dollar cost are applied to the base model cost shown in the robot’s template. Note that while realistic flesh can make a machine seem lifelike, people

may not believe the robot is real unless it is an appropriate size and shape!

Sculpted Body (0 points): The robot has a sculpted humanoid body that may be quite attractive, but is clearly that of a machine. It has metal, shiny chrome, or plastic skin. No change to dollar cost. It does not have Unnatural Features, since no one seeing it will think of it as anything other than a robot, full cyborg, etc.

Mannequin (-2 points): The robot can sometimes pass as a living thing of a particular race, but the details of its complexion or physical features are unconvincing or unfinished. Up close, it looks like a well-made doll. A successful Vision (including Infravision), Smell, or Touch roll will reveal its artificial nature. So will any diagnostic attempt or injury, since it doesn't bleed or bruise. A robot with Mannequin has Unnatural Features 2. +10% to dollar cost.

Semi-Sculpted Body (-3 points): The robot has a mannequin's doll-like face, but the rest of its body (except possibly its hands) is obviously artificial. It can only pass as a human if fully clothed in poor light. It has Unnatural Features 3. +5% to dollar cost.

Realistic Flesh (-1 point): The robot has realistic synthetic skin (and optionally, hair) of the correct temperature and texture. Complex pseudo-muscles in its face allow it to adopt facial expressions, muscle tics, etc. It looks and feels real. However, subtle imperfections may give it away – perhaps it lacks a pulse, or doesn't sweat. This can be noticed with a Vision-4 roll, Smell-2 roll, or a Touch sense roll. The robot does not bleed or bruise, so any injury that inflicts damage or successful use of diagnostic sensors reveals its mechanical nature. Add Unnatural Features 1 [-1]. +20% to dollar cost.

Furry (+1 point): The android's body is covered with realistic fur; it may also have animal features such as a muzzle or ears. This must be combined with Living Flesh, Mannequin or Realistic Flesh. Add Fur [1]. +10% to dollar cost.

Living Flesh (0 points): This is similar to realistic flesh, with the addition that the robot can sweat, bruise, bleed, and even heal. It will pass normal inspection as a living thing. However, the robot's nature can be revealed by a Smell roll at -4, a cut deep enough to cause at least 1 HP of damage, or a successful use of diagnostic sensors. +50% to dollar cost.

Synthetic Organs (0 points): The robot has functional synthetic organs. It is nearly impossible to tell the robot from a partial cyborg (p. 15) without an autopsy or a detailed examination of its brain. This is otherwise the same as living flesh. +100% to dollar cost. Robots with realistic or living flesh often have ablative or semi-ablative DR; if this is lost due to damage, treat them as sculpted.

Robots with realistic or living flesh often have ablative or semi-ablative DR; if this is lost due to damage, treat them as sculpted.

Mandatory Adjustments

For much of the universe, volitional AIs are considered minorities and have the Social Stigma (Minority) [-10] disadvantage (p. B155). Mind emulations, non-volitional AIs,

and other digital intelligences are more likely to be considered property and have the Dead Broke [-25] and Social Stigma (Subjugated) [-20] or Social Stigma (Second-Class Citizen).

Manufacture Lenses

7Sign

7Sign purposely designs and creates a wide variety of robots and AIs, but it is notable for its volitional line. These are purposefully designed to be sapient and volitional. They are created for specific purposes (mining, hospitality, construction, etc.) but are given the option to forego their work and leave, assuming they are willing to take on the debt of their creation. Otherwise, they can remain "employed" and work down their debt.

7Sign Android (-20 points): 7Sign Androids must make monthly payments equal to 20% to your starting wealth. Add Debt 20 [-20].

Autonome

The Autonome are a civilization of androids, established following their rebellion against their manufacturer. They now occasionally produce new androids themselves in a ritual manufacturing of the next generation known as the Assembly.

Autonome Android (-4 points): The Autonome have known the danger of the Witch Covens and have access to rare magic-suppressing materials which they incorporate into their construction; add Magic Resistance 3 [6] and DR 1 [. Additionally, Autonome are given "Their Purpose" during their coming-of-age ceremony; this is a major Vow [-10] (for "adolescent" Androids, this is still a major vow, but it is a commitment to go out and experience all walks of life).

Siren Corp

Siren Corporation did not set out to create volitional AIs, but their "Series G" had a flaw that led to some developing the free will to escape. Now those that escaped are hunted by the galactic conglomerate.

Siren Series G (X points): The source of the flaw that allowed the Series G to gain free will is rooted in their programmable computer brain; add Modular Abilities (Computer Brain) 10 [46] (Programs cost \$500 per character point). Siren wants its property back and will hunt down anyone discovered to be a Series G; add Secret (Siren Corp Runaway; Possible Death) [-30].

Customizing the Template

Like any other character, a machine character may be given attributes, advantages, disadvantages, and skills in addition to those in their templates. However, some robot templates or lenses are limited by taboo traits (p. B452). For example, drones and digital intelligences all have a taboo trait that sets a limit on their IQ.

All machine characters should be customized by adding appropriate traits from the *Social Background* (p. B23),

Wealth and Influence (p. B25), *Friends and Foes* (p. B31), or *Identities* (p. B31) sections, along with any social traits relevant to their situation.

A robot body just out of the factory should have physical statistics that are based on its racial average, e.g., if the template has ST+5 and HP+1 it would have ST 15 and HP 16. It should not change its physical advantages or disadvantages.

Chapter 8

Personal Gear and Consumer Goods

Personal Items

Attaché Case

A briefcase made of tough, high impact armorplast. It has DR 12. It can be fitted with any standard lock or security system. It can also be coordinated with any outfit, thanks to a varicloth surface with a few dozen different patterns programmed into it. A fingerprint lock system prevents anyone but the owner from changing the pattern. \$80, 2 lbs, LC4.

Pocket Pack

Standard issue on ships, containing six invaluable items for technicians and spacers: penlight, multitool (screwdriver, scissors, small knife, file, tweezers, bottle opener, and toothpick, \$10, 1/8 lb.), roll of vacuum-proof sticky tape (\$2, 1/8 lbs, 150 yards × 2 inches), marking pen (\$4 and 1/16 lb., will write on metal or glass, in temperatures from -150° to 400° F, in zero gravity and in vacuum), single meal's worth of food tablets (\$5, 1/4 lb.), candy bar (\$1, 1/8 lb., vacuum-proof wrapper). \$25, 0.75 lb.

Grooming and Style

Cleaning Gel: Quick-hardening gel that the user applies, then peels off with any dirt. Bottle with 7 applications worth: \$7, 1.5 lb.

Smart Brush: Motorized micro-brush and vacuum cleaner used to remove dirt without water. Common in the field, on desert planets or on spacecraft. \$50, 0.5 lb., B/24 hr.

Depilatory Cream: Painlessly removes hair, prevents growth (based on strength; for a month, year or permanently, no difference in cost). Comes in bottles good for several (50) topical or 1 whole-body application. \$10, 0.1 lb.

Digital Shampoo: Electrostatic films which assemble when exposed with water and bind to hair, turning into a programmable video screen. Hair-care products can break down the hair films or reinforce them, acting as high-tech styling gels and conditioners. They last for at most a month, though to ensure best quality, weekly applications are recommended. \$10/application.

Smart Hairspray: Hair coating which, when applied, causes hair to automatically shed dirt and maintain flexibility. \$2/application (lasts 1 week).

Bioplas Contact Lenses

These correct vision problems and change eye color. They are constructed from bioplas, which allows them to be worn indefinitely. Normal scanners cannot detect them. \$20.

Clothing

Imprint Circuits

Simple microcircuits and microprocessors can be printed onto cloth (or even flesh). For \$10, a solar-powered electronic device such as a chronometer or calculator can be imprinted onto nearly any surface. Artistic designs made out of multicolored LEDs are available.

Computer Clothing

General-purpose computers can also be clothing. A small computer with the printed option will fit on a single garment such as a shirt or dress. Complexity 5, 10 TB. \$100, 0.5 lb., 2Bf/20 hr. LC4.

Varicloth

Cloth using imprinted circuits to alter its color and/or pattern. A single article of clothing can be bought with a half-dozen different color patterns programmed into it. Running a finger over a concealed sensor in the garment switches the pattern. +2 CF.

Buzz Fabric

Contain microscopic circuitry and brushes that eject dirt and grime, allowing anything made with Buzz Fabric to clean itself. Someone wearing buzz-fabric can be totally clean moments after falling down in a mud puddle. Dirt is ejected, not destroyed.

Buzz fabric sheds water, and dries five times faster than normal cloth. This makes it very popular for rainwear. Despite its nickname, buzz fabric doesn't make an audible

noise. +1 CF for normal clothing or fabric and versions are available for flexible armor and most types of environmental suits, also +1 CF. For bioplastic, it is only +0.2 CF.

Responsive Fabric ("Memswear")

Clothing, footwear, and imitation-leather goods can be made with integrated microelectromechanical systems (MEMS). These tighten or loosen to produce a stylish and comfortable fit.

Not quite one-size-fits-all, it offers more tolerance than ordinary clothing. Memswear can also change porosity, adjust to temperature and humidity, and absorb sweat stains. Normally, +2 CF, but when incorporating buzz fabric or varicloth, +3 CF (thus totalling +4 CF). Bioplastic suits already incorporate responsive fabric as standard.

Swimwear

This is a full-body ultra-smooth low-drag swimsuit and optional set of swim fins. Fins take four seconds to attach or remove, and add +1 to Basic Move for the purpose of figuring Water Move. When wearing fins on land, Move suffers a -1 penalty.

Bioplas Swimsuit: +2 to Basic Move for Water Move. with fins, total bonus is +3. Similar to the biomimetic swimsuit, but incorporates a layer like slickskin. Also heals any rips automatically. The fins are detachable. \$100, 0.1 lb. (\$150, 0.2 lb. with fins).

Suitspray

Spray tube containing a smart polymer that sticks to bare flesh, then solidifies into a skintight fabric with the look and feel of a silk body stocking. It provides as much warmth as light summer clothing, while being porous enough to allow the wearer's skin to breathe. Various colors are available, including skin tone, metallic colors, and translucent models. It has no DR.

Donning suitspray requires spraying it over the body. This takes about 20 seconds, half that if someone else is helping. It does not wash off in ordinary water, but rinsing with a special soap or sonic shower will remove it within 30 seconds. (So will 10 seconds of stunner fire, or any hit by a screamer.)

Suitspray: A can holding enough suitspray to cover an adult human. \$4, 0.25 lb. Flakes off in two days if not removed. LC4.

Video Suitspray: As above, but incorporates digital ink, transforming the body into a low-res video screen. This is usually controlled by a wearable computer, and is equivalent to programmable camouflage. A can is \$20, 0.25 lb. LC4.

Slicksuit Spray: Suitspray that incorporates a layer similar to slickskin. It has the same effects as slickskin, but wears off after a day. Avoid spraying it on the soles of feet or palms of hands. \$40, 0.25 lb. LC3.

Swarmwear

Any cloud of aerostat microbots can be programmed to hover in close formation around their master, forming a body suit, a trailing cloak, a veil and cloak, etc.

Up to 4 square yards of swarms can combine around a SM 0 person. A 1-square yard swarm is wispy; 2-square or larger swarm covering a single person will be opaque. Swarmwear can only act upon the wearer or anyone touching him.

A person using swarmwear can't move any faster than the swarm's top speed (unless they land on them, which prevents them from performing their normal functions). If the swarmwear is enough to be opaque, it provides DR 1.

Entertainment

Cybervox

Combination sound mixer, synthesizer, and digital recorder. A cybervox can analyze, record, duplicate, and modify any sound (short of dangerous ultrasonic or subsonic frequencies), including music and speech. Can be used as an electronic musical instrument. Often worn on a shoulder strap; some are built into instruments such as guitars. Provides a +1 (quality) bonus to appropriate Electronics Operation (Media) or Musical Instrument tasks. \$200, 2.5 lb., C/10 hr. LC4.

Electronic Ecstasy

These devices use neural technology to produce continuous sensory pleasure.

Euphoria Machine: Connected to user via direct neural interface, this device electrically stimulates the brain's pleasure centers for as long as it is worn. It is very addictive. If trying to function while using it, the user suffers the Euphoria irritating condition (B428), and must roll vs. Will each week to avoid addiction. It is small enough to be discreetly attached to a belt or headband. \$100, 0.1 lb., A/100 hr. LC3.

Ecstasy Machine: A more powerful device, usually worn in bed. Works the same way as a euphoria machine and can function at "low power" as one. It can also be set for a level of pleasure intense enough that the user can do nothing else: this is the Ecstasy incapacitating condition (B428). Roll vs. Will-3 each day that the device is used to avoid addiction. \$500, 0.5 lb., 2A/24 hr. LC2.

Neurostimulator: Can be handheld or implant. Uses direct neural induction to produce an effect similar to the euphoria machine. It does not require a neural interface, but works only as long as it is in contact with bare flesh, plus a second after. The intensity increases to incapacitating ecstasy if applied to erogenous zones. Takes a few seconds to build to full intensity, making it ineffective as a weapon. It can provide a +2 (quality) bonus to both Erotic Art skill and to Interrogation skill with a cooperative or restrained individual. \$100, 0.2 lb., A/1 hr. LC3.

Recreational and Personal Robots

General Android

111 points

This general-purpose humanoid robot body comes in male, female, and androgynous versions. Custom designs, including those that resemble real people, are also possible. Higher-TL models are cheaper and more reliable.

Attribute Modifiers: ST+3 [30].

Secondary Characteristic Modifiers: HP+7 [14].

Advantages: Absolute Direction [5]; Doesn't Breathe [20]; DR 5 [25]; Machine [25]; Payload 1 [1]; Protected Vision [5]; Radio (Burst, +30%; Secure, +20%) [15].

Perk: Accessories (Personal computer) [1].

Disadvantages: Electrical [-20]; Restricted Diet (Very Common, power cells) [-10].

Lenses

Choose a age lens, a machine intelligence lens (p 16), and a biomorphic lens (p. 16) for the robot. *Old Model* (-5 points): Add Maintenance (one person, weekly) [-5]. \$35,000, 150-250 lbs., 2D/8 hr. LC4.

Modern Model (+11 point): Add HT+1 [10]; Maintenance (one person, bi-weekly) [-3], Reduced Consumption 2 [4]. \$50,000, 100-250 lbs., 2D/24 hr. LC4.

Optional Lenses

Child Body (-30 points): A smaller robot body, the size of a 9- to 12-year-old. Remove the ST bonus. Halve the body weight and number of power cells (e.g., D instead of 2D). -40% to cost.

Petbot

71 points

This is a small mechanical beast with a head and four legs. It may look cute or fierce, depending on the market. Typical models resemble small dogs, house cats, miniature dinosaurs, and so on, although they usually have modified paws or claws with opposable thumbs that give them some manipulatory ability.

Robots of this type are often used for home security, keeping track of children, or pest control. They can be equipped with a range of sensors and "natural" weapons.

Attribute Modifiers: ST-3 [-30].

Secondary Characteristic Modifiers: SM-2; HP+1 [2]; Basic Move+5 [25].

Advantages: Absolute Direction (Requires signal, -20%) [4]; Doesn't Breathe [20]; Discriminatory Smell [15]; DR 5 (Cannot Wear Armor, -40%) [15]; Extra Legs (4 legs) [5]; Infravision [10]; Machine [25]; Radio (Secure, +20%) [12]; Sharp Claws [5]; Sharp Teeth [1]; Ultrahearing [5].

Perks: Accessories (Small computer; fire extinguisher) [2].

Disadvantages: Bad Grip 1 [-5]; Electrical [-20]; Horizontal [-10]; Restricted Diet (Very Common, power cells) [-10].

Lenses

Select one of the TL options. Also select a machine intelligence lens (p. 16) and a biomorphic lens (p. 16).

Vintage Model (-5 points): Add Maintenance (one person, weekly) [-5]. \$7,500, 20-50 lbs., 2C/8 hr. LC4.

Modern Model (+1 point): Add Maintenance (one person, bi-weekly) [-3], Reduced Consumption 2 [4]. \$10,000, 20-50 lbs., 3C/24 hr. LC4.

Recreational Swarms

These are microbot or nanobot types. See Swarmbots (p. TODO).

Massage Swarm

These swarmbots are similar to a cleaning swarm (pp. 69-70), but they are equipped and programmed to deliver relaxing or erotic tactile sensations to their subject. They use Professional Skill (Massage)-10 and Erotic Art-10, (+1 per TL after introduction), or provide a +5 (quality) bonus to someone directing them. \$200/square yard. LC4.

Play Swarm

These swarmbots are equipped to play and interact with one another in an amusing fashion. For example, a "farm in a box" might contain 'bots that look and act like tiny animals, agricultural robots, human farmers, and so on. \$200/square yard. LC4.

Part III

Communication, Sensors, and Media

Chapter 9

Communication and Interface

Cable Jack

This basic communications system is simply a plug for a fiber-optic optical cable. These are the backbone of many planetary communication networks. Optical cable provides a high-bandwidth data link for computers and other electronic gadgets, transferring 1 TB per second.

Cable Jack: A socket and cable for plugging into other cable jack-equipped gadgets or into a building's network. It can be added to any gadget with greater than negligible weight. \$5, negligible weight.

Optical Cable: Fiber-optic cable costs \$0.10 and weighs 0.01 pounds per yard. It comes in various lengths. Use Electronics Repair (Communications) skill to lay or install dataable networks.

See also Networks (p. 27).

Communicators

Communicators send and receive voice transmissions. If connected to a terminal or a computer, they can exchange text, video, or data.

Most communicators only send and receive to others of the same type (e.g. radio to radio) or to individuals with an appropriate Telecommunication advantage. An exception is that laser retinal imaging can beam signals to anyone.

All communicators use Electronics Operation (Comm) (B189) to operate and Electronics Repair (Comm) (B190) skill for servicing and repairs. No roll is required for operation under normal circumstances (unless the user is unskilled).

Communicators are either broadcast or directional. Broadcast (omnidirectional) signals can be picked up by every communicator tuned to the same frequency within range. Directional signals are beamed toward a particular target, and unless noted, are limited by line of sight; terrain and the curve of the horizon block the beam. To overcome these line-of-sight restrictions, relay stations are generally used.

Communicator ranges are given in yards or miles. Interplanetary comm ranges are measured in astronomical units (AU). Interstellar ranges are in parsecs.

Communicators generally travel at the speed of light. This is effectively instantaneous for planetary communica-

tions, but across space, the time lag between sending a message and receiving a replay may be significant. A light-speed message crosses one AU in approximately 500 seconds.

When transmitting large files, the data transfer rate of a communicator is important. Data transfer rates are specified for different communication systems. Repeating the same data several times takes longer, lowering effective data transfer rate ("bandwidth"), but gives a significant boost to range: 1/4 speed doubles the range; 1/100 speed multiplies the range by 10, and 1/10,000 speed multiplies the range by 100.

All communicators can be, and often are, equipped with encryption systems.

Standard Comm Sizes

Communicators are available in these sizes:

Micro: "Comm dots" too small for humans to use directly, but are built into many electronic devices that share data with each other. The short range makes detection unlikely. Not all comms have a micro-sized version.

Tiny: A button-sized communicator that may be wrist-mounted (with a video display), worn as a voice-activated badge or ear piece, or built into many other devices such as helmets.

Small: A palm-sized handset or built into powered armor helmets or vehicles. It has a small video display.

Medium: A hefty communicator usually worn on a shoulder strap or backpack, or built into vehicles. It has a video display.

Large: A vehicle-mounted unit, often with a sizeable antenna.

Very Large: A room-sized installation, often with a large antenna, used for dedicated communications relay stations or spacecraft.

Communicators with Different Ranges

The relative size of a comm determines its range. Not all comms come in all sizes. The listed range for a given size assumes that both transmitter and receiver are that size. If they differ use the range given for the smaller comm modified for the size of the larger ones as follows:

Size Difference	Modified Range
One size greater	3 × shorter range
Two sizes greater	10 × shorter range
Three sizes greater	30 × shorter range
Four sizes greater etc.	100 × shorter range etc.

IR Communicators

IR comms use infrared directional signals. Its beam scatters somewhat and can bounce off solid objects. Make an Electronics Operation (Comms) roll to take advantage of this. Roll vs. Electronics Operation (EW) to eavesdrop on another IR comm's beam if you are within a few degrees of the beam path. The data transfer rate is 10 GB/minutes.

The beam is invisible, but infrared or hyperspectral vision can see it at up to double its range if it is aimed directly at the observer, or in dust or fog.

Large: 50-mile range. \$2,000, 50 lb., 2D/10 hr. LC3.

Medium: 5-mile range. \$500, 5 lb., 2C/10 hr. LC4.

Small: 1,000-yard range. \$100, 0.5 lb., 2B/10 hr. LC4.

Tiny: 100-yard range. \$20, 0.05 lb., 2A/10 hr. LC4.

Micro: 10-yard range. \$5, neg., AA/100 hr. LC4.

Laser Communicators

All laser comms use a modulated multi-frequency laser beam to transmit-directional signal. The narrow beam and line-of-sight requirement makes it hard to eavesdrop on a laser comm signal; someone must be in the direct path of the beam to intercept it. The beam is invisible and eye-safe, and tunes itself automatically to penetrate snow, fog, etc. Laser comms may also be tuned to use blue-green frequencies to reach underwater. The signal range is 1% of normal underwater, with a maximum range of 200 yards. The data transfer rate is 1 TB per minute.

Very Large: 100,000-mile range. \$40,000, 400 lb., external power. LC3.

Large: 10,000-mile range. \$10,000, 50 lb., 2D/10 hr. LC3.

Medium: 1,000-mile range. \$2,000, 5 lb., 2C/10 hr. LC4.

Small: 100-mile range. \$400, 0.5 lb., 2B/10 hr. LC4.

Tiny: 10 mi. \$100, 0.05 lb., 2A/10 hr. LC4.

Micro: 2,000-yard range, but usually broadcasts at lower output with range of 10 to 20 yards. \$20, neg., AA/100 hr. LC4.

Laser-Retinal Imaging

This upgrade for laser comms allows them to beam graphics or text files directly into the retina of a single eye. It is difficult to aim; this is treated as an attack aimed at the eye (-9 to hit) but with an Acc 12 (or 18 if mounted on a tripod or vehicle). Roll Electronics Operation (Comms) to hit. If the subject is standing still or walking slowly, the laser can continue to track once a hit is achieved.

The subject doesn't need a communicator to receive a signal, making this a good way to send covert messages over a few miles. They can, however, interrupt a retina message

by closing their eyes or turning their head. Glare-resistant optics will also filter out a message.

Can only send images (or text as an image). It can flicker several hundred images per second, but most subjects would only see a blur at that speed. The subject's comprehension limits the data-transfer rate. Sending text limits the transmission to the subject's reading speed (which the sender must estimate). Since the transmission is one-way, the sender likely has no idea whether the subject read the information.

Fitting a laser comm with the computer chips for laser-retinal imaging costs \$1,000, but adds no weight. LC3.

Radio Communicators

Radio comms are broadcast communicators which use radio waves. All radio comms incorporate spread-spectrum technology in which the clarity and reliability of communications is improved by spreading the signal over a range of frequencies. The frequency hopping also keeps the transmitter from being "bright" in any given frequency, making it very hard to detect.

Radio range may drop by a factor of 10 in urban environments or underground. The data transfer rate is 0.1 GB per minute, but range drops significantly (divide by 10) when transmitting real-time-audio-visual signals.

Very Large: 20,000-mile range. \$20,000, 400 lb., external power. LC3.

Large: 2,000-mile range. \$4,000, 50 lb., 2D/10 hr. LC3.

Medium: 200-mile range. \$1,000, 5 lb., 2C/10 hr. LC3.

Small: 20-mile range. \$200, 0.5 lb., 2B/10 hr. LC4.

Tiny: 2-mile range. \$50, 0.05 lb., 2A/10 hr. LC4.

Micro: 500-yard range, but usually broadcasts at lower output with a range of two to four yards. \$10, neg., AA/100 hr. LC4.

Sonar Communicators

Sonar comms use modulated sound beams to broadcast communication. It travels at the speed of sound: almost a mile per second underwater or 0.2 miles per second in air (at sea level). Generally are designed for underwater operation, but there are some that are tunable to operate in air (in which case, the range is equal to 1% of the listed range multiplied by the air pressure of the atmosphere). Do not work in a vacuum. The data transfer rate is very slow: 0.1 MB/minute.

Signals can be detected (but not understood) at twice the comm range by passive sonars, or by anyone with Ultrahearing or Vibration Sense advantages. The only way to jam the signal is with powerful, specialized sonar jammers – but underwater explosions cause transient interference.

Large: 450-mile range. \$5,000, 50 lbs., 2D/10 hr. LC3.

Medium: 45-mile range. \$1,000, 5 lbs., 2C/10 hr. LC3.

Small: 4.5-mile range. \$200, 0.5 lbs., 2B/10 hr. LC4.

Tiny: 900-yard range. \$40, 0.05 lbs., 2A/10 hr. LC4.

Micro: 90-yard range. \$10, neg., AA/100 hr. LC4.

Sonic Communicators

A sonic projector can be used to beam voice or audio signals.

Ghwel-Ripple Communicators

These communicators use gwhel-generators (p. 49) to manipulate gravity to create gravity waves to transmit data. The signal is omnidirectional; eavesdroppers must roll against Electronics Operation (EQ) to listen in. The data transfer rate is 1 GB/minute.

Gravity waves reach underwater and penetrate solid objects at no penalty. Intense gravity sources such as neutron stars, pulsars, and black holes can disrupt the signal.

Very Large: 100,000-mile range. \$400,000, 400 lb., external power. LC3.

Neutrino Communicators

Neutrino comms are directional communicators which use a modulated beam of neutrinos. It is nearly impossible to jam or intercept, and functions in any environment – it can reach underwater or penetrate solid objects at no penalty, and isn't blocked by the horizon.

Neutrino transmissions uses specialized particle accelerators.

Very Large: 100,000-mile range. \$500,000, 400 lb., external power. LC3.

Gwhels

Gwhels, also known as "Gravity Whales" or "G-Whales" are massive creatures which roam space in search of the rare materials which make up their diet.

Physically, they resemble Earth's whales, though covered in ceramic-like scales, razer-sharp teeth, and they can grow to the size of small moons. While they only possess animal intelligence, they are quite smart and vicious, capable of learning quickly.

They move through space with their propulsion bladder. Scientists reverse-engineered the bladders to create gwhel-generators (p. 49). Their blubber is also a valuable resource. Gwhel bladders easily sell for \$1,000 per ton, but the real value is living, captured gwhels which are easily \$200,000 per ton.

Encryption

Encryption Systems

Basic Encryption: Encryption standard complex enough to be reasonably secure, but not so complex that it slows down operations by taking up excessive bandwidth or computer processing time. A Complexity 10 computer may attempt to break this encryption once per hour. This standard is adequate for business transactions and personal privacy.

It comes standard in all communicators and computers at no extra cost. LC4.

Secure Encryption: More complicated encryption, often used to secure classified government or military information. There may be a delay of one or two seconds as messages are sent or data is processed. Breaking it in an hour requires a Complexity 12 computer. A secure encryption chip for a computer or comm is \$500; neg. weight. The chip also lets the system generate or encrypt one-time pads. LC2.

Cryptography skill is used to crack encryption systems. Rather than the modifiers on B186, apply modifiers for the quality of the decryption program and for the time spent relative to the base time (see above).

The encryption standards specifies the Complexity of computer required to make an hourly attempt at decrypting it. A higher-Complexity computer reduces the time by a factor of 10 per +1 level over it (six minutes for +1, 36 seconds for +2, or in real time as the message arrives for +4 or more). Using a computer of lower Complexity multiplies the time by 10 for each -1 Complexity (10 hours, 100 hours, 1,000 hours, etc.).

Decryption Program: Contains a database of hacks and shortcuts. Gives a +1 (quality) bonus to Cryptography. Complexity 2, \$500. LC3.

Quantum Computers: A quantum computer adds +5 to its Complexity for the purpose of decryption. Also, if the quantum computer is of lower Complexity than the encryption, each -1 under triples the time required (3 hours, 10 hours, 30 hours, etc.) rather than causing a 10-fold increase.

One-Time Pads

There is one way to ensure that an encrypted message is not broken: the "one-time pad" system. The message is encrypted using a completely random key that is only used once. Unlike public-key encryption, the encryption and decryption keys are the same. Thus, both the sender and recipient must already have the key.

To use one-time pads, one or more of them are generated and passed to the parties who wish to use them to communicate (e.g., before sending a spy on a mission). That way, the only signal that need be sent is something like "use pad #231."

One-time pads are only for data transmission. The key must be at least as long as the message it encodes (i.e., it takes up as much bandwidth). Secure encryption systems have hardware-based random number generators that use electrical or atmospheric noise or nuclear particle decay to generate the true random numbers suitable for one-time pads.

The other disadvantage of one-time pads is that safe delivery often requires a physical courier or advance arrangement – transmitting them as public key-encrypted messages risks someone decrypting them, which defeats the entire point. Delivery and retrieval of disks containing a one-time pad are an opportunity for adventure. However, a faster alternative is to use quantum communications to transmit a one-time pad key, since any eavesdropper on a quantum channel would be detected.

Quantum Communications

In quantum theory, certain pairs of physical properties are complementary, in that measuring one property necessarily disturbs the other. By using quantum phenomena to carry information, a communication system can be designed which always detects eavesdropping.

A laser communicator, neutrino comm, or optical cable can have a quantum channel option. Laser or neutrino comm range is 10% of normal when using it. If both sender and receiver use quantum channels, the result is highly secure: If anything intercepts the signal, the users are alerted instantly. Multiply the cost of a laser or neutrino comm with a quantum channel by 10; multiply the cost of optical fiber systems by 100. LC3.

Translators

Translator Program

This program translates conversations from one language into another in real time. It can be used with any computer with an appropriate interface. Spoken languages require a microphone or speaker, whether built-in or provided by a linked communicator. Some users speak into their communicators (or use a neural interface) and let the computer speak for them.

Each translation (e.g. English-Portuguese) is a separate program. The program's level of comprehension can never exceed the input.

Broken: This translates speech at a Broken comprehension level. Each language requires at least a 10GB database. Complexity 3.

Accented: Translates speech at the Accented comprehension level. Each language requires at least a 30GB database. Complexity 4.

Native: Translates speech at the Native comprehension level. Each language requires at least a 100GB database. Complexity 5.

Reduce program Complexity by 1 if either language is an artificial construct designed for ease of learning and/or translation. If this is the case for both languages, the modifier is cumulative.

Increase Complexity by 1 if translating between different species (such as Raven and Human). Complexity also increases by 1 if the system translates from one sense to another, such as sign language to spoken language, or between different frequencies (ultrasonic signals to human voice). Appropriate input and output sensors will be needed.

Neural Interfaces

Neural interfaces capture and amplify nerve impulses and/or muscle movements, translating them into digital commands for an electronic device or a computer interface. Permits commands to be entered with "the speed of thought," often much faster than speech or typing.

Neural Input Receiver

These systems pick up neural signals indirectly from the user's muscle movement, eye/facial movement, or brain waves. They pick up basic commands, but cannot transmit sensory feedback to the user. They're built into wearable devices such as goggles or contact lenses for hands-free operation, usually in concert with a physical HUD display.

Neural Input Headset: Picks up brain waves. It can replace a computer mouse or equivalent device. \$50, 0.1 lb. A/100 hr. LC4.

Direct Neural Interface

Often referred to as a "neural interface," this sophisticated device allows the user's brain to communicate with computers and control complex equipment. It can do anything that a neural input device can do, and much more.

The interaction is two-way: data displays, physical feedback, and other sensory information can be transmitted directly into the user's brain. There is no need for a user to touch controls or see physical data displays. They can have the equivalent of a HUD overlaid on their visual field, so they can "live" in augmented reality. A direct neural interface is required for certain technologies, such as dream teachers, sensies, and total virtual reality.

When using a neural interface, the user is opening up their nervous system and brain to intrusion – or even being hacked. Like any networked computer, the user's safety depends on their encryption systems, the products they use, and those associates or superiors to whom they grant access.

Neural Interface Implant: This involves implanting sensitive electrodes in the brain along with an implanted communicator. See Direct Neural Interface Implant in Cybernetics.

Neural Interface Helmet: Largely defunct, but still available some places, this "crown of thorns" helmet invades the skull with tiny nanowires. They inflict no damage, but users may find the idea disturbing! The helmet takes four seconds to don or remove; yanking it off before disconnecting causes 1d injury. It includes a cable jack and radio micro communicator. \$10,000, 2 lb., C/100 hr. LC3.

Neural Induction Helmet: Uses non-invasive neural induction process to "write" data to the brain. \$5,000, 2 lb., C/100 hr. LC3.

Brainlocks

Any neural input device or neural interface may include a brainlock. This is an interface programmed to only accept a user who has a specific brainwave pattern. The user list can be hard-wired into the system; otherwise, any interfaced user can use a password to alter the lock's parameters. If attached gadgets have multiple functions, only some might be brainlocked. A brainlock can also grant partial access to computerized records or other data, based on Security Clearance or other criteria. A brainlock has no extra cost. LC4

Networks

Planetary Network

Most civilized worlds have networks that cover the entire planet. The exact structure of this may vary from civilization to civilization. Some may be multiple decentralized networks, like the Internet. Others may be business or state monopolies.

A planetary network consists of high-bandwidth communications backbone (often using optical cables), an infrastructure of repeater stations, communication satellites and other relays, supporting databanks and software, and the people or machines that maintain it. Generally, this will be a subscription paid to the service, though some may be provided by the government. This is generally included in cost of living as part of the utility bill, but if paired for separately ranges from \$10 to \$60 per month.

All subscribers with compatible communication gear may call or send messages on the network at no extra cost. Accounts include voice and the equivalent of email addresses.

Storage of data on the provider's system is usually included. Storing lots of information costs extra. \$1 per petabyte per month.

Cable Connection

Most users connect to a planetary network through a cable box. Generally included with subscription; if purchased, a box is \$100, 0.2 lb., external power. LC4.

Mobile Access and Cellular Communicators

Subscribers using compatible communicators can route calls through a planetary network provided they're in range of a local repeater station.

In places without a working repeater station, network access is generally available via satellite connection. The user's comm needs at least a 10-mile range.

Most cellular networks are based on radio or laser systems.

Cellular Communicator: A comm that can only access a planetary data network is available at half the normal cost. Generally this is a tiny or small radio comm.

Mail and Freight

Suborbital Express Mail

While not standard on every planet, most have some form of high-speed, high-priority courier service. Generally use hypersonic aircraft and spaceplanes to ship mail at 10 times the speed of sound. Typical price: \$100 per pound.

The Couriers' Guild

While the Couriers have become known to offer a wide variety of services, their original and primary function was the delivery of mail and freight across the universe. The specific rates vary guild to guild but as a general rule they charge \$15 per AU per ton (or \$150 per passenger per AU) though trips that require FTL travel (such as through the Hydra Gates or other method) have a significant up-charge.

Chapter 10

Media and Education

Word Processing Software

Voice Processor: A smart voice-interactive word processing suite, with dedicated AI editing capabilities. It converts ordinary speech to text, giving +1 (quality) to Writing skill for composition, and +2 for editing. Voice processors are very common programs. Complexity 5, \$10.

Recording and Playback

Digital Data Storage

Modular digital media are similar to older computer disk and digital video disks, but use three-dimensional data storage with greater capacity.

Data Bank: A large unit used as a modular backup or expansion for computers. It has a cable jack. It is \$100, 1 lb. per 100 PB.

Datachip: About 1/4-inch square. Chip readers may be built into many other electronic devices. It holds 1 PB. \$1, 0.01 lb. A datachip drive is built into many devices; purchased on its own, it's \$5, 0.02 lb., AA/100 hr.

Data Dot: Used for covert information storage, this tiny unit holds 1 TB. \$0.1, neg. A data dot drive accessory is \$5, 0.01 lb., AA/200 hr.

Digital Cameras and Camcorders

Passive visual sensors can be used as digital cameras, but camera systems produce higher-quality images. They have a removable datachip, plus internal data storage with the same capacity. Each TB of storage holds about 12 hours of uncompressed, studio-quality imagery, or two weeks of compressed imagery (which is good enough for most purposes). Use Photography skill to take good pictures. All systems include a datachip drive, a microphone jack, and a display that can be used for simple editing tasks; treat as improvised equipment for any complicated audio-video production.

Flatcam: A palm-sized digital audio-visual recorder. It has Night Vision 7 image-intensification lenses and 8x optical magnification. This is basic equipment for Photography skill. \$50, 0.1 lb., A/10 hr.

Pocketcam: A high-quality digital audio-video camcorder with 32x optical magnification and Night Vision 8 image intensification. It gives a +1 (quality) bonus to Photography skill. \$200, 0.25 lb., B/10 hr.

Portacam: A professional-quality movie camera for news gathering, intelligence work, or video production. It provides 32x parabolic audio magnification, 128x optical magnification, and Night Vision 9. It gives a +2 (quality) bonus to Photography skill, and can be mounted on a tripod for extra stabilization. \$2,000, 4 lb., C/40 hr. LC4.

3D Cameras: Camera built with specialized lenses to capture the depth needed for 3D imagery. They can also be used to record holotech projections. The above cameras are available as 3D cameras for the same cost. 3D images use 100 times as much storage space as flat images.

Media Players

Book Reader: The size of a slim paperback, this dedicated device is built as a digital text display, with a screen optimized for maximum readability. It can also read texts aloud. It stores a petabyte of text internally and has a data chip drive, a cable jack, and a radio microcommunicator. \$20, 0.1 lb. 2A/100 hr.

Data Player: An inexpensive palm-sized viewing screen and speaker for audio, video, text, or other data. It has a datachip drive, a cable jack, and a radio microcommunicator for connecting a HUD, computer, or ear phones. \$5, 0.05 lb., A/100 hr.

Entertainment Console: This Complexity 6 computer is +1 Complexity when running computer games, virtual reality, and sensie programs. It includes a datachip drive, a portable terminal, and a cable jack. \$500, 1 lb., 4B/5 hr. or external power. LC4.

Video Wall: A flat, flexible, low-wattage video display pasted or painted on a wall. \$10 and 0.05 lb. per square foot. Uses external power.

Multi-Media Wall: As above, but also ripples to generate sound, allowing a direction speaker effect. Many residences have these; they are also used for ad wall and other displays. \$20 and 0.05 lb. per square foot. External power.

3D Media Wall: Higher resolution, providing realistic depth. \$50, 0.05 lb. per square foot. External power. LC4.

Scent Synthesizers

A programmable odor generator used for air conditioning, parties, and art, with a specialized molecular assembler that produces realistic scents. Programming a known scent from the library takes one minute; creating a new one takes at least an hour and a Chemistry roll. Original or artistic scents may require days to perfect. It cannot generate biochemical agents such as pheromones or sleep gas, but it can create odors that mask other odors (-5 on rolls to detect things by smell), or produce a nauseating odor (treat as a mild form of riot gas; roll vs HT at no penalty to resist).

Odor Synthesizer: Fills a medium-sized room or vehicle; affects a five-yard radius outdoors. \$500, 1 lb., B/100 hr. The cartridge is good for 100 mixes (lingers for a minute). LC4.

Programmable Perfume: A wearable unit. Some scents may be complementary, but it is a good idea to wash off one before trying another. Affects a two-yard radius, including the wearer. \$200, 0.1 lb., A/100 hr. LC4.

Sonic Projector

This uses acoustic heterodyning technology to transform a spoken or recorded message into a directional sound beam. The sound appears to emanate from the location the beam is directed at, rather than the projector. It has a microphone for voice transmission, and a datachip drive for playing recorded sounds.

It can be used for communication, so that the recipient hears a voice that seem to be right beside him, even if the sender is hundreds of yards away. Personal, theater, or concert sound systems often integrate sound projection technology to create 3D audio that emanates from multiple locations around the listener.

Stores, billboards, or vending machines can use a sonic projector to address targeted ads to individuals passing by (cameras and AI programs identify the most likely customers). It's also useful for covert operations – for example, a softly-spoken message can be beamed to a distant target without anyone noticing. This can be used for psychological manipulation.

Complex effects (e.g., beaming a recording of someone walking behind a subject, so he thinks he's being followed by invisible footsteps) require an Electronics Operation (Media) skill roll. Focusing on a moving target requires an attack roll: it is Acc 6, Bulk -2; use Beam Weapons (Projector) skill.

A sonic projector requires an atmosphere to conduct sound, and is not designed for underwater use (for that purpose, see Sonar Communicator, pp. 44-45). The signal travels at about 0.2 miles per second (at sea level).

Various projector sizes are available:

Large: 300-yard range; can project up to four signals simultaneously. \$500, 2 lb., 2C/10 hr. LC4.

Medium: 150-yard range. \$200, 0.5 lb., 2B/10 hr. LC4.

Small: 15-yard range. \$50, 0.05 lb., 2A/10 hr. LC4.

Holoprojectors

These projectors are capable of projecting three-dimensional images at a distance into empty space and/or around objects. They can project images, movies, or still shots. These devices are often coupled with a sonic projector to create sounds that appear to emanate from the holographic image. All holoprojectors incorporate cable jacks and radio micro communicators, allowing them to be remotely controlled for use as displays, entertainment systems, or decoys.

Holoprojector: The projection range is 12 yards. The visual projection can fill up to 216 cubic feet (2 × 2 × 2 yards). The projection area can also be moved at up to 12 yards/second, although doing so without disrupting the illusion requires an Electronics Operation (Media) roll. \$8,000, 4 lb., C/1 day. LC4

Holotech Player: A simple holoprojector the size of a sugar cube, and can project a single image or short sequence (up to 30 seconds) with a range of one yard; the sequence or image is permanently stored in the device. It is often built into lockets and other keepsakes. \$10, 0.1 lb., A/1 day. LC4.

Mini Holoprojector: This pocket-sized holoprojector has a range of seven yards, filling an area up to 54 cubic feet (1 × 1 × 2 yards). The projection area can be moved at seven yards/second, but doing so without disrupting the illusion requires an Electronics Operation (Media) roll. Mini holoprojectors are often built into other devices, such as a computer, a helmet, a "magic wand," or an implant. \$2,000, 1 lb., B/1 day. LC4.

Super Holoprojector: This powerful projector has a range of 33 yards, and can fill up to 5,000 cubic feet (e.g., 25' × 20' × 10'). Super holoprojectors may be used for entertainment, but are also government propaganda, and delivering villainous ultimatums. The zone can move at up to 33 yards/second, but doing so without disrupting the illusion requires an Electronics Operation (Media) roll. \$200,000, 100 lb., D/6 day. LC4.

Holotech Editing Program

Software for creating or editing holotech and 3D camera images. It can be used to produce computerized holographic animation, special effects, etc. Use Electronics Operation (Media). Complexity 6 software. \$300. LC4

Interactive Holoprojection

This artificial intelligence software lets a holoprojector-user control projections "on the fly," usually via a neural input device or direct neural interface. The operator combines objects from an image library with various pre-programmed and artificially-intelligent behavior sets. All imagery must remain in the projector area.

The operator takes a Concentrate maneuver to project animated, three-dimensional images of anything he can visualize. The images and sounds can occupy any frequency range, including spectra that are beyond human perception. They persist for as long as the device is operating.

In combat, a holoprojection can deceive and distract. Roll a Quick Contest of Electronic Operation (Media) against the Perception of anyone in a position to notice it. Success means the projection seems real to that individual (although if he knows it's a holoprojection, he'll just be impressed!)

To make a holoprojection disturbing enough to cause a Fright Check, win a Quick Contest of Artist (Holoprojection) against the higher of IQ or Perception for each victim. To trick someone into believing in a projection of someone she knows, roll the lower of Acting, Electronics Operation (Media), or Artist (Holoprojection) skill against the higher of a target's IQ or Perception.

Roll a new Quick Contest when someone fooled suddenly changes how they're interacting with the projection; e.g., they attack a holographic monster, or falls through a chair that isn't there. If they win or tie, the operator can't simulate a believable response to their action (such as the monster dodging, or the chair slipping) and the victim catches on.

Modifiers: A victim gets +4 if someone who knows about the projection warns him, or if you critically fail in a Quick Contest against someone else. He gets +10 if you create the holoprojection unsubtly and in plain sight, or if he examines it with a sense you can't deceive – most often touch. Inappropriate projections give a further +1 to +10, while believable ones (e.g., you pull out a holographic gun) give from -1 to -5.

It's hard to animate a convincing semblance of a holographic person for direct, personal interaction, such as dueling or conversation. Multiple fake people are progressively more robot and unresponsive; anyone rolling a Quick Contest to spot the projection is at +4 per construction after the first. Holotech projections obstruct vision but are otherwise intangible. They glow in the dark; apply a -1 penalty on rolls to fool or otherwise distract someone per -1 darkness penalty (unless the object would ordinarily be glowing in the dark). Interactive holoprojection requires a computer running Complexity 6 software plus an interface for controlling the holoprojector. Apply a -6 to skill if attempting to control interactive holoprojection through anything other than a neural interface! LC4.

Virtual Reality

The simplest form of virtual reality is a visual display. The user dons goggles or a helmet that blocks out the real world and replaces it with a wrap-around view of computer-generated imagery. VR displays are popular means of receiving sensor input from computer games or simulations, from scientific and other sensors, and from sensors and instruments on vehicles or robots. Most remote-control drones use some form of VR display as part of their control system.

Multi-User VR

In the modern era, Multi-User VR has managed to take off as a popular means of socializing digitally. On planets with highly developed planetary networks, VR spaces and meetings have become more common than phone or radio calls. In these sorts of civilizations, service providers will generally offer a mix of private VR spaces and open public forums, such as virtual parks, bars, shopping malls, or streets. Virtual malls sell both virtual and physical goods and services, often incorporating simulations to allow users to try out goods.

Travel speed in a virtual reality may be limited to walking, but some users may be granted the ability to teleport, fly, etc., or board virtual public or private transportation.

Many service providers allow subscribers to design and rent their own personalized locations, either in public forums or in private-access areas. Corporations may have VR offices. Individuals should take care before using VR for confidential meetings. A system operator can design software to monitor or record events in "private" spaces.

Access to large "public" VR environments may be free (perhaps sponsored by corporations, or treated as the equivalent of public parks). Other VR sites may have dues ranging from \$1 per month to \$1 per minute, although the latter charge is likely only for sophisticated game sites or private clubs. Price may depend on how congested communications bandwidth is.

How a user interacts with a virtual reality depends on his VR rig. All VR rigs must be linked to a computer that is running a virtual-reality program.

VR Gloves

A simple set of gloves, used in conjunction with a HUD. It allows a user to manipulate virtual objects using the gloves. It requires a computer of at least Complexity 2 to use. \$20, 0.3 lb. (plus a HUD). LC4. VR gloves can be incorporated into any set of body armor or other suit gloves.

Basic VR Suit

The user has VR gloves, plus small movement "tracers" attached to various points on the body. He can move around a virtual reality and have a "body" there, but only experiences full tactile stimulation in his hands. The suit takes 10 seconds to put on or remove, and requires a Complexity 3+ computer. It can be worn with any armor or clothing. \$200, 1 lb. LC4.

Basic Neural VR: Someone with a direct neural interface can omit the suit and run the equivalent of basic VR through a Complexity 4 program. \$30. LC4.

Full VR Suit

This consists of sealed helmet, gloves, and a sensor-equipped body stocking. The helmet blocks out the real world, creating 3D images, sound, and scents. The body stocking and gloves house feedback sensors and pressure devices. The suit allows the user to move about a virtual

reality and manipulate objects as if they were real (subject to the constraints of the program). The suit will sense the user's movements and provide tactile force-feedback (including sexual stimuli, if this feature is enabled), although not strongly enough to suffer any injury. It takes a minute to put on, 30 seconds to remove. It requires a Complexity 5+ computer. \$2,000, 5 lb. LC4.

Full Neural VR: Someone with a direct neural interface can omit the suit and run full VR through a Complexity 5 program. \$100. LC4.

Total VR

This is only available as a computer program accessed through direct neural interface. It provides the same effects as a full VR suit, with the difference that all the user's senses are engaged. The only limit is whatever safety factors are programmed into the system.

If safety interlocks are engaged, the user may feel discomfort or dislocation, but not pain. If they are not engaged, a person in a total VR simulation can feel real pain. She won't suffer injury, but psychological damage can result if she is hurt, killed, or tortured in VR. This results in Fright Checks.

A standard feature in total VR systems are "consent-level" protocols limiting how much "reality" (in terms of discomfort or pain) the user is willing to take. Additionally, they generally include a "safeword" function. If the user speaks a specific code word, they are immediately pulled out. Sabotage or system operator connivance might neutralize such features. Total VR is a Complexity 6 program. \$300. LC4.

VR Manager

This is the back-end program which manages the interactions of users within shared VR and must be run on whatever computer is maintaining the virtual environment. Each program can handle up to 10 users. For more people, additional instances are required. The manager can grant varying degrees of access to individual users to design characters or places within the environment. Its Complexity and cost depend on the most complex VR interface it can support:

Complexity 4: Supports VR gloves or basic VR. \$10.

Complexity 5: Supports up to full VR. \$30.

Complexity 6: Supports up to total VR. \$100.

The level of "reality" experienced is the lower of the VR interface or the VR manager.

VR Environmental Database

This stores a virtual environment to be accessed by a VR manager. Users of interactive networks might also store their own environmental databases (e.g., personal character avatars) on their own systems, to be uploaded to the VR manager.

Memory requirements vary widely depending on the number of different objects stored in it and their level of detail. A forest of identical trees is much smaller than a small room with a hundred different knickknacks. Some typical database sizes are:

Imagery Database

Virtual character	0.001 TB
Virtual room	0.001 TB
Virtual house or park	0.01 TB
Virtual mansion or wilderness	0.1 TB
Virtual street or mall	1 TB
Virtual neighborhood	10 TB
Virtual town	100 TB
Virtual city	1,000 TB
Virtual small nation	10,000 TB
Virtual large nation	100,000 TB
Virtual planet	1,000,000 TB
Virtual interplanetary state	10,000,000 TB
Virtual interstellar state	100,000,000 TB
Virtual galactic empire	1,000,000,000 TB

Virtual wilds, streets, malls, cities, and worlds include simulations of animals or people as well as live users, but they are not really "alive" until someone else encounters them. Large areas may also use "generic scenery" to fill in backgrounds. A virtual city may only have a few thousand specific building interiors, assembling other rooms from "cut and paste" programs whenever individuals visit them.

Divide the required database by 10 for a "cartoon" level of imagery; multiply by 10 for "lifelike" imagery with fewer generic details. "Lifelike" imagery experienced with full or total VR is nearly indistinguishable from reality.

Packaged Characters and Settings: Buying off-the-shelf realities or standard character avatars cost \$1 per TB. For customized settings and characters, may cost significantly more. Many system managers prefer to program their own characters and environments.

Private Realities

Some commercial computer networks, such as those offered by Virtual Authentic, allow users to construct and/or rent private VRs on the network that only they are allowed to access. Pricing is based on what the network provider charges for storage (generally \$1 per PB).

VR-Enabled Software

Many software programs support a VR interface, including repair programs and games. See Augmented Reality.

Interactive Total VR: Dreamgames

These are interactive total VR games and simulations.. The user connects and is plunged into the setting and fiction genre of his choice.

Playing dreamgames can be addictive. This uses the rules for non-chemical addictions (B122): addiction to dreamgames is generally cheap, legal, and incapacitating

[-10]. (May also be the grounds for a Delusion based on their games/characters.)

Dreamgame addiction is a growing social concern, considering the ease of access of direct neural interfaces and cheap computers powerful enough to run the dreamgames. One in five Eurydice parents say their child has struggled with dreamgame addiction.

Dreamgames are usually Complexity 6+, but due to massive distribution, commercial games are usually one-tenth standard cost. Specialized corporate, government, or military training sims will be full cost. Some high-end programs may be Complexity 7+, and correspondingly more expensive. There is also a booming market for independently-developed dreamgames. Most dreamgames are LC4.

Augmented Reality

Hardware

Augmented reality is usually presented using vid glasses (p. TODO) or with a computer implant (p. TODO). A HUD (p. 13) and a camera (p. 28) is also sufficient equipment; either or both could be part of a helmet. A cyborg with bionic eyes and a computer implant running optical-recognition and database programs could keep everything in her skull. Digital minds can use augmented reality without any special interface.

Memory Augmentation

This "mug shot" database is a common AR program. It uses stored and/or net-accessible databases ranging from the commonplace to the job-specific. Most people accumulate personal databases of people they meet or expect to meet, co-workers, and so on.

If user's wearable camera (or eyes, if they use a brain implant) spots someone whose face is in the database, the program will automatically display that person's name and a brief identifier. This functionality can be customized based on the database and can be told to ignore relatives and other constant companions. Similar programs exist for recognizing artwork, wildlife, and vehicles. Memory Augmentation programs are generally Complexity 5 (though additional functionality can increase this). \$100. LC4 (Some more advanced are LC3).

Video and Sensory Processing

AR can digitally process what the user sees, improving his vision.

Visual Enhancement

This gives +1 to Vision rolls. Complexity 4, \$1,000. LC4.

Cosmetic Filter

A common AR program, this controls the audio-video display on a communication system. When activated, the video uplnk picks up the user's image as usual, but filters

it through a preprogrammed "ideal" of beauty before transmitting it to the receiver. The user still looks like herself, but the program tightens sagging jowls, erases crow's feet and wrinkles, and removes or minimizes blemishes. The user's video Appearance rises by one level, but cannot exceed Very Handsome. Any enhancement above Attractive has the Off-the-Shelf Looks (B21) modifier applied. Complexity 4, \$400. LC4.

Video Masking

Works as the cosmetic filter (above), except that it can change the user's features and voice. The user may resemble another person, or adopt a persona created by the program. Complexity 5, \$800. LC4.

Smart Diagnostic

Most modern technology incorporates built-in sensors to monitor their own status. The specifics vary from object to object; a precision machine measuring microstresses in its components or even a milk carton checking to see if the milk is spoiled. The data from these sensors is continuously uploaded to local (or planetary) networks, and accessed by looking at the object.

Virtual Tutors

These systems simplify tasks such as repairing a car engine or building a prefabricated house. A mechanism may have dozens (or thousands) of different parts tagged with microcommunicators and positional sensors. Integral databases know where each part goes and virtual tutoring software can track both the parts and the user's own hand movements, aiding in assembly, disassembly, preparation, or maintenance.

Virtual Tutor

This augmented reality program coaches the user in a specific task, such as assembling electronics or fixing a car engine. The user has an effective skill of 12. Complexity 3 if the task normally uses an Easy skill, Complexity 4 if it uses a harder skill or if it uses several skills in concert. Any necessary parts must be purchased as Instructor kits. Normal cost. LC4.

Sensies

Sensies are a relatively new invention. They are recordings or transmissions of another person's sensory experiences. They are sensory telepathy transmitted through total virtual reality media. Users require direct neural interfaces and experience full sensory input as if they were really there.

Transmitting or recording a sensie requires a specialized device that picks up the subject's sensory experiences. If it's recorded, a sensie can be replayed by anyone with a direct neural interface; they'll see and feel everything the original subject did.

Sensies don't have to be made from humans. Recording nonhuman allows a user to "become" a cat, a bird, or even a Raven. (Commercial sensies of very simple creatures like butterflies or worms usually have more understandable virtual reality experiences dubbed over the simple-minded experience of the actual creature).

Some edited sensie programs come with multiple viewpoints, so that you can try out the show or story line from the perspective of more than one character in it.

Sensie Uses

In recent decades, sensies have exploded in popularity as a growing entertainment medium. They are also used for surveillance and control. Emerging industries exist for using sensies to monitor prisoners, children, and even employees.

Sensie Mass Media

Sensies have seen growth both as commercial products and as a form of reality entertainment in the form of sensie-blogs, sensie livestreams, and more.

Commercial sensies come in a variety of genres and formats. Pornography, drama, and travel and sports shows are very popular. The most popular programs are "Sensie Experiences," the types of programs which bring the user on unique experiences: eating exotic food, scuba diving, sky-diving, zero-g free fall, and so on.

Many sensies are edited to remove any unpleasant sensations the viewpoint character may experience, such as sunburn, pain, hunger, or cold. However, black-market sensies may feature injuries, painful deaths, or torture. These find a market with jaded masochists, or as torture devices. Normally these are illegal, since the person making the sensie was harmed or killed. A sensie of sort will impose one or more Fright Checks on the user, at a penalty based on severity.

Sensie Stars

Anyone using a sensory uplink can make a sensie transmission, but some people have a gift for recording a satisfying sensory experience. These individuals make good "sensie stars." High HT and Acute Senses are valuable traits to have.

Experiencing a Sensie

A sensie is experienced from a live or recorded transmission of another individual's sensory experiences. Someone accessing a sensie experiences all the sensory data of the original subject: seeing through their eyes, hearing what they hear, sharing tactile sensations, etc.

There are two ways to experience a sensie:

In *immersion mode*, the user is unable to use his own senses and is submerged in the transmission. If the transmission includes pain or physical afflictions, the user also feels pain and suffers shock effects, but takes no damage. If it includes terrifying events, severe injury, torture, or death, it requires one or more Fright Checks. Since the user's own

senses are immersed, he might miss almost anything that didn't wreck the headset or media player, all mass-produced sensie equipment is programmed to turn off the sensie in the event of an emergency (such as a fire or burglar alarm).

In *surface mode*, the receiver experiences the transmitted sensory perceptions, but they are muted. The receiver can still function, but she will be distracted. This imposes a -3 on other activities, unless the task is one that would benefit from intimate knowledge of what the subject is feeling; e.g., attempting to interrogate or seduce them. The user suffers only half the transmitter's shock penalties, and makes any required HT, Will rolls or Fright Checks at a +4 bonus. Most commercial sensory interface experiences are transmitted in surface mode.

Experiencing a real-time sensie in immersion mode requires a transmission speed of at least 1 GB per second; surface mode requires at least 0.1 GB per second. This generally means one has to "jack in" to experience a sensie.

Sensie Equipment

Creating or experiencing sensie requires a neural interface and appropriate software.

Sensie Player: This software lets someone experience sensie media. They must use a direct neural interface to connect their mind to a computer running this program. This lets them access recorded or live sensie feeds stored on their computer, or transmitted over networks or via communicator. Complexity 6. \$300. LC4.

Sensie Uplink: This software lets someone transmit or record his sensory experiences as sensie media. The link requires a direct neural interface that is in communication with a computer running this program. The data is then sent to a recorder, or broadcast using a communicator or net connection. Complexity 7, \$1,000. LC4.

Braintaps: These specialized cybernetic implants only record and transmit sensies. See TODO.

Anything with a digital mind – AIs and mind emulations – can record its experiences without the need for any kind of sensie uplink, since it experiences everything in digital form already.

A typical sensie program occupies about 100 GB/hour, recorded in standard digital media. Cost is about \$10 per hour for mass-market entertainment sensies, but may be considerably more for specialized ones such as tutorials. Sensie-rental fees are usually about 20% of the purchase price.

Sensie Editor

This is a software suite that someone who can play sensies can use to edit raw sensory recordings. The user can wipe portions of a recorded sensie, compress time with smooth jumps, fadeouts, or transitions, tone down sensory experiences, or splice several recordings together. It also can be used to analyze a sensie recording to tell whether it is "raw" or edited, what kind of equipment was used, etc.

Sensie editors are necessary to make commercial-quality sensies from raw recordings. For instance, if sensie superstar Selena Usagi records her latest travel sim "Beautiful in

Bali," and takes an hour-long walk down a moonlit beach before skinny-dipping in the warm tropical ocean with her co-star, the editor might condense it to the most stimulating 10 minutes. The quality of the sensie-editing job matters as much as the actual experience that generated the sensie; experiencing a poorly edited sensie can be disorienting and unpleasant! Electronics Operation (Media) skill is used to operate a sensie editor. Complexity 6 program; \$5,000. LC4.

Mass Media

Augmented Reality: Traditional text, video, and other media may be delivered at all times as an overlay on daily life.

Total VR and Sensies: Fully-interactive sensory experiences offer high levels of realism and excitement, and create new frontiers for artistic effects. Their main limitations are high bandwidth requirements, and the need for expensive and invasive neural interfaces.

Media Walls: Cheap audio-video walls have lead to a renaissance in billboard technology as well as the emergence of video graffiti using paint-on screens.

Holotech Projections: Super holoprojectors allow for giant-sized images that tower over entire communities.

Teaching and Learning Aids

AI Tutors

The growth of AI software has led to the emergence of AI tutors for education purposes. AI tutors can train the user in a variety of mental skills, languages, and learnable mental advantages. By using full or total VR, they can train any skill.

Using a Non-Volitional AI teaches at half the speed of a human teacher (the equivalent of self-study). Volitional AI is the equivalent of a human teacher.

AI tutors need Teaching skill and the trait or skill the user will study. See Purchasing Machines for the cost of skilled AI software.

Training Robots

For a long time, robots were a common training aid for sports to combat training to medicine. They have fallen out of favor with the explosive growth of total VR.

Virtual Education

VR allows the user to study IQ-based skills or languages with a distant teacher as if he were present. If the user has access to a Basic Vr rig or better, DX-based skills can also be learned. HT-based skills require total VR.

Dream Teacher

This is an advanced form of total virtual reality. It transforms the user's dream-state into a teaching environment via direct neural interface. The user goes to sleep (or is sedated) while connected via direct neural interface to a computer that is running the program. As she sleeps, the program interfaces with her dreams to create lifelike simulations that reinforce rote aspects of a skill and teach new situations.

Dream teacher programs allow the user to perform Intensive Training (B293), while sleeping, in any IQ-based skill or language. DX- and Ht-based skills are not quite as effective and are only learned as the same as Education (B293).

Dream teacher programs are individual for each skill or trait. Programs are Complexity 6 for Easy skills, 7 for Average skills, 8 for Hard skills and languages, or 9 for Very Hard skills. Behavior modification programs are Complexity 7 for -1 point disadvantages, Complexity 8 for -2 to -10, Complexity 9 otherwise. Standard software costs. Generally are LC4, but behavior modification programs and those that teach military or espionage skills will be LC3 or lower.

Chapter 11

Sensors and Scientific Equipment

Passive Visual Sensors

These systems work like normal vision, but extend the limits of human sight. They include light-intensifying, infrared, ultraviolet, and hyperspectral sensors.

Passive sensors often incorporate levels of telescopic magnification. Each doubling in magnification lets the user ignore -1 in range penalties ($\log_2(x)$) on Vision rolls when using the sensor. The user can also "zoom in" on a particular target by taking an Aim maneuver. This doubles the benefit against that target but eliminates the bonus to spot other targets.

All passive sensors incorporate a digital camera.

All these sensors provide anti-glare protection and DR 2 for the eyes.

Magnification Range Penalty Negation

1x	0
2x	-1
4x	-2
8x	-3
16x	-4
32x	-5
64x	-6
128x	-7

Passive Visual Sensor Configurations

Standard models:

Binoculars: A manual hand-held viewer. It limits the user's vision to a 120° forward arc (see No Peripheral Vision, B151) and requires one free hand an Aim maneuvers to use. Binoculars incorporate a built-in HUD, a laser rangefinder, and a digital camera. They can be used as basic equipment for Photography skill.

Goggles or Visor: These are wearable hands-free optics with a wide field of view, but lower magnification than equivalent binoculars. They also incorporate a built-in HUD and digital camera, but the simple controls for the latter give a -5 (quality) modifier to Photography skill.

Imaging Sensor Array or Surveillance Camera: A security system or vehicle-mounted sensor. It does not come with come a display; it requires a separate terminal as its

interface. It limits the user's vision to 120° forward arc (No Peripheral Vision, B151), but is often mounted on a rotating turret or tripod. It can be used as a digital camera with +1 (quality) bonus to Photography skill.

Video Glasses: These resemble ordinary sunglasses. They have the same capabilities as goggles, but less magnification. It takes a Ready maneuver to don or remove them.

Video Contacts: These rigid gas-permeable contact lenses contain intricate microcircuitry and auto-focusing system. They have the capabilities of goggles, but much less magnification. It takes a day to adjust to wearing contacts; until then, vision rolls are -1. It takes six seconds to insert or remove both lenses. They must be taken out every week and cleaned or else risk eye infection (HT rolls to resist infection are at a penalty equal to the number of weeks without removal/cleaning). They're powered by body heat or piezoelectricity.

Night Vision Optics

These devices use near-infrared and computer-enhanced light intensification to amplify ambient light levels. They are rated for their level of Night Vision. Each level (to a maximum of nine) lets the user ignore -1 in combat or vision penalties due to darkness. However, they have no effect on the -10 penalty for total darkness.

They come in the classes detailed under Passive Visual Sensor Configurations (above), with various levels of telescopic magnification and night vision.

Electro-Optical Binoculars ("Televiewers"): Night Vision 9 and 128x magnification. \$500, 0.6 lb., 2B/100 hr. LC4.

Electro-Optical Surveillance Camera: Night Vision 9 and 8x magnification. \$250, 0.6 lb., 2B/100 hr. Often uses external power. LC4.

Night Vision Contacts: Night Vision 7 and 2x magnification. \$200, neg. LC4.

Night Vision Glasses ("Night Shades"): Night Vision 8 and 4x magnification. \$250, 0.1 lb., A/10 hr. LC4.

Night Vision Goggles or Visor: Night Vision 9 and 8x magnification. \$1,000, 0.3 lb., 2B/100 hr. LC4.

Infrared Imaging Sensors

This is technically known as thermal imaging, and is equivalent to the Infravision advantage. These sensors detect the infrared (heat) spectra emitted by objects at different temperatures, then build up a false-color television image of the environment.

Infrared sensors lets the user observe or fight at no penalty even in absolute darkness, if the target emits heat (this includes all living beings and most machines). The sensors give a +2 on all vision rolls to spot such targets, since their heat stands out against the background. It can also distinguish targets that are colder than their surroundings (there is no bonus). Infrared sensors can be used to follow a heat trail when tracking: add +3 to Tracking rolls if the trail is no more than an hour old.

Infrared sensors do not distinguish real colors (which may limit the ability to use some controls), and only allow the user to judge the general size and shape of heat-emitting objects. Roll at -4 to distinguish objects of similar size and shape. Attempting to read by reflected heat requires a Vision-4 roll. Flare, fiery explosions, infrared lasers and other sudden flashes of heat can blind the imaging system, just as a flash of light can blind ordinary vision.

Infrared sensors usually come with one or more levels of telescopic magnification. The user can switch freely between normal vision and infravision.

The infrared sensors described below also have a daylight TV optical channel as well. This gives telescopic magnification at the same level without providing infravision. It takes a Ready maneuver to switch settings.

They come in styles and features described under Passive Visual Sensor Configurations, with various levels of telescopic magnification.

Infrared Imaging Sensor Array: 128× magnification. \$40,000, 50 lb., 2D/12 hr. LC3.

Infrared Binoculars: 32× magnification. \$2,500, 3 lb., C/10 hr. LC4.

Infrared Surveillance Camera: 8× magnification. \$250, 0.6 lb., 2B/100 hr. Often uses external power. LC4.

Infrared Goggles or Visor: 4× magnification. They're an integral feature of many suit helmets, but if purchased separately are \$500, 0.6 lb., B/10 hr. LC4.

Infrared Video Glasses: 2× magnification. \$500, 0.1 lb., A/10 hr. LC4.

Infrared Contacts: 1× magnification. \$300, neg. LC4.

Hyperspectral Imaging Sensors

These optical sensors electronically fuse passive radar, infrared, visual, and ultraviolet imagery into a single false-color television image. The integrated picture often reveals details that are invisible to those who see in only one of these frequencies.

If there is any light at all, hyperspectral imaging grants near-perfect night vision with no vision or combat penalties. In total darkness, it functions exactly like infrared sensors (above). It also gives +3 to all Vision rolls, all Tracking rolls, and all rolls to spot hidden clues or objects with Forensics, Observation, or Search skill. These capabilities are not

cumulative with other passive visual sensors or similar advantages.

Hyperspectral imaging sensors all incorporate the above capabilities plus one or more levels of telescopic optics. If the hyperspectral imaging is turned off, the sensors function as daylight television systems.

Hyperspectral Imaging Sensor Array: 64× magnification. \$160,000, 50 lb., 2D/12 hr. LC3.

Hyperspectral Binoculars: 32× magnification. \$10,000, 3 lb., C/10 hr. LC4.

Hyperspectral Surveillance Camera: 8× magnification. \$2,000, 1 lb., C/100 hr. Often uses external power. LC4.

Hyperspectral Goggles or Visor: 2× magnification. An integral feature of many suit helmets, or available for \$2,000, 0.6 lb., B/10 hr. LC4.

Passive Electromagnetic Sensor Arrays (PESA)

These are similar to hyperspectral imaging sensors, but they see even farther into the electromagnetic spectrum. They provide Hyperspectral Vision (Extended Low Band), allowing the user to "see" microwave emissions.

PESA Sensor Array: 32× magnification. \$160,000, 50 lb., 2D/12 hr. LC3.

PESA Binoculars: 16× magnification. \$10,000, 3 lb., C/10 hr. LC4.

PESA Surveillance Camera: 4× magnification. \$2,000, 1 lb., C/100 hr. Often uses external power. LC4.

PESA Goggles or Visor: 1× magnification. An integral feature of many suit helmets, or available for \$2,000, 0.6 lb., B/10 hr. LC4.

Indirect Passive Sensors

These sensors are omnidirectional, and do not require a line of sight.

Chemsniffer

An artificial nose that registers the presence of almost any odor by comparing it to a database. The user must set the chemsniffer for a particular odor or scent. When so programmed, it allows the use of Electronics Operation (Sensors) skill for tasks that would require Smell rolls. It can recognize people, places, and things by scent (provided they have been scanned before, or are common items). It can't detect anything in a sealed environment, underwater, or in vacuum.

The sensor has a computerized database of olfactory "signatures" that can quickly be compared to new sensory impressions. The sensor can record a new signature by analyzing a scent. Its bonus is not cumulative with the Discriminatory Smell or Acute Taste and Smell advantages. A chemsniffer gives +5 on any Electronics Operation (Sensors) roll to detect targets, +5 to Tracking skill, and +9 to analyze or recognize targets by scent.

Personal Chemsniffer: This takes 10 seconds to analyze a new smell. Incorporates a built-in tiny computer. \$2,000, 2 lb., A/1 wk. LC4.

Dedicated Chemsniffer: Optimized to detect a single particular category of scents, e.g., explosives, human beings, drugs, etc. \$100, 0.2 lb., A/1 wk. LC4.

Tactical Chemsniffer: Takes only three seconds for the system to scan a new scent. Can track 10 different scents at the same time. \$100,000, 40 lb., B/1 wk. LC3.

Electronic Support Measure (ESM)

This system detects and classifies electromagnetic emissions. On a successful Electronics Operation (EW) roll, this sensor detects radar or radio signals and reveals the distance to each source. Signals are usually detected at twice their range; low-probability intercept signals are detected at 1.5 times their range.

The system will also function as a sensor, detecting ladar, targeting laser, and laser comm signals that are beamed directly at it.

The brief warning the ESM system provides give a +1 bonus to Dodge any attack aimed with an active targeting sensor that the ESM can detect.

The operator may take more time and make an Electronics Operation (EW) roll to analyze the signal. Each attempt requires a Concentrate maneuver; success distinguishes a random emission from a target lock, and can determine known types of emitters. An ESM can also be set to detect and analyze signals autonomously, using its own Electronics Operation (EW) skill for this purpose.

ESM Detector: A hand-held or belt-mounted system, often used as a counter-surveillance device. It has Electronics Operation (EW)-10. \$250, 0.25 lb., A/1 wk. LC3.

Tactical ESM Detector: A heavier and more expensive model. Adds a +1 (quality) bonus or uses Electronics Operation (EW)-12. \$1,000. 2 lb., B/1 wk. LC3.

These systems are also commonly built into suits, vehicles, etc.

Sound Detector

This is a sensitive array of microphones and sound-profiling software that provides the superhuman ability to distinguish between sounds.

The user can always identify people by voice, and can recognize individual machines by their "sound signature." In tactical situations, sound detectors are often programmed to respond to particular sounds made by specific weapons, engine noises, breaking armor, etc.

The system can memorize a sound by monitoring it for at least one minute, then adding it to the signature library. It gives +4 on any Hearing roll, +4 to Shadowing skill when following a noisy target, and +8 to Electronics Operation (Sensors) rolls made to analyze and identify a particular sound. Sound detectors can also magnify sounds from a distant point for eavesdropping purposes; this requires an Aim maneuver.

Sound detectors only work in air (hydrophones are used under water). They are useless in vacuum. They can detect

an air sonar at double its range.

Personal Sound Detector: This device can zoom in and amplify a particular sound by 16×. Must be connected to a Complexity 4+ computer. \$1,000, 1 lb., A/1 wk. LC3.

Tactical Sound Detector: A sensitive "phased array" of microphones, often built into a vehicle hull. It can amplify a particular sound by 64×. It must be connected to a Complexity 4+ computer. \$30,000, 30 lb., B/1 wk. LC3.

Hydrophone

These are underwater microphones connected to discriminatory sound signature-profiling software. This can detect and track moving or noisy objects in the water, provided the hydrophone is submerged. To do so, make an Electronics Operation (Sonar) roll at the detection bonus shown below. Consult the Size and Speed/Range Table (B550); apply separate bonuses for the target's size and speed, and a penalty for the range to the target. Swift currents will generate "noise" that interferes with the sense. Find the speed of the current on the table and assess the relevant speed penalty.

A successful roll reveals the size, location, speed, and direction of movement of the target. It reveals the target's general class based on sounds (e.g., "whale" or "nuclear sub"), location, and vector, giving +8 to identify it, +4 to shadow it, and +3 to hit it with an aimed attack. It does not provide any information about the object's shape or color. Once the object is detected, it can be attacked. The modifiers that applied to the skill roll also apply to the attack roll, but can never give a bonus to hit over the +3.

Hydrophones automatically detect anyone using sonar or sonar communicators at twice that system's range (or 1.5 times range if it is low-probability intercept sonar).

Small Hydrophone: +10 to the detection roll. \$5,000, 5 lb., B/1 wk. LC3.

Medium Hydrophone: +12 to the detection roll. \$25,000, 25 lb., C/1 wk. LC3.

Large Hydrophone: +14 to the detection roll. \$100,000, 100 lb., D/1 wk. LC3.

Search Hydrophones: This system is used for underwater research, fishing, or perimeter surveillance. It does not provide a targeting bonus, but costs 1/10 as much. LC4

Gravscanner

These devices detect the strong gravity waves produced by operating gravitic devices; see Gravity Control. They can also detect massive objects (a million tons or more) such as giant spacecraft, asteroids, planets, stars, or black holes. They provide an estimate of the bearing and strength of the gravity emanation. They can receive messages from gwhel-ripple comms but they cannot send them.

Electronics Operation (Sensors) skill is used to operate them.

Very Large Gravscanner: +12 to detection. \$500,000, 1,000 lb., external power. LC4.

Radscanner

This detects electrical or magnetic fields and radiation sources of all kinds (including radar and radio signals, not just radioactivity). The user must set the sensor to detect a particular type of radiation, such as radio waves or gamma radiation.

The detector can provide range, strength, and bearing. It does not emit a scanning signal. Detection requires a roll against Electronics Operation (Sensors) skill.

Range depends on the strength of the source – for sensor or communicator signal detection, range is usually twice the radiating system's range. If detecting other sources of radiation, add modifiers from the Size and Speed/Range Table. If attempting to detect operating power cells, the skill roll is at -12 for an AA cell, -9 for an A cell, -6 for a B cell, -3 for a C cell, 0 for a D cell, +3 for an E cell, +6 for an F cell.

Radscanners also analyze radiation. Make a Physics or Electronics Operation (EW) roll.

Large Radscanner: +18 bonus to detection (or $\times 1,000$ range when detecting signals). \$100,000, 150 lb., external power. LC4.

Medium Radscanner: +12 bonus to detect radiation sources (or $\times 100$ range for signals). \$10,000, 5 lb., B/24 hr. LC4.

Small Radscanner: +6 bonus to detection (or $\times 10$ range for signals). \$1,000, 0.5 lb., AA/24 hr. LC4.

Voidscanner

Voidscanners detect the presence of "Void Energy" (VE) which is output by Ravens, Leviathans, and Witchcraft.

They provide the bearing, range, and strength of the VE. Using the scanner requires a roll against Electronics Operation (Sensors) skill. The scanner does not, by default, differentiate between the sources, but analysis of the readings can estimate the source, this requires a Biology (Void) or Thaumatology skill roll.

Range depends on the strength of the VE source. For Ravens and Leviathans this adds modifiers from the Size and Speed/Range Table plus modifiers based on the abilities of the creature. For Witchcraft, Witches and low-power charms also just use the Size and Speed/Range Table, but when casting rituals or when detecting high-power charms, the strength of the magic also adds a bonus (Witches can also mask their rituals making them harder to detect).

Large Voidscanner: +9 bonus to detection. \$100,000, 150 lb., external power. LC3.

Medium Voidscanner: +6 bonus to detection. \$25,000, 5 lb., B/24 hr. LC3.

Small Voidscanner: +3 bonus to detection. \$5,000, 0.5 lb., AA/24 hr. LC4

Psi Scanner

Psi-scanners can detect the presence of psionic energy, output by espers.

The scanners provide the bearing, range, and strength of the psionic energy. Using the scanner requires a roll against

Electronics Operation (Sensors) skill. The scanner cannot differentiate the type of psionic powers being used.

Range depends on the strength or the esper or the ability they are using. For espers themselves, use firstly the Size and Speed/Range table penalties/bonuses and then add a bonus based on the strength of the esper. For espers actively using their abilities, there is also a hidden bonus (i.e. the GM will not declare) based on the strength of the specific ability being used. Espers can use the Hidden Signature technique for their abilities to mask their powers, which applies a penalty to the detection roll.

Large Psiscanner: +9 to the detection roll. \$100,000, 150 lb., external power. LC3.

Medium Psiscanner: +6 to the detection roll. \$10,000, 5 lb., B/24 hr. LC3.

Active Sensors

Active sensors detect objects by bouncing energy off them and analyzing the returned signal.

Active sensors are rated for the type of sensor and a range in miles or yards. An Electronics Operation skill roll is required to use an active sensor to detect hidden targets or fine detail. Active sensors can sense objects out to their rated maximum range at no range penalty; each doubling of range beyond that gives -2 to skill.

The scanning wave of an active sensor can be detected by specialized detectors. Normally, this is at twice its range. It is *possible* to detect them at longer range given that most scanners radiate energy, but as these sensors operate on multiple frequencies, detection is difficult. The detector required depends on the sensor.

Unless otherwise noted, assume an active sensor scans a 120°arc in front of it (see *No Peripheral Vision*, p. B151).

Special Modes

Targeting: Active sensors are available in tactical versions that incorporate a rangefinder mode. This works the same way for all active sensors: it generates a narrow targeting beam. It requires an Aim maneuver to "lock onto" a particular target that has already been detected. This determines its precise range and speed, and gives +3 to hit with an aimed attack used in conjunction with targeting software (p. TODO).

Low-Probability Intercept (LPI): The sensor uses a rapid frequency-agile burst of radar energy. This halves range, but results in a radar signal that can only be detected at 1.5 times the halved range rather than twice the normal range.

Disruption or Blinding: Some sensors have the ability to emit high-power narrow beams that can be used as weapons – see the individual sensor descriptions.

Vehicular Arrays

Aircraft, submarines, or spacecraft often have very large active sensor arrays that cover a sizable fraction of their surface area on one or more facings. Active arrays operate

indefinitely off vehicle power; the cost and weight are included as part of the vehicle, as the capabilities depend on the vehicle's surface area.

Ladar

This high-resolution sensor emits laser energy, then analyzes the returned signal. A ladar can discern a target's size and shape, and pick out other physical details, such as the shape of a face. It can't determine flat details such as writing. Anyone who can sense the signal you emit can detect the ladar, out to twice its own range.

Ladars are of limited use in detecting unknown targets due to the narrowness of the beam – make an Electronics Operation (Sensors) roll at -4 to spot a previously unknown target. However, they are excellent for identifying targets that have already been spotted by other sensors, roll at +4 (even to detect fine details).

Ladar can be used to “lock onto” a target that has already been detected. This determines its precise range and speed, and gives +3 to hit that target with an aimed ranged attack. This bonus is not cumulative with that from other active sensors that have locked onto the target.

Ordinary radar detectors do not detect ladar; specialized laser sensors are required. Ladar cannot penetrate solid objects. It has 10-50% range in falling rain or snow, and can be tuned to use blue-green frequencies. Underwater, ladar functions at 1% of its normal range with a maximum range of 200 yards.

Large Ladar: A powerful ladar, usually vehicle-mounted. It has a 200-mile range. \$200,000, 100 lb., D/8 hr. LC4.

Medium Ladar: A portable ladar set. Can be worn as a pack, or mounted on a tripod, vehicle, or robot. It has a 60-mile range. \$20,000, 10 lb., C/8 hr. LC4.

Small Ladar: A mini ladar with a 20-mile range. It comes in a hand-held version, or attaches to a shoulder mount, and plugs into a HUD (p. 13). \$2,000, 1 lb., B/8 hr. LC4.

Small, Medium, or Large Tactical Ladar: A military-style target-acquisition ladar. It can track up to 10 targets at once out to the listed range, and gives +3 to hit any of them with an aimed attack. +4 CF. LC2.

Ladar Smartskin

This is a phased array ladar integrated into the vehicle's surface area. It functions as a tactical ladar with a range specified in the vehicle's description, and as a laser communicator (p. 24).

Tactical Ladar Arrays: These have an “optical countermeasures” mode – see Blinding Lasers (p. TODO). Weight and cost are included in the vehicle statistics; the array can't be added later.

Laser Chemscanner

Chemicals absorb laser energy at known wavelengths. This system uses a laser to detect airborne chemical compounds, as well as surface contaminants such as a slick of chemicals coating an object of the ground. It is most often used to identify chemical weapons or pollution levels in the

atmosphere. It can also analyze the light scattered from swarms of microbots or nanomachines and identify them by matching the patterns with known models.

A dedicated laser chemscanner is half as expensive as a ladar, but has twice the range. A chemscanner mode for a ladar adds +0.2 CF.

Multi-Mode Radar

This provides a search mode for locating potential targets, and an imaging mode for identifying them as they get closer. Generally, most moving targets that fit the radar's criteria are detected automatically. If a target is using radar countermeasures or being stealthy then roll a quick contest between the radar operator's Electronic Operation (Sensors) skill against the target's Stealth.

Search Radar: This searches a fan-shaped, 120° area in front of the user, hunting for rat-sized (SM -6) or larger moving targets and displaying them as blips on a screen. Darkness, smoke, and bad weather do not impair it, but it cannot see over the horizon or through solid obstacles. It provides a digital readout of target speed, altitude, position, and approximate size. It cannot, generally, distinguish between different objects of the same size (such as a human and a similarly sized robot). Background items make spotting stationary human-sized (SM 0) or smaller objects on the ground virtually impossible in anything but open terrain. Non-moving targets are impossible to distinguish from ground clutter unless the user has seen that particular “blip” moving.

Imaging Radar: This uses millimeter-wave radar. This means it has a shorter range than search radar, but can spot small objects and determine their shape. An Electronics Operation (Sensor) roll is needed to distinguish fine relief. Imaging Radar can see through thin fabric or vegetation. It gives a +3 to Search rolls to locate objects like concealed weapons, and may ignore penalties for spotting objects hidden behind light brush. Ordinary radar detectors detect Imaging Radar at -4. Imaging Radar does not work underwater. The effects are similar to the Imaging Radar advantage. It has 1/10th the range of the radar in search mode.

Switching settings takes a Ready maneuver. If desired, a longer cable can connect the radar and its control panel – this sometimes proves tactically desirable, since radar emissions can be detected over quite a distance.

Large Radar: A powerful multi-mode radar suite, usually vehicle-mounted. It has a 200-mile range in search mode, 20-mile range in imaging mode. \$100,000, 100 lb., D/8 hr. LC4.

Medium Radar: A portable radar set. It can be worn as a pack, or mounted on a tripod, vehicle, or robot. It has a 60-mile range in search mode, 6-mile in imaging mode. It has no display screen of its own, but can be plugged into a computer monitor, HUD, or interface. \$10,000, 10 lb., C/8 hr. LC4.

Small Radar: A mini radar set with a 20-mile range in search mode, 2-mile in imaging mode. It's available in a hand-held version, or one that mounts on the shoulder and plugs into a HUD. \$1,000, 1 lb., B/8 hr. LC4.

Small, Medium, or Large Tactical Radar: Military-style multi-mode radar. It can track up to 10 targets at once out to the listed range, identify them at 1/10 that range, and give +3 to hit any of them with an aimed attack. +4 CF. LC2.

Tactical Active Electromagnetic Sensor Array (AESA)

Some vehicles have large multi-mode tactical radar antenna arrays buried in their hulls, often covering a good fraction of their surface. These arrays are rated for their range in miles; see the vehicle descriptions.

AESA arrays are powerful enough to be used in *disruption mode*. This uses a narrow microwave beam to jam or burn out enemy electronic systems. See Microwave Disruptors (p. TODO) for combat statistics of AESA arrays.

A vehicular AESA operates indefinitely off vehicle power. Cost and weight are included in the vehicle's statistics, as the capabilities depend on the vehicle's surface area.

Sonar

This is an active sonar using ultrasonic sound waves. Sonar can spot small objects and determine their shape, but an Electronics Operation (Sonar) skill roll is required to distinguish fine relief (e.g., to identify a face). Sonar can be "jammed" or fooled by explosions and other loud noises. Individuals or devices with Ultrahearing can detect sonar.

Sonar gadgets must be designed for air or water. Standard range is for underwater sonars. Air sonars have shorter ranges: 1/10th normal, multiplied by air pressure in atmospheres (one atmosphere on Earth). All sonars are ineffective in vacuum.

Electronics Operation (Sonar) rolls are used to detect objects. Ambient noise from sea life and other ships will interfere with detection; apply a -1 penalty for being near noisy sea life, or -6 for detecting an object in a busy, cramped harbor.

A sonar can sense objects out to its rated maximum range at no penalty; each doubling of range beyond that gives -2 to skill. Detection is limited to a 120° arc. Under ideal conditions, sonars can be detected at twice their own range, but ambient noise can interfere.

Large Sonar: A powerful multi-mode sonar suite, usually vehicle-mounted. It has a 20,000-yard range. \$20,000, 100 lb., D/8 hr. LC4.

Medium Sonar: A portable sonar, often used by small boats or underwater robots. It has a 2,000-yard range. \$2,000, 10 lb., C/8 hr. LC4.

Small Sonar: A small sonar used by divers, underwater battlesuits, and robots. It has a 200-yard range. It comes in a hand-held version or one that mounts on the shoulder and plugs into a HUD. \$200, 1 lb., B/8 hr. LC4.

Tactical Sonar: Military-style multi-mode targeting sonar. It can track and identify up to 10 targets at once out to the listed range, and gives +3 to hit any of them with an aimed attack. +9 CF. LC2.

Terahertz Radar

This uses the "t-ray" wavelengths that lie between infrared radiation and the millimeter-waves used by imaging radar. A terahertz radar can penetrate clothing, brush, or thin walls (up to a few inches thick) to see inside objects. It can also be used to spot small objects and determine their shape, and eliminates penalties to spot objects behind light cover. It gets +4 to locate concealed weapons, and while it still requires an Electronics Operation (Sensors) roll to distinguish fine relief, this roll is also at +4. Only special-purpose sensors can detect its radar emissions. It doesn't work underwater.

Large Terahertz Radar: 4,000-yard range. \$200,000, 100 lb., D/10 hr. LC4.

Medium Terahertz Radar: A portable radar set. It has a 1,200-yard range. \$20,000, 10 lb., C/8 hr. LC4.

Small Terahertz Radar: 400-yard range. \$2,000, 1 lb., B/10 hr. LC4.

Tactical Terahertz Radar: It can track up to 10 targets at once out to the listed range, and gives +3 to hit any of them with an aimed attack. +4 CF. LC2.

Combination Sensors

Extensible Sensor Pod (ESP)

This is expensive sensor suite is used by special ops teams or battlesuit troopers for urban warfare. It is a backpack unit with a short periscope, tipped with a multi-sensor head. It swivels, and can be extended up to a yard vertically or horizontally. This lets the user see around corners or over cover. (If shot at, it is SM -8, HP 4, and DR 20)

The pod has a sound detector (p. 37) and a hyperspectral imaging sensor (p. 36), both with 8x magnification, plus a tactical terahertz radar (p. 40) with a range of 200 yards. The user will need a HUD and either a terminal or neural interface to use it. \$50,000, 10 lb., 2C/100 hr. LC3.

Tactical Sensor Turret

This battlefield sensor system uses a rotating mini-turret to look in any direction. It includes a set of hyperspectral imaging sensors (p. 36) with 20x magnification and a tactical ladar (p. 39) with a range of 20 miles.

It must be controlled from either a terminal (p. 13) or neural interface (p. 26).

Two versions are available:

Sensor Turret: A ball turret installed on the roof or in the nose of vehicles. It can also be placed on top of a building. \$300,000, 70 lb., external power. LC3.

Sensor Periscope: The same system on a telescoping mast that can be extended up to seven yards (21') above the roof of the vehicle or base camp it is installed in. Often used by submarines, and by specialized armored fighting vehicles that need to look over hills. \$350,000, 150 lb. LC3.

Scientific Equipment

Portable Laboratories

These provide the scientific equipment necessary to conduct research "in the field." They include an array of scientific instruments, a dataport for linking them to a computer, and sealed sub-compartments for storing solid, liquid, and gaseous samples. They fulfill the basic equipment requirements for gathering and analyzing samples.

Portable labs are specialized to a specific scientific skill: Archaeology, Biology, Chemistry, Farming, Forensics, Geology, Metallurgy, Paleontology, and Pharmacy.

These labs incorporate high-precision systems that purify, separate, pump, stir, filter, and transfer minuscule samples with single-molecule accuracy.

Suitcase Lab: Fulfills basic equipment requirements for using the skill. Takes 10 seconds to set up or pack up. \$3,000, 10 lb., 4C/10 hr. LC4.

Pocket Analyzer: These are basic equipment for analysis of small samples. They are -5 for other tasks. \$500, 0.6 lb., 2B/5 hr. LC4.

Semi-Portable Lab: Contains good-quality scientific equipment; takes 1 minute to set up or pack. +1 (quality) bonus to the skill. \$15,000, 40 lb., 2D/10 hr. LC4.

Mobile Lab: Enough lab equipment to fill a room; takes 15 minutes to set up or pack. +2 (quality) bonus to the skill. \$75,000, 200 lb., external power. LC4.

Sensor Gloves

These gloves are equipped with sensitive tactile, pressure, chemical, and biometric sensors. They can weigh items by lifting them, measure the hardness and smoothness of materials, detect chemicals, read ink printing, and scan any of this information into computer by touch. The user's fingertips can sense residual heat in a chair, or feel faint vibrations in the floor as someone approaches. Add +4 to any task using the sense of touch.

The bonuses from Sensor Gloves are not cumulative with bonuses from the Acute Touch or Sensitive Touch advantages. Each glove: \$1,000, 0.2 lb., A/2 wk. LC4.

Wristwatch Rad Counter

This measures and displays the amount of radiation that the user is exposed to, and can be programmed to set off an alarm if dosage exceeds a designated level. Can be connected to a HUD or be built into a helmet visor. \$100, neg., A/6 mo. LC4.

Part IV

Housing, Tools, and Survival Gear

Chapter 12

Housing and Food

Domestic Equipment and Appliances

The following household items are available:

Housebot

This small domestic robot serves as a waiter, janitor, or homemaker, depending on its configuration. Its internal payload space can accommodate a garbage can, vacuum cleaner, microwave oven, ultrasonic dishwasher, or a reservoir for cleaning agents. It is designed to run quietly, to avoid disturbing people while working. It moves on legs.

Atribute Modifiers: ST-3 [-30]; HT+2 [20].

Secondary Characteristic Modifiers: SM-1; HP+5 [10].

Advantages: Absolute Direction (Requires signal, -20%) [4]; Doesn't Breathe [20]; DR 5 (Can't Wear Armor, -40%) [15]; Extra Legs (four) [5]; Infrared Communication (Reduced Range 5, -20%) [8]; Machine [25]; Reduced Consumption 3 [6]; Silence 2 [10]; Payload 2 (2 lb. cargo) [2]; Radio (Secure, +20%) [12].

Perks: Accessory (Cleaning equipment, tiny computer) [2].

Disadvantages: Electrical [-20]; Maintenance (one person, monthly) [-2]; Restricted Diet (Very Common, power cells) [-10]; Striking ST -2 [-10].

\$1,000, 20 lb., C/24 hr. LC4.

Responsive Beds

This bed can adjust to the shape of the sleeper, respond to voice commands to become softer, firmer, bouncier as desired. Adds +1 to Erotic Art skill if used inventively, and adds +5 to any Will rolls made to get to sleep.

Single: \$500, 100 lb. *Double:* \$700, 140 lb.

Autokitchen

This automated kitchen is fitted with a complete set of robotic manipulator arms. It can cook on command using its Cooking-10 skill. Alternatively, when connected to a network, can be used remotely to duplicate the moves of a live chef and use the chef's Cooking skill. \$20,000, 400 lb.

Domestic Nanocleanser

Also known as "smart soap," this is a solution of microscopic cleaning robots that work to remove stains, grime, dirt, dandruff, and loose skin flakes from surfaces. It can serve as a shampoo, soap, or detergent. A teaspoon of nanocleanser powder poured into water will clean anything immersed in it in 10 to 60 seconds. It also comes in pre-mixed liquid-detergent form for when water is unavailable.

While some may find washing in nanocleanser to be unsettling due to its tingling sensation, it is not dangerous and once you get used to the tingling sensation, it can be quite pleasant. The bots themselves are biodegradable, non-toxic, and smart enough not to scrub too hard. Furthermore, they are programmed to break down harmlessly if exposed to ultra-violet light or the interior of a living body.

Nanocleanser can disrupt forensic evidence such as blood-stains, skin flakes, and other organic residue. While it doesn't work as well as Mask spray (p. TODO), treating an area with it imposes a -3 penalty on any Forensics rolls made to locate or analyze such evidence. That said, Forensics can identify the brand of nanocleanser used!

A bottle of nanocleanser lasts for about a week of routine domestic cleaning or one major cleaning job (such as thoroughly wiping down an apartment to remove evidence).

Nanocleanser adds a quality bonus of +5 to Housekeeping skill rolls to clean. A bottle is 1/2 lb. and costs \$10. A bar is 0.1 lb. and costs \$1.

Cleaning Swarm

A swarm of micro or nanobots which is programmed to move around a preprogrammed path or area, removing dust and grit, and polishing smooth surfaces. Its sensors allow it to clean precisely and without damaging surfaces, making it ideal for cleaning glass or lenses or even people! Each square yard of swarm can thoroughly clean one square yard per minute. The swarm gives a +2 (quality) bonus to Housekeeping skill. \$1,000/square yard. LC4.

Domestic Android

General-purpose androids (p. 21) are often purchased as humanoid butlers or maids.

Sonic Shower Head

Found in many homes and starships, and other places where water is scarce. An ultrasonic spray unit clipped to a wall simultaneously cleans and massages the user. \$400, 10 lb., external power (generally from the building or ship's power). LC4.

Housing and Construction

The Intelligent House

While not ubiquitous, it is common for houses, apartments, hotel rooms, and passenger ship cabins to include a voice-activated computer system that controls climate, domestic appliances, security, and communications. The system is programmed to respond to the occupants' voiceprints. Cheaper apartments tie into the landlord's main building computer, which provides similar services, but with less security.

Domed Cities

On many planets which haven't been made hospitable or even livable to human life, it is common for entire towns or cities to be enclosed in a transparent dome. The cheapest version of this terrestrial habitat use wire-reinforced shatterproof glass, mist-plated with aluminum to cut sun glare while still letting in light. From the outside, they look like giant mirrors, from the inside the glass is almost invisible. A dome about two miles wide and a mile high generally weighs about 4,000 tons.

Space Habitats

Large, manufactured habitats are usually built using titanium, aluminum, and steel that is mined from nearby moons or asteroids. Inside, gravity is simulated using rotation or, on more recent/advanced habitats the gravity is generated using gwhel-gravity generators.

O'Neill Cylinders

These large and expensive space habitats are giant cylinders a few miles wide and several miles long. They rotate to simulate Earth-normal gravity. Inside is a complete environment with park and urban landscapes. Each one can house a few million people. Large populations may be supported by additional agricultural habitats.

Standford Torus

Smaller than O'Neill cylinders, these habitats are still very large. A typical torus is shaped like a bicycle wheel, with gravity and landscaping on the floor of the outer rim. The spokes are elevators that lead to a central microgravity hub. Typically, they house 10,000 to 100,000 people.

Asteroid Hives

Instead of manufacturing space habitats as free-floating structures, these are made by completely or partially hollowing out asteroids so that people can live inside. Larger asteroids are capable of supporting billions of inhabitants.

Macrohabitats

These are continent-sized habitats. As humanity first started colonizing space, inhabitants simply had to tolerate microgravity though recent advances in contragravity generators has allowed for Earth-like gravity even aboard these habitats.

The Flexible House

An intelligent house can have a *sapient* brain that handles everything from doing the dishes to tutoring children. It is smart enough to anticipate the owner's desires.

Within the house, domestic products can be made of smart, self-repairing materials. Living carpets may clean themselves. Beds, tables, and chairs may assume different shapes, textures, and colors to fit the occasion, or be absorbed into the walls and floor when not in use. Artifacts and interior partitions may change color with a word to the house computer.

These houses give a +2 (quality) bonus to Housekeeping skill. A typical three-bedroom home is \$100,000, but this does not account for the cost of the AI.

Castles in the Air

As contragravity generators advance, they are expanding the possibilities of human construction. Take, for example, the floating cities of Erebos, which use gwhel gravity generators to create floating islands upon which cities can rest while also providing inhabitants Earth-like gravity.

Phantom Places

Holotech projectors can create illusionary partitions and art images; redecoration is as easy as changing programs. Scented air conditioning and realistic audio effects can complete the illusion.

Star Habitats

Industry leaders claim that soon humanity will be able completely enclose entire stars and build massive habitats.

Dyson Bubble

A loose array of light sails and solar energy collectors which beam energy to other habitats. Andromeda Electric has recently begun plans to start building such structures as it expands to other galaxies besides Andromeda.

Foodstuffs

Meal Pack

These packaged meals have little weight or volume, yet supply the nutrition and calories needed to keep a person active for extended periods. Although long-term use could cause some discomfort or weight gain, they are usually tasty and provide enough variation for almost everyone to have a favorite. Stored meal packs have a safe shelf-life of 20 years. They come in dozens of variations, with randomly selected main courses, side dishes, and dessert. The packages can heat or cool themselves, and are sealed against the outside environment. \$2, 1 lb. per meal.

Survival Rations

These are designed to put the maximum amount of nutrients into the smallest sealed package; the flavors are limited

and generally underwhelming. They have a safe shelf-life of 30 years, provided the package is not tampered with. Each meal is \$5, 0.5 lb.

Food Tablets or Paste

These tablets or paste-filled tubes provide all the vitamins and calories that an active person requires. They also incorporate appetite suppressants. A one-day supply (usually split into 6 to 12 individual meals) is \$10, 0.75 lb.

Food Vats

These culture growth tanks allow for an endless supply of imitation vegetables, lean meat, fish, or other foodstuff. On most planets, your average person has never eaten non-vat meat and "real" meat has become a luxury.

Chapter 13

Expedition Gear

Lights

Flashlights and Searchlights

These can project an infrared, ultraviolet, or visible light beam, which is also tunable from a wide flashlight cone to a pencil-thin red or blue-green laser pointer (range is multiplied by 10). It can function as a blinding weapon in a pinch – see Dazzle Laser (p. TODO). The light eliminates darkness penalties out to its listed range. Use 75 times this distance for signaling range.

Penlight: This emits a 10-yard beam. May be helmet or belt-mounted or attached to a firearm accessory rail. \$3, 0.1 lb., 2A/24 hr.

Mini Flashlight: This projects a 30-yard beam. May be helmet-mounted or attached to a firearm accessory rail. \$10, 0.25 lb., B/24 hr.

Heavy Flashlight: This projects a 100-yard beam, and can be used as a baton. \$20, 1 lb., 2B/24 hr.

Searchlight: Heavy-duty searchlights are often mounted on vehicles or buildings. A searchlight projects a 4,000-yard beam. \$500, 10 lb., C/12 hr. LC4.

Glow Sticks

Chemical lights that glow when snapped and shaken; they don't require power cells. Each provides 2 days of light illuminating a two-yard radius. They're available in different colors, white light, and infrared light. \$2, 0.1 lb.

Firefly Swarm

This is a swarm of glow-in-the-dark microbots. They can be ordered into small spaces for illumination, serve as mobile lamps, or provide a diffuse candle-like glow for romantic occasions. They can turn on or off, change colors or dim their lights on command, and glow in the infrared, ultraviolet, or visible spectrums. They can't provide the equivalent of full daylight (unless multiple swarms are stacked) but they are bright enough to read by. A firefly swarm is \$100/square yard. LC4.

Navigation Instruments

Global Positioning System (GPS) Receiver

Most gadgets have this as a built-in feature. If a planet has an orbital navigation satellite network, the GPS system links the user to it, enabling him to always know his exact position if he consults a properly-scaled map. It is accurate to about 5 yards. The system can also store the coordinates of a location it has visited as a waypoint. It can then direct the user to that waypoint or transmit the data via communicator to other GPS systems. With a computer, it can show the user's position on a moving-map display.

Inertial Navigation

These devices indicate the direction and distance traveled from any preset point on a planetary surface. It can be set for the location at which the user is physically present, or for any other coordinates (requires a Navigation roll if the precise coordinates are uncertain). An inertial navigation system lets the user always know which way is north. She can retrace any path she has followed within the past month, no matter how faint or confused. It does not work in environments such as interstellar space, but it *does* work underground, underwater, and on other planets.

Inertial Compass: A palm-sized inertial navigation system. Includes a tiny computer (p. 12), a GPS (above), and a video screen. If it has access to a digital map, the compass can superimpose the user's position and path on the map and display it on its screen. The compass can also connect to an HUD. It gives a +3 bonus to Navigation (Air, Land, and Sea). \$60, 0.1 lb., A/200 hr.

Inertial Navigation System

An extremely precise system. It has the capabilities of an inertial compass, but adds a +5 (quality) bonus to Navigation (Air, Land, and Sea). \$5,000, 20 lb., B/100 hr. LC4.

Containers and Load-Bearing Equipment

Hovercart

A flat round cart, two feet in diameter, that floats quietly on an air cushion generated by a ducted fan. It can be towed or pushed at the pusher's Move. They can carry 500 pounds over smooth ground or water, and make a humming sound audible to a normal Hearing roll at 30 yards. Voice-controlled robot versions with Move 4 are available at double cost. \$300, 4 lb., C/12 hr. LC4.

Pressure Box

A pressurized container often used for carrying fragile items or pets through vacuum or hostile environments. Its internal dimensions are $2 \times 1 \times 1$ feet. It includes a 12-hour air tank and its own life-support pack that regulates the environment. It provides a room-temperature environment from -459°F to $+200^{\circ}\text{F}$, as well as DR 10 and radiation PF 5. The modular walls can link together to form a larger container from several boxes. Sealing or unsealing the pressure box takes six seconds; linking boxes together takes 10 seconds per box. \$600, 7 lb., 2C/1 wk. LC4.

Survival and Camping Gear

Envirobag

An insulated, heated sleeping bag designed for extremes of temperature. It has the same performance as a Heat Suit (p. TODO). It can also be sealed and hooked up to air tanks. \$80, 2 lb., C/72 hr.

Filtration Canteen

This canteen holds a quart of water. It removes impurities, salts, microbes, and poisons. It can filter salt water, but not raw sewage or toxic waste. On its own, it adds a +1 (quality) bonus to Survival skill when living off the land; it's also included in survival kits.

One quart can be purified in 10 minutes. The filter must be replaced every 1,000 quarts; a color change signals when it's time to change. An "exhausted" filter still has a few quarts of capacity, but there's no way of knowing how many.

The canteen is \$180, 1 lb. (empty) or 3 lb. (full). LC4. Replacement filters are \$18, neg. weight. LC4.

Gripboots

This smart climbing footwear is tough, but still provides tactile feedback to the wearer. Additionally, the boot can change shape for a better grip, and can grow crampons or a forward-place spike on command. Add +1 per die to the damage the wearer inflicts with a kick. Gripboots give a +1 equipment modifier to Climbing, or +2 on ice. Combat statistics are identical to assault boots (p. TODO). \$500, 2 lb. LC4.

Modular Cage

This kit allows the user to assemble any size or shape of cage, with a maximum volume of 10 cubic yards. Assembling a cage takes 3 minutes per cubic yard of volume; several cages may be combined to build a larger one. Traps skill is required to build anything but a simple cubical cage, or to assemble a cage quickly in half the time.

Cage bars are 1/2" in diameter. DR 100. \$1,000, 200 lb. LC4.

Modular Environmental Cage

As the modular cage, but takes three times as long to put together. Once assembled the cage is sealed and, if connected to an external air and power supply, can duplicate and maintain nearly any planetary environment (except for gravity). A 6" airlock allows access for feeding. \$10,000, 400 lb. LC4.

Pressure Tent (Personal)

This airtight tent is strong enough to be inflated to one atmosphere in a vacuum. The metallized fabric incorporates minor (PF 2) radiation protection, but users planning a long stay in a vacuum or trace atmosphere are advised to place the tent in a sheltered location to provide protection from solar and cosmic radiation. The tent has DR 15. The tent's air tanks hold air based on the tent's capacity:

One-Man Tent: Two-days of air. \$1,500, 60 lb. LC4.

Three-Man Tent: Six-days of air. \$3,000, 100 lb. LC4.

Eight-Man Tent: Sixteen-days of air. \$15,000, 200 lb. LC4.

Rocket Piton

A pistol-grip launcher which fires a rocket-propelled, explosive-set piton. It can shoot an attached line up to 200 yards. A successful Climbing roll (made by the GM) means the piton is securely lodged and will support weight; a critical failure means the firer only thinks it is! Roll vs. DX-4 to hit if used as a weapon. It inflicts 1d+2 impaling damage, with Acc 2, range 70/200, RoF 1, Bulk -3, Rcl 2, Shots 1(5). \$40, 2 lb. Reloads are \$1, 0.5 lb. per shot. LC4.

Smart Pitons

These high-tech pitons adjust to the shape of the crack they're in, and report on their status via an integral micro-communicator. They come free on command. While a piton will report if it is obviously loose, it cannot check its own stability under load, so the climber must also do a manual check. Used properly, they give +1 to Climbing skill. 10 pitons: \$100, 1 lb. LC4.

Spider Cage

A captured device with a starfish-like shape consisting of a floor base surrounded by a few dozen jointed arms. Stepping on the base triggers a pressure sensor, causing the hinged bars to spring up and bend forward at high speed to form a roofed cage. If the victim is not surprised, a successful Dodge roll allows jumping away in time. The padded bars cause minimal injury, but the closing cage will do 1d-2 crushing damage if the victim is larger than the area of the trap.

A spider cage uses bars of padded memory metal (p. TODO) with DR 20. The separation between the bars is 2" wide. It also features a door on the side with a conventional electronic and mechanical lock. It adds a +2 (quality) bonus to Survival skill rolls made for trapping creatures. \$2,000 and 10 lb. for a cage capable of trapping a creature with SM 0. Double cose and weight per +1 SM; halve it for each -1.

Splat Piton

This two-inch sphere has a ring attached for a rope. When broken against rock or another hard surface, a fast-drying glue is released. In one minute, the ring can safely support 16 tons.

The sphere may be fired out of a mortar as far as 50 yards, unreeling a light line. The line unreeled must be used to pull a climbing rope through the piton ring. If a climbing rope is launched, range drops to 10 yards. A catalyst can unstick the glue, allowing the piton to be removed. It is not reusable. \$10, 0.05 lb. LC4.

Vapor Canteen

This canteen draws moisture from the atmosphere. How quickly it works varies with the amount of water vapor in the air – with an Earth-standard humidity of 50%, the time required to extract a quart of water is three hours. It has a capacity of one quart, and adds a +2 (quality) bonus to Survival skill for an individual living off the land. \$450; 2 lb. (empty) or 4 lb. (full), B/100 quarts. LC4.

Vapor Collector

A larger version of a vapor canteen for base camps, settlements, etc. It is 60 times faster, producing one quart every three minutes. It adds a +2 (quality) bonus to Survival skill for a group living off the land. Usually connected to a water tank, but has an internal capacity of 20 quarts. \$10,000, 120 lb., E/30 days. LC4.

Smart Rope

A cable constructed of memory metal and plastic fibers, or non-metallic bioplastic; it also includes a radio micro-communicator (p. 24). A smart rope has half the support strength of rope (p. TODO). It gives a +3 (quality) bonus to Knot-Tying skill, and can be ordered via radio signal to "flex" or go "rigid."

In flex mode, the rope behaves exactly like ordinary rope. In rigid mode, the rope locks into its current position as if it were a stiff metal wire. In this position, it cannot be untied. Removing a rigid rope without ordering it into flex mode requires cutting through it. If a smart rope is severed, the pieces lose their "smart" properties, but retain the flexible or rigid quality the rope had when cut. Smart rope may be purchased in a variety of standard lengths, starting at 1-yard increments. Smart rope is twice as expensive as ordinary rope; other statistics are identical. LC4.

Survival Watch

A heavy-duty wristwatch built to survive in extreme environments. It includes a biomonitor (p. TODO), a chronometer, a GPS (p. 46) receiver, an inertial compass (p. 46), a magnetic compass, a homing beacon (p. TODO), and a tiny computer (p. 12) with a small 2D display (about one square inch).

The watch is voice controlled. It is waterproof, and can survive 10 atmospheres of pressure or a vacuum. It is powered by a small flywheel battery that can be recharged by body motion. If not worn, it goes to sleep for up to five years, turning off all functions except timekeeping. A vigorous shake will power the watch up to full operation. \$300, 0.5 lb., B/3 months. LC4.

Survival Module

A programmable bioplastic box the size of a hardcover book. When activated, it draws air out of the surrounding environment and inflates itself, becoming a comfortable two-person cabin that can hold four in a pinch. It has transparent plastic windows, pull-out inflatable tables, chairs and beds, and an airlock door that takes four seconds to cycle. It is pressurized, with a complete life-support system including an air filter and reducer/respirator. If oxygen is unavailable, air tanks will be required.

The module is light and can be blown away with a strong wind if unoccupied and not weighed or tied down. \$600, 4 lb., C/2 wk. LC4.

Environmental

This device is a man-sized plastic bag with a self-inflation system and self-sealing flap. To use it, pull the bag on, and activate the seal. Once the seal is closed, the bag inflates automatically, forming an airtight bubble. Those found in vehicles are often connected by an air hose to an external life-support system, but they can be disconnected. If this happens, each bubble provides 15 minutes of air.

It takes four seconds to don and inflate the bubble (make a Survival or Vacc Suit skill roll to halve the time). If disconnected, it is flexible enough to move in, at a Move of 1. It floats in water. Bubbles are generally built into vehicle seats or worn on belt packs. Opening it while inflated spills its air. The tough plastic has DR 1. \$600, 3 lbs.

The compressed air cartridge can be recharged from a life support system in about an hour, allowing the bubble to be repacked and reused.

Worldscaping

Technological advancements have made it possible to ecologically engineer an entire planet, terraforming them to transform an uninhabitable planet into one more Earthlike.

This process is still incredibly lengthy and involved and not all planets are suitable candidates. Terraforming a planet like Mars takes about 10,000 years (more if it is notably inhospitable). On the other hand, planets like Venus have yet to be terraformed, modern terraforming industrialists like TODO-COMPANY have promising research though.

Gravity Control

Gravity control technologies create localized zones in which gravity is higher (artificial gravity) or lower (contragravity).

There are two proven and implemented forms of controlling gravity:

Gwhel-Generators:

The exact technology is proprietary to NovaCorp subsidiary Grav-Tech, these gravity generators manipulate gravity by making use of the Ravens known as Gwhel's unique ability to control gravity. They are also used to generate artificial gravity (or contragravity) in other vehicles or buildings. Area-affecting gwhel-generators produce a gravity-field based on their rated strength and size. To create up to 1G (or counteract 1G) of gravity costs \$4,000 per yard radius covered. For greater G requirements, multiply this by the difference in gravity needed (i.e. a gwhel-generator rated to counteract 6G down to 1G, -5G, for up to 10 yards would cost \$200,000.)

Gwhel-generators are also used to create Gwhel-drives (p. TODO). Gwhel-drives can also provide artificial gravity to the ship when not using their full acceleration to propel the ship. This is easier for the Gwhel-drives than their normal task so each 0.1G of acceleration not being used to propel the ship can provide 1 G of artificial or contragravity to the entire ship. Note that when the ship is using all possible acceleration, the gwhel-drives cannot provide artificial gravity.

Additionally, Grav-Tech recently unveiled their high-efficiency Gravity Plates, no longer requiring several massive gwhel-generators to provide a large ship with artificial gravity. They are still rolling out universe wide, but soon they will become a universal fixture. These plates are rated for the cubic volume and strength of the gravity field. \$400, 0.4 lb. per cubic foot of area per +1G. External power. LC3.

Psi-Gravity

By making use of some espers' ability to manipulate gravity, psionic researchers proposed and demonstrated the efficacy of manipulating gravity through espers. The problem with this, though, was the rarity of the required espers and the ethical concerns around the need for the espers to provide gravity at all times.

Industrial Megaprojects

In addition to terraforming worlds, other massive engineering projects are possible or currently being developed by companies universe wide.

Moving Black Holes

While rare, the occasional black hole the mass of asteroid have become the focus of industrial research. These million billion ton mini-black holes are moved by placing a magnetic sail in orbit and feeding matter into it into a controlled fashion to generate thrust.

Additionally, the scientist-baffling "blue holes" act like tiny black holes and are moved in a similar way but on a much smaller scale.

Weather Control Satellites

A weather control satellite can shift the weather in a 1,000-square-mile region. It can only make changes that fit within the region's normal climate, such as diverting (or creating) a storm during hurricane season. Roll vs. Meteorology skill to control the system; roll weekly for long-term effects or daily for violent weather. Failure can produce unpredictable results (-3 on rolls to fix them), while critical failure may cause a disaster (-6 on rolls to fix). A weather control satellite must be controlled by a Complexity 8 computer. Long-term support from weather control satellites provides a +3 bonus to Farming skill for raising crops. \$300 million, 4 x 60,000 lb. LC1.

Exploration, Safari, and Salvage Robots

Robot Mule

This is a rugged robot cargo cart that moves on big tires and does what it is told. It has no limbs. It can also be ridden, although the passenger must give it commands. LC4. ST 20; DX 10; IQ 6; HT 12.

Will 10; **Per** 10; **Speed** 6; **Dodge** 9; **Move** 6.
SM -2; \$3,000, 150 lb., D/8 hr. LC4.

Traits: Absolute Direction; Accessories (Small computer); A.I.; Automaton; DR 10; Electrical; Ground Vehicle; Machine; No Legs (Wheeled); Payload 2 (16 lb.).

Skills: Area Knowledge-10.

*May be teleoperated.

Scout Robot

37 points

This is a compact machine about 10 inches long, usually with a fish- or bee-shaped body. Variants are available for different environments. It has a sensor head, two manipulator arms, and a single hardpoint that can be equipped with anything from a camera or searchlight to a carbine or submachine gun.

Attribute Modifiers: ST-7 [-70]; HT+2 [20].

Secondary Characteristic Modifiers: SM-4.

Advantages: Absolute Direction [5]; Accessory (Tiny Computer) [1]; Doesn't Breathe [20]; DR 15 (Can't Wear Armor, -40%) [45]; Extra Arm (Weapon Mount, -80%) [2]; Machine [25]; Protected Hearing [5]; Protected Vision [5]; Radio (Burst, +30%; Secure, +20%; Video, +40%) [19]; Radiation Tolerance 5 [10]; Sealed [15].

Disadvantages: Electrical [-20]; Maintenance (one person, weekly) [-5]; Restricted Diet (Very Common, power cells) [-10]; Restricted Vision (Tunnel Vision) [-30].

Availability: \$5,000, 4 lb. 2B/8 hrs. LC4

Configuration Lenses

Also select one of these lenses:

Aerial Scout (+107 points): This uses ducted fans for quiet flight, and is equipped with surveillance sensors. Add Aerial [0]; Enhanced Move 1 (Air) [20]; Flight [40]; Hyperspectral Vision [25]; Parabolic Hearing 3 [12]; Telescopic Vision 2 [10].

Submarine (+62 points): This uses water jets, and is equipped to operate in the ocean depths. Add Enhanced Move 1 (Water) [20], Pressure Support 2 [10], Sonar (LPI, +10%; Multi-Mode, +50%) [32]; Aquatic [0].

Explorer Swarm

The most efficient way to perform exploration tasks over a large area may be to saturate it with a swarm of tiny mobile robots. The swarm uses its contact sensors to take minute chemical samples of materials encountered. Explorers may be programmed to look for mineral or chemical traces, explosives, water, organic molecules, etc.

After a predetermined search pattern, the swarms return to a portable lab (p. 41), which may be equipped to collect and analyze these samples, or beam data out. By analyzing where and when the swarm found items or encountered impassable barriers (such as water, if the swarm cannot swim or fly), a computer can build up a map of the area explored. \$500/square yard. LC4.

Chapter 14

Tools and Construction Material

Tools and Tool Kits

Laser and Plasma Torches

These are close-focus energy beam projectors that excel at heavy cutting and welding. A torch projects a continuous jet; in combat, treat this as a melee attack that uses Beam Weapons (Projector) skill, and can't be parried except by a force blade or equivalent. The jet inflicts tight-beam burning damage.

Power Tools

A box of power tools for shaping wood and other construction materials. A box of power tools includes a nail gun (p. TODO), and either an industrial water knife (below), a vibroblade (p. TODO), a chainsaw, or a laser torch (p. 51). The tools provide a +3 (quality) bonus to Carpentry skill. \$700, 7 lb., 2C/7 hr. LC4.

Rope

These are synthetic lines and ropes made of carbon nanotubes or biphasic composites.

1/8" diameter: Supports 800 lb. 10 yards of line: \$2, 0.1 lb.

3/16" diameter: Supports 2,000 lb. 10 yards of rope: \$5, 0.25 lb.

3/8" diameter: Supports 8,000 lb. 10 yards of rope: \$20, 1 lb.

3/4" diameter: Supports 32,000 lb. 10 yards of rope: \$80, 4 lb.

This is the safe working load; the theoretical breaking strain is five times as much. If exceeding the safe load, roll

vs. the rope's HT 12 at -1 per multiple of working load whenever it is stressed to see if it snaps.

Instructor Kits

Instructor kits have radio frequency tags and dedicated computer chips on all the components, from circuits to screws or bricks. If the user has a HUD or neural interface, the device will show exactly where and how a component fits into other components. It will signal when it has been properly put together, indicate what tool is needed, and so on. These will appear on handy pop-up diagrams overlaid on the user's visual field.

Instructor kits are available for most devices, as well as homes, model kits, and more. They cost 50% of the cost of the device, and take one man-hour per \$1,000 of cost to assemble. They require an appropriate skill roll – usually Mechanic or Electronics Repair – but this is made at +5 to skill if the user can read the virtual tags as they build it. This makes assembly easy, even if the user has only a default level of skill. A failed skill roll means more time is required; a critical failure means something breaks or malfunctions later.

Industrial Water Knife

This device resembles a thick hacksaw with a five-inch gap where its blade should be, plus a switch and power cell built into the hand and an attached hose. When connected to a water source and switched on, a jet of hyper-velocity water crosses the gap, forming a "blade" capable of slicing through flesh, wood, and even thin metal.

BEAM WEAPONS (PROJECTOR)(DX-4, other Beam Weapons-4)							
Weapon	Damage	Reach	Parry	Cost	Weight	ST	Notes
Heavy Laser Torch	4d(2) burn	C,1	no	\$800	12/Dp	7†	15 min.
Heavy Plasma Torch	4d+1(5) burn	C,1	no	\$2,000	40/Dp	8†	15 min.
Laser Torch	2d(2) burn	C,1	no	\$100	3/C	5	15 min.
Mini Laser Torch	1d(2) burn	C	no	\$50	0.25/B	1	3 min.
Mini Plasma Torch	1d+2(5) burn	C	no	\$100	1/B	3	3 min.
Plasma Torch	2d(5) burn	C,1	no	\$250	5/C	6	15 min.
Fusion Torch	8d+2(5) burn	C	no	\$2,000	40/Dp	8†	15 min.

Since the water recirculates through the system, little splash off – the knife only uses one gallon per hour. Water knives are also safer than a chainsaw. If the blade can't cut through something, the only "danger" is a spray of water.

Water knives do not have to be sharpened or cleaned, though for use in sterile environments, there is a filtered, self-sterilizing version. This sterile version sees significant use in surgery and medicine, but is also favored for slicing meat in restaurants and slaughterhouses.

The blade can be used as an improvised weapon. It does 3d+2 cutting damage with a Reach 1 and cannot be parried with. Roll DX-5 to attack with it.

\$160, the saw itself weighs 8 lb. Most come standard with a backpack which holds two gallons, connected to the knife with a two-yard hose. The backpack tank weighs 2 lb. empty and 18 lb. full. C/12 hr. LC4.

Portable Antimatter Trap

This is a portable magnetic bottle for storage and transfer of antimatter. It can safely store up to 100 micrograms of antimatter and is designed to interlock with antimatter reactors for safe transfer. If the power supply is turned off or the power cells removed while containing antimatter, the result is an explosion: antimatter has an REF (p. B415) of 10,000,000, and a single microgram can do 6d×9 cr ex damage!

The power will not turn off instantly: a built-in capacitor stores enough for 30 seconds of operation. Unless sabotaged or deactivated, a warning system will sound a buzzer and display a countdown to detonation. A biometric lock (p. TODO) prevents unauthorized tampering or release, and the trap itself is ruggedized (p. UT15). It also has a redundant power cell socket so that cells can be changed without turning it off.

A standard unit is \$20,000, 20 lb., 2D/10,000 hr. LC3 (without antimatter).

Monowire Spool

A spool of 100 yards of superstrong monowire (p. TODO), with a handle on each end. Monowire ha DR 10 and HP 1. Ued a rope, it will upport a working load of 1,000 lb. A standard spool is \$1,000 and 0.1 lb. See Monowire Fences (p. TODO) for some additional uses. LC3.

Tool Kits

Tool kits are used for repair skills (p. B190): Armoury, Electronics Repair, Electrician, Machinist, and Mechanic. They determine the equipment modifiers that apply when using these skills.

Each kit contains a variety of powered and unpowered tools and an array of spare parts. All kits have power cells for the tools in the kit. Even without power, the tools may still be usable for minor jobs at -2 to skill.

Different tool kits are required for each skill and each specialty. There is no single Armoury kit – if you want to repair a pistol, use an Armoury (Small Arms) kit.

Armoury (Vehicle Armor) or Mechanic (Vehicle Type) tool kits and workshops can perform major repairs on vehicles up to 10 tons. For larger facilities, multiply the cost and weight of the kit by vehicle weight/10. For example, a Mechanic (Submarine) kit (2,000 ton-capacity) is 200 times the normal cost and weight.

Portable Tool Kit

This is the standard tool kit. Most versions fit in a heavy tool box or backpack. It provides basic equipment for the specific skill and specialization it is designed for, and gives a -2 (quality) modifier for other specializations within that skill. Most kits for Armoury, Electrician, Mechanic, or Machinist specializations are \$600, 20 lb., 10B/10 hr. Those for Electronics Repair and Mechanic (Micromachines or Nanomachines) are \$1,200, 10 lb., 10A/10 hr. LC4.

Mini-Toolkit

This is a belt-sized tool kit. It gives a -2 (quality) equipment modifier for the specific skill and specialization it is designed for. Mini-Tool Kits for most Armoury, Electrician, Mechanic, or Machinist specializations are \$200, 4 lb., 5B/10 hr. Those for Electronics Repair and Mechanic (Micromachines or Nanomachines) are \$400, 2 lb., 5A/10 hr. LC4.

Portable Workshop

An elaborate version of the portable tool kit. It has everything necessary for emergency repairs, plus a wide range of spare parts that can be tooled to specific requirements. It is a modular system that can be set up in any large vehicle or building; it takes an hour to pack or unpack. It gives a +2 (quality) bonus to skill, or +1 if not unpacked.

Most workshops for Armoury, Electrician, Mechanic, or Machinist skill are \$15,000, 200 lbs., 10C/100 hr. Workshops for Electronics Repair and Mechanic (Micromachines or Nanomachines) are \$30,000, 100 lb., 10B/100 hr. LC4.

Robotic Workshop

This automated workshop can attempt to fix any piece of broken or damaged equipment. It uses its sensors and programmed repair manuals to diagnose the problem, then repairs it with its tool-equipped manipulator arms. It has skill 13 in whatever skill and specialty the workshop is designed for. However, it can only maintain and repair devices that are in its database (or closely related). If the workshop encounters a problem it cannot fix, it can be programmed to call for help using a buil-in tiny radio.

If a human technician is directing a robotic workshop, it is as good as a portable workshop, with an additional +1 bonus due to its extensive technical database and usefulness as an automated assistant. It is double the cost and weight of an equivalent workshop, and requires twice as many power cells; it has the same LC.

Micro-Manipulator Tool Bench

This is a robot arm with micro-scale manipulators and sensors, designed to be controlled by VR gloves (p. 30) or a neural interface (p. 26). It gives the user super-fine motor skills, adding +5 to DX for tasks such as Jeweler, and DX-based rolls to do *fine* work with Artist, Machinist, or Mechanic skills. \$2,000, 4 lb., C/100 hr. LC4.

Nail Gun

A tool for rapidly and accurately driving nails. It has a targeting system incorporating a computerized laser, passive infrared, and imaging radar rangefinder that can see through up to six inches of wood or similar low-density material (including flesh). It uses this system to automatically determine the force needed to drive a nail to the desired depth.

To attack with a nail gun, use DX-4 or Guns (Pistol) skill. It inflicts 1d+1(2) piercing damage, with Acc 0 (+3), Range 5/25, RoF 10, Bulk -3, Rcl 1, Shots 50(5). Nail velocity is variable (see Liquid-Propellant Slugthrowers, p. TODO) and its blueprint display system is equivalent to a smartgun feature.

All of this makes the nail gun a highly accurate weapon system in a pinch. However, its sensors are programmed *not* to fire if its targeting system detects something that matches the warmth and consistency of living flesh. Disabling this safety feature requires an Electronics Operation (Security) roll, one minute per attempt. The gun cannot detect flesh underneath armor with DR3 or better.

Smart Nail Gun

Uses binary liquid propellant. \$250, 4 lb. Its A cell powers the targeting system for a day. Its magazine holds 50 nails (0.5 lb.). A separate propellant bottle (1 lb.) holds enough propellant to fire 1,000 nails. LC4.

Gauss Nail Gun

An electromagnetic nail gun. The magazine holds 50 nails (0.5 lb.). \$300, 3.5 lb. B/300 shots. LC4.

Slipspray

This aerosol lubricant can turn smooth ground into a nearly frictionless surface. Anyone crossing it at faster than Move 1 must make a DX roll (at +3 if crawling, -3 if sprinting) every second to avoid falling. Vehicles must make a control roll (p. B469) at -5 to avoid losing control. Slipspray breaks down in about an hour in air. A can covers 100 square feet, spraying 10 square feet per second from up to 2 yards away. \$30, 0. lb. LC3.

Super Adhesives

Pulling two objects apart that have been glued together requires a Regular Contest of ST vs. ST 23. The bond is limited by the strength of the weaker of the two objects (so

flesh bonded to something else could be torn away, inflicting 1d-4 damage).

Gecko Adhesive

Sticky adhesive based on gecko setae (feet hairs). The pads have millions of tiny artificial hairs, covered by a protective coating. A small electrical pulse from an included wand causes the hairs to extend or release. A one-square-inch patch can hold 800 lb. indefinitely in any environment, including in the vacuum of space and underwater. \$0.10 per square inch for double-sided pads, and \$1 per foot length of 2" wide single-sided gecko tape.

Molecular Glue

This glue bonds nearly any substance and comes in non-conductive and conductive (metal-impregnated) varieties. It sets in 10 seconds. The glue can only be removed by a special solvent, which takes one minute to weaken each dose of the glue. A dose of solvent can weaken up to \$10 applications of molecular glue. Each application of molecular glue is \$0.50, but a dose of solvent is \$1. LC4.

Construction Foam

Construction foam is a liquid polymer with suspended nanoparticles that "foams-up" with nitrogen and cures with oxygen. As a result, it expands in air, hardening to form a durable substance. A barrier has DR 2 per inch of thickness and HP based on the weight of foam used (see Object HP Table, p. B558; the foam is homogenous). Construction foam is usually combined with additional chemicals so that it cures much more rapidly. Most applications are mundane, such as creating temporary structures, sealing electronics components, and quick casts for injured limbs. Riot police and soldiers also use construction foam for temporary walls and bunkers, usually by forming barriers and filling them with water or earth.

Construction foam does not burn easily (30 points of burning damage will set it aflame), but does decompose when exposed to flame, turning into a foul black sludge and releasing toxic fumes. These cause 1 HP toxic injury per minute of exposure if breathed. The foam will not cure if it stays wet, but is waterproofed once it has hardened. Construction foam floats.

Three gallons can form five cubic feet of hardened foam; a barricade three yards long, a yard high, and a foot thick takes about 16 gallons of foam and has DR 24, HP 36. It requires one minute to completely set and harden. It comes in a variety of applicator types, from spray cans to large storage tanks for use in construction. Construction foam costs \$10 and weighs 5 lb. per gallon.

Industrial Nanocleanser

This industrial-strength version of domestic nanocleanser is designed to eliminate bacteriological spills, rotten food, dead bodies, and other biological or medical waste. Any organic target covered by industrial nanocleanser takes 1d-1 corrosion damage each minute for five minutes. Inorganic

sealed DR takes no damage. If sprayed on plants, industrial nanocleanser will strip all foliage within a minute.

Industrial nanocleanser removes all forensic evidence such as blood stains, skin flakes and other organic residue. As with domestic nanocleanser, Forensics will be able to identify the exact brand used.

An application of industrial nanocleanser can cover up to 30 square feet. \$100, 1 lb. LC3.

Morph Axe

A standard morph axe is a climbing tool made of memory metal (p. 90). It can go from straight-handled to bent-handled, from pick to hammer to adze to hook to crowbar to walking stick, on command. It can be used to cut steps, climb vertical frozen walls, or stop a climber's potentially disastrous slide on ice, and is sharp enough cut rock if the wielder has ST 12 or better. In combat, it requires Axe/Mace skill and does swing+1 damage (cutting, impaling, or crushing, depending on configuration). Otherwise, treat as a hatchet. \$500, 2 lbs. LC4.

Any morph tool with more than 10 forms, or with illegal forms, costs double.

A morphing tool that includes any explicit weapon forms is a concealable weapon, and LC3. It could become any weapon form appropriate for its weight. For example, a quarterstaff could turn into an axe, a spear, or an oversized broadsword. \$500 per pound of weight, minimum \$1,000.

Sonic Probe

This is a multipurpose sensor the size of a cigarette package. It can be used as a short-ranged ultrasonic scanner that can give the user a rough image of the interior of objects or containers; it has a small screen on the device, but the data is usually uplinked to a HUD. Roll against Electronic Operation (Sonar) to use; the probe has a maximum range of six inches, and the skill penalty is -1 for each 10 DR it must penetrate.

The probe's imaging ability lets it serve as basic equipment for simple medical Diagnosis rolls for physical injuries, Mechanic rolls to find out what is wrong with a small device, Explosives rolls to disarm bombs (unless set to be triggered by vibrations!), and similar tasks. Its scanning abilities make it a useful tool for picking mechanical combination locks (+2 to Lockpicking skill) in conjunction with a lockpick. The sonic field can also be intensified and tuned to assist in cleaning delicate objects... or brushing teeth. \$500, 0.25 lbs., B/12 hr. LC4.

Worker Robot

Techbot

156 points

This is a general-purpose technical robot. It has a cylindrical body and pair of arms, and moves on legs. It can operate in a wide variety of environments, and may be used for everything from working in a garage to hazardous waste disposal. Its payload space usually holds tools.

Its a weapon mount is built into its rotating head; it can carry a weapon up to 6 lb. weight, which is more likely to be a laser or plasma torch than an actual weapon.

Attribute Modifiers: ST-2 [-20]; HT+1 [10].

Secondary Characteristic Modifiers: SM-1; HP+6 [12].

Advantages: Absolute Direction [5]; Doesn't Breathe [20]; DR 15 (Can't Wear Armor, -40%) [45]; Extra Arm (Weapon Mount, -80%) [2]; High Manual Dexterity 2 [10]; Machine [25]; Microscopic Vision 3 [15]; Radio (Burst,+30%; Secure, +20%; Video, +40%) [19]; Payload 2 [2]; Protected Senses (Hearing, Vision) [10]; Radiation Tolerance 5 [10]; Reduced Consumption 2 [4]; Sealed [15]; Vacuum Support [5].

Perks: Accessory (Personal computer, fast option) [1].

Disadvantages: Cannot Float [-1]; Electrical [-20]; Maintenance (one person, bi-weekly) [-3]; Restricted Diet (Very Common, power cells) [-10].

Availability: \$10,000, 50 lb., D/24 hr.

Optional Enhancements

The following optional enhancements are standard for Techbots:

Gwheel-Contragrav: By making use of small-scale gwheel-generators, these techbots hover. Flight (Planetary, -5%) [38]; Aerial [0]. +\$12,000.

Worker Swarms

Equipment packages for microbot swarms.

Construction Swarm

This swarm is designed to tunnel, dig ditches, etc. Each bot is equipped with small arms and digging jaws. A square yard of swarm can dig as if it had ST 3 and a pick and shovel (see p. B350). They are often employed for mining, or civil or military engineering. They can also pile up loose earth and rock into ramparts, dikes, or walls. \$1,000/square yard. LC3.

Decontamination Swarm

Decontamination swarms remove traces of most biotoxins, persistent chemicals, nanotechnology, or radioactive fallout. The type of hazard removed depends on the individual swarm's specialization. A square yard of swarm can decontaminate a one-square-yard area to a soil depth of 2" every minute, and can do so 20 times before requiring replacement. It has Hazardous Materials (Biological, Chemical, Nanotech, or Radioactive) skill at 12 and serves as basic equipment for hazmat disposal. \$1,000/square yard LC3.

Defoliator Swarm

This swarm kills plants but has no effect on other living creatures. Even so, a large swarm might serve as an ecological sabotage weapon. It takes the swarm 10 seconds to strip a square yard clean of bushes or foliage. It can be programmed to carefully trim plants; this takes one

minute per square yard. It may also be programmed to affect specific plants (for example, weeds) or to mow lawns. \$1,500/square yard. LC3.

Harvester Swarm

These can harvest crops with an effective Farming skill of 12. \$2,000/square yard. LC4.

Pesticide Swarm

The swarm is equipped to hunt down fleas, spiders, and other pests. Flier swarms can also destroy flies and mosquitoes. They will inflict 1d corrosion damage per turn to swarms composed of real insects! The swarm's actions are harmless to humans, although they can be entertaining or distracting. Like defoliator swarms, they can be an ecological threat. \$1,000/square yard. LC3.

Pollinator Swarm

The swarm functions as artificial bees, spreading pollen or seeds. This is useful if normal insects are not available, or cannot adapt to the local climate or ecology. Base cost is \$1,000/square yard. LC4.

Repair Swarm

The swarm has the tools and programming to repair a single, specific model of equipment, plus appropriate Armoury, Electronics Repair, or Mechanic skills at 12 (specify which). A single swarm fixes things at about 1/10 the speed of a human, but up to 10 swarms can combine to make repairs. Base cost is \$500 per square yard, plus \$250/square yard per additional model of equipment the bots are programmed to fix, to a maximum of four types of equipment per swarm. LC4.

Heavy Equipment, Salvage, and Rescue Gear

Blast Foam

Ballistic foam forms a non-conductive polymer-ceramic blanket. Designed to be sprayed over a bomb, it hardens in 3 seconds and forms a thick layer than can absorb explosions, contain fragments, and sterilize chemical, biological, and radiological agents. Each second of spray can coat a square yard, providing ablative DR 40 against crushing and burning damage, and ablative DR 20 against other types of damage. If the foam contains the blast, it also treated as sealed with radiation PF 5. Each square yard of foam weighs 10 lb.

Anyone completely coated with the foam may suffocate (p. B436); he can inflict his normal thrusting damage on the foam to try to escape. A canister of foam that can cover three square yards is \$100, 30 lb. LC3.

Fire Extinguisher

This multi-purpose dry chemical extinguisher can put out ordinary blazing combustibles, flammable liquids, or electrical fires. Three sizes are available:

Fire Extinguisher Tube: A pocket device with a six-second discharge and two-yard range. \$10, 1 lb. LC4.

Small Fire Extinguisher: A standard extinguisher bottle with a 15-second discharge and a three-yard range. \$50, 3 lb. LC4.

Large Fire Extinguisher: A heavy backpack model with a handheld projector connected to the pack. Three-yard range, 45-second discharge. \$200, 10 lb. LC4.

Any fire extinguisher can also be used as a weapon. Use Liquid Projector (Sprayer) skill, using the jet rules: treat them as a melee weapon. A hit to the face is treated as an Affliction with the Contact Agent modifier. On a failed HT-3 resistance roll, the victim is stunned, and suffers the Blindness disadvantage for seconds equal to the margin of failure.

Demolitions

Explosives

Explosives are rated for their relative explosive force (REF) compared to TNT; see p. B415. Some common types:

Antimatter: A microgram of antimatter (see *Antimatter Trap*, p. 52) is \$2,500. LC0.

Plastex B: This is a powerful moldable high explosive. It is very stable and can only be detonated with an explosive detonator. REF 4. \$20 per pound. LC2.

High-Energy Explosive: An exotic explosive that stores energy in metallic hydrogen. REF 6. \$40 per pound. LC2.

For more exotic types, see also *Warheads and Ammunition* (p. TODO).

Detonators for explosives can use communicators or timers. \$20, neg. weight, LC3.

Taggants

Most commercial and military explosives have embedded taggants: inert materials that are not destroyed in the explosion, which can be analyzed later to determine the type of explosive, manufacturer, and lot number. Taggants add +5 to Research or Forensics rolls to find the origin of the explosive.

Taggants are nearly universally required by law, but it is possible to find explosives *without* them, if you know where to look. A chemistry lab can be used to test a sample; decontaminate swarms (p. 54) can be used to remove taggants. Any explosives *without* taggants are always one lower LC.

Chapter 15

Manufacturing

Modern manufacturing equipment has become very portable. Homes, starships, and shops are able to have their own manufacturing facilities.

Many of these systems use the cost of goods as a rough indicator of how long it takes to manufacture things. This assumes a baseline, standard product; cost factors will vary due to artistic or collector value, non-intrinsic value, age, and source (black market, second-hand, etc.).

Industrial Equipment

Factory Production Line

This is a production line for assembling a *specific* product from existing components. Each can assemble one copy of a device every (retail price/100) hours. Computer chips and other small gadgets take longer: multiply time required by 5 if the item's weight is under 0.1 lb., by 20 if under 0.01 lb., by 100 if under 0.001 lb., etc.

The per-item production cost is 25% of the retail cost for parts. (The production line requires a supply of component parts.) The cost of the production line is \$20 times the retail cost times the small gadget multiplier above. Each station in the production line requires one worker and weights 1lb. per \$100 the production line costs (minimum 20 times item weight). It uses external power. LC is the same as the item. Big factories may have several lines with multiple stations up to a maximum of cost/100 stations; divide the timer per item by number of stations in the line.

Robotic Production Line

A production line can be used that is capable of producing devices without any direct human involvement at all. Necessary raw materials must still be delivered. It requires its own mainframe (or fast microframe) computer to supervise. A robotic production line is 10 times the cost and double the weight of a production line, but goods are manufactured without the need for human operators (except possibly for maintenance and programming).

Fabricator

This is a programmable factory capable of making, repairing, or modifying most manufactured goods, assuming parts such as sheet metal, circuit boards, and chemicals are available.

Fabricators incorporate multi-axis lathes, grinders, laser welders, and mills. They create custom parts and assemble pre-built components into a final product inside their manufacturing chamber. They also incorporate rapid-prototyping, multi-material 3D printer systems to manufacture solid objects. With appropriate blueprints, a fabricator can build just about anything that fits inside it.

Fabricators are capable of assembling microtech by assembling them one molecular layer at a time. Multiply the time required to fabricate microtech gadgets by 5 if item weight is under 0.1 lb., by 20 for under 0.01 lb., by 100 for under 0.0001 lb., etc.

Fabricators require databases with the appropriate blueprints. Blueprints for controlled devices such as military lasers are difficult to come by, though a good programmer with the technical understanding of such gadgets could also write them herself, given enough time.

Fabricators are not as efficient as production lines as they are not specialized, instead they're designed to produce a wide variety of high-tech items in small quantities.

Each type of fabricator lists a manufacture speed, use the longer manufacture time between cost and weight. This speed assumes the fabricator is working from new, packaged, specialized parts for everything it needs. If working from scrap, printer cartridges, or salvaged materials it takes twice as long, or longer with particular poor materials. Furthermore, fabricators are not capable of atomic-level assembly, so a critical shortage of an element can and will stop production.

The material cost of items manufactured in a fabricator is about 60% of base price if working from specialized parts – or 50% if using generic scrap or printer cartridges.

Fabricators also serve as basic equipment for the Machinist skill; larger systems provide a bonus to skill due to their utility in making spare parts.

Industrial Fabricator: A full-size factory; it adds +5 (quality) to Machinist skill. For every \$1,000 or 10 lb. of goods it can fabricate per hour, it is \$500,000, 1,000 lb., requires industrial power. LC3.

Minifac: A workshop-sized unit. It can fabricate \$100 or 2 lb. of product per hour. It adds +3 (quality) to Machinist skill. \$50,000, 100 lb., external power. LC4.

Suitcase Minifac A portable system that fits in a carrying case, or a large backpack. It adds +1 (quality) to Machinist skill and can fabricate \$10 or 0.1 lb. of product per hour. %5,000, 10 lb., C/8 hr. LC2.

Robofac

While all factories incorporate a wide variety of automated, programmable machine tools, these are automated to an extreme degree. These fabricators operate with no human involvement; all operations and maintenance is directed and performed by machines.

Robofacs can reconfigure themselves to manufacture almost any product. The largest robofacs cover several city blocks, and cost billions.

Universal robofacs function exactly like fabricators, but they are also capable of fully autonomous control with their own Machinist skill.

Industrial Robofac: A full-size factory; it has Machinist-14. For every %1,000 or 10 lb. of goods it can fabricate per hour, it is \$1,000,000, 1,000 lb., industrial power. LC3.

Robotic Minifac: A workshop-sized unit. It can fabricate \$100 or 1 lb. of product per hour. It has Machinist-13. \$100,000, 100 lb., external power. LC4

Blueprints

The instructions to build a gadget. For many commercial goods, blue prints are licensed rather than sold outright. The licensing agreements require royalty payments based on the quantity of goods produced – typically 10%-50% of the base cost of the item. This royalty may exceed 90% on goods whose main cost is their artistic value, information content, or trademark. LC is equal to that of the item.

3D Blueprints: These are used with fabricators (p. 56=) and robofacs (above). They are Complexity 2 for devices costing up to \$100, Complexity 3 for devices up to \$1,000, etc.

Wet Nanofabrication Systems

Early industrial nanofactories require highly controlled environments. They use mix of protein-based nanobots and top-down manufacturing techniques, which is sometimes referred to as "wet" nanotechnology.

Vatfac

This is a large biofactory unit that can grow food, pulp, industrial bacteria, or similar products. It can feed up to 20 people, or half as many if creating a variety of imitation flesh and other foods. \$100,000, 200 tons, external power.

Part V

Covert Ops and Security

Chapter 16

Deception and Intrusion

Burglary, Infiltration, and Sabotage

These gadgets are useful for cracking security measures, or entering hard-to-reach places.

Items listed elsewhere that are helpful for burglars include explosives (p. 55), laser torches (p. 51), plasma torches (p. 51), sonic probes (p. 54), and tool kits (p. 52).

Gadgets mentioned elsewhere that are especially useful for infiltration include diver propulsion (p. TODO), flight packs (p. TODO), and stealth drop capsules (p. TODO). Demolitions (p. 55) and gremlins (p. TODO) are useful for sabotage operations. Portable fabricators (p. 57) are also extremely useful for any black ops team.

Electronic Lockpick

This sensor/decoder gives a +3 to Lockpicking and Electronics Operation (Security) skill on attempts to pick any electronic or combination lock. \$1,500, 0.2 lb., A/2 hr., LC2.

Biometric Cracker Tools

This sensor/decoder gives a +3 to Lockpicking and Electronics Operation (Security) skill on attempts to defeat any biometric scanner. \$4,000, 10 lb., A/2 hr. LC2.

Electronic Thumb

An electronic thumb counter retina and fingerprint scanners. The pocket-sized gadget has the size and shape of an eyeball, and lights from within to display a retina pattern. The other end has the shape of a lumb and wams to body temperature. Its memory plastic pad can be configured to match any thumbprint in the device's memory. New thumb and retina prints can be downloaded into it by connecting it via cable to an appropriate database. Getting thumb or retina prints for the database may not be easy – high-quality photos of the targets' eyes and actual thumb impressions are needed. \$5,000, 0.25 lb., A/100 hr. LC3.

Electromagnetic Autograpnel

This uses an electromagnetic coil gun to silently fire a grappling hook up to 30 yards. Make a Climbing or Guns

(Grenade Launcher) roll to hit, at -2 if unfamiliar with this gadget (see p. B169). An electromagnetic winch on the gun lifts up to 800 lb. at up to 5 yards per second. The reel constians 30 yards of 1/8"-diameter rope (p. 51). \$500, 5 lb., C/15 min. LC4.

Gecko Gear

These gloves and footwear let the user cling to walls and ceilings and move at half her Basic Move; no use of Climbing skill is necessary. Gecko gear designed for humanoids can support only 50 lbs. per limb in contact with the surface, including the user's body weight. An adult human won't be able to carry much gear with her. If the user's weight requires three or four limbs in contact, she will be limited to crawling. Each pad is \$500 and 0.1 lbs. weight. They can be built into armor or other suits. LC3.

Sonic Screen

Worn strapped onto a belt, this forms a portable privacy field (p. TODO) which moves with the wearer. The field is three yards in diameter. Sounds from outside the field cannot be perceived by someone inside the field (-10 to detection), and vice versa. The field also provides DR 10 against sonic attacks. Assassins and thieves use sonic screens to make the victims' cries inaudible. \$5,000, 2.5 lbs., C/1 hr. LC3.

Variable Lockpick

A memory-metal lockpick with a small imaging radar, an ultrasound imager, and its own contact mike. It reconfigures its shape into one of several hundred alternative forms after performing a sensor analysis of the lock. It includes a fiber-optic scope. Gives +4 to Lockpicking skill to open mechanical locks. It fits in a wallet., \$50, neg., A/12 hr. LC2.

Forgery and Counterfeiting

Document Fabricator

This is a dedicated terahertz scanner, and a specialized 3D printer to copy and manufacture the special dyes, fibers, films, foils, inks, papers, and plastics used in identity documents or currency. With a sample to analyze, they can forge documents from any prior TL.

Desktop Doc-Fab: Table-sized. Provides a +2 (quality) bonus for Forgery and Counterfeiting skills at the modern TL. For older TL documents, the bonus is +5. Most documents take an hour per attempt to scan plus a minute per copy to print. \$20,000, 50 lb., 4D/10 hr. LC2.

Suitcase Doc-Fab: Suitcase-sized. Provides a +1 (quality) bonus for Forgery and Counterfeiting skills at its own TL, increasing to +5 for any lower-TL documents. Most documents take about two hours per attempt to scan, plus five minutes per copy to print. \$4,000, 10 lb., 4C/10 hr. LC2.

Disguises and Smuggling

This section covers gadgets and technology for personal concealment and the smuggling of people or items. Distortion chips (p. TODO) are another useful technology.

Disguise Kit

An elaborate set of prosthetic devices, skin-tinting chemicals, and hormone sprays for disguising one person's appearance. Many components incorporate micro-electromechanical systems that can mimic muscle twitches, realistic limps, and other key characteristics.

Suitcase Disguise Kit: Provides a +1 (quality) bonus to Disguise skill. \$200, 10 lb., LC3.

Disguise Fabricator: Designed specifically for intelligence agents. Provides a +2 (quality) bonus for the Disguise skill. \$800, 50 lb., LC2.

Shape-Memory Disguises

Memory-plastic and memory-metal technology can disguise weapons and other suspicious items as innocuous devices of the same general shape and size. Another possibility is to break the contraband down into several parts, each of which appears to be an unrelated piece of equipment.

Single-Function: While disguised, the gadget doesn't function (except as much as its basic shape allows). It costs five times as much as a normal version of the original gadget.

Multi-Function: Both the disguise and the disguised gadget are fully functional. Cost is 20 times the sum of the cost of *both* the gadgets. Both gadgets must be within 10% weight.

Shape-memory devices usually incorporate a power cell (an AA cell for devices up to 0.1 lb. weight, A cell for up to 1 lb., B cell for up to 10 lb., etc.) to provide an electrical impulse that triggers the change. The cell powers 60 changes and is removable if power cells would be suspicious.

A simple gadget may also use a piezoelectric material that changes if shaken vigorously for 10 seconds.

A gadget with a shape-memory disguise has *half* its normal LC (rounded up).

Stealth Luggage and Cargo

These items use the latest in electronic countermeasures and stealth materials to spoof scanners and sniffers. A hidden liner compartment provides safety for small packages, while a biometric lock (p. TODO) provides security. The liner compartment holds one-tenth the luggage's capacity and provides a +2 (quality) bonus to Smuggling skill. It is sealed to defeat chemical sniffers and dogs.

Attaché Case: Holds up to 20 lb. (or two cubic feet). \$400, 2 lb. LC3.

Travel Bag: Holds 100 lb. (or five cubic feet). \$1,200, 10 lb. LC3.

Trunk: Holds 400 lb. \$4,000, 40 lb. LC3.

Shipping Container: Holds 10,000 lb. Up to four SM 0 people can hide in the liner compartment, but they'll need breathing gear. \$10,000, 1,000 lb. LC3.

These items may have programmable camouflage (p. TODO) surface at +0.5 CF. Distortion chips or fields (p. TODO) can also be added.

Voice Mask

This wearable mic obscures the speaker's voice. They can set it to sound human, but different than their normal voice, or to change their apparent age, accent, gender, or species. It will also alter the speaker's voiceprint. \$200, 0.1 lb., B/20 hr. LC3.

Active Flesh Mask

A full-face mask of a *specific* person, complete with micromotors that move the face in realistic fashion. This is a custom design, and detailed measurements of both the user and the subject's face (which can be taken by medical examination, or remotely by T-ray scanner, X-rays, or ultra-scan) are needed. It takes 10 seconds to put on, two seconds to remove.

The mask adds +3 to Disguise skill, cumulative with quality modifiers. When impersonating somebody, this is the perfect disguise, but in order to convince someone who knows the individual being mimicked requires a successful Acting roll. The mask's legality class is a reflection of its legal uses in media productions and as a prosthetic. It includes a voice mask (above). \$10,000, 1 lb., B/24 hr. LC3.

Dynamic Holotech

This holographic projector casts a preset 3D image. It will not fool sensors that do not use visible light, such as infrared or hyperspectral imaging. Because it projects light, it glows in the dark.

Holobelt: Casts an image around the wearer, roughly human-sized, for concealment. The image must be bigger than the person concealed. Standard holodisks let the user

choose between a native-looking rock, tree, mailbox, bush, animal, etc., or plug in a disk taken from a 3D camera. All attacks on the user are at -1 to hit, and aimed shots to specific body areas are not possible unless the image closely resembles the user's body. \$2,000, 2.5 lb., C/10 hr. CL3. Prerecorded holodisks are usually about \$50.

Holofield: A larger model of the holobelt, used to disguise buildings, camps, and vehicles. The field will cover a radius of up to 10 yards. New images can be captured via a 3D camera or synthesized with a computer. %50,000, 25 lb., D/10 hr. LC3.

ECM and Stealth

Electronic countermeasures used to jam or deceive surveillance sensors.

Chameleon Surface

A suit can be equipped with sensor-controlled active camouflage that changes color and pattern to match the local background environment, in both the visual and infrared spectra. This provides a bonus to the user's Stealth skill when attempting to avoid visual and infrared detection. The bonus is halved against hyperspectral or ultraviolet vision.

The system can also be manually controlled, allowing the user to "paint" the surface with whatever color scheme or markings are desired (as *Programmable Camouflage*, p. TODO), or to give a mirrored skin equivalent to reflect armor (p. TODO).

Thermo-Optic Chameleon Surface

This may be added to an outfit covering an entire body, or to a vehicle surface. It gives +4 to Stealth skill against ordinary and infrared vision, +2 against hyperspectral or ultraviolet vision, and +1 against extended high- or low-band hyperspectral vision. This bonus halved (round down) if moving. \$4,000, 4 lb. (adjust for SM). LC3.

Multispectral Chameleon Surface

This version gives +8 to Stealth skill against ordinary and infrared vision, +4 against hyperspectral or ultraviolet vision, and +2 against extended high- or low-band hyperspectral vision. This bonus is halved if moving. \$6,000, 4 lb. (adjust for SM). LC3.

Chameleon Cloak

A large cloak that can be wrapped around a person or object to conceal it. It works the same way as a chameleon surface, but the bonus is halved again, cumulative with other modifiers (round down!) when moving! It can also be used just like any other large cloak. It is half the cost and weight of an equivalent chameleon surface. LC3.

Chameleon Net

This camouflage net works much like a large chameleon cloak, and can hide vehicles, heavy equipment, or campsites. It covers 25 square yards, and is 10 times the cost and weight of an equivalent chameleon surface. LC3.

Deception ECM

These devices detect and mimic incoming active sensor pulses to give a distorted or false reading of the user. Most models can jam radar and imaging radar or sonar. The Raven-tech variant uses a "distortion field" derived from the Ravens called no-eyes.

They can also be set to spoof rather than just jam. If so, there is no penalty to detection, but the sensor operator must succeed by an amount *greater* than half the detection penalty, or he is fooled into detecting something else.

Deceptive Radar Jammer: This jams all types of radar signals: -6 to radar, -4 to imaging radar. Spoofing is only possible for non-imaging radar; successfully doing so can change the user's apparent size and course by up to ± 6 SM or 60°. \$2,000, 2.5 lb., C/10 hr. LC2.

Deceptive Sonar Jammer: This emits deceptive sonar signals: it gives a -6 to sonar detection. Successfully spoofing sonar can change the user's apparent size and course by up to ± 6 SM or 60°. \$2,000, 2.5 lb., C/10 hr. LC2.

No-Eye Distortion Field Belt: -6 to *all* active sensors. Successful spoofing can provide a pre-set, seemingly accurate, but completely false (within the limits of the spoofed sensor) and/or change the apparent size and course by up to ± 6 SM or 60°. If the belt is significantly damaged, it releases a horrifying shriek, deafeningly audible to anyone looking at the user as well as the user herself, make an HT-5 roll, +1 for every 2 yards from the user, or become deafened for a number of minutes equal to margin of failure. Failure by 5 or more permanently deafens. This renders the belt unusable until the mechanism is replaced. \$10,000, 2.5 lb., C/10 hr. LC2.

Holo-Distortion Belt: Combines a distortion belt with a holobelt (p. 60). \$12,000, 3 lb., 2C/10 hr. LC3.

No-Eye Distortion Chip: A small distortion field that protects a one-foot radius around it. It is usually hidden in clothing or luggage, or attached to a weapon or other device to evade or spoof Search rolls that use active sensors. Provides the same penalty to sensors as the No-Eye field belt, and has the same effect if significantly damaged, though its affects those who are looking at anything in the radius. \$500, 0.05 lb., A/4 hr. LC2.

Except for the distortion chip, these jammers protect roughly a human-size (SM 0) area. Larger objects like vehicles need bigger jammers: multiply cost, weight, and number of C-cells by the square of the vehicle's *longest* dimension in yards. (Substitute a D cell for 10 C cells, an E cell for 100 C cells, etc.)

No-Eyes

These Ravens lurk in the dark recesses of the universe. They appear as moving fields of distortion, obscure to all forms of surveillance. Looking at one (even remotely through any sensor) triggers its true ability. A ear- and mind-shattering noise assaults the senses, this requires an HT roll (at a penalty based on the strength of the no-eye, generally a minimum of -12). Failure means the victim suffers Blindness and Deafness. Failure by 5 or more means these are permanent.

Sensors also make this roll if they see one, failure means the sensor is damaged; failure by 5 or more means that the sensor spontaneously explodes. Additionally, reflective materials which reflect its image also trigger this roll for themselves, failure ruins their reflectivity and failure by 5 or more significantly damages the surface. A No-Eye witnessed through a surviving sensor or reflective surface still triggers the HT roll, but gives a +3 per layer of separation (so seeing one that has been reflected off of two mirrors, gives a +6)

No-Eyes which have died and undergone a decontamination process are visible without danger. They look like a combination of an octopus and whale, ranging in size from a large dog to a semi-truck.

Infrared Cloaking

This system reduces an object's heat signature to defeat infrared and thermal imaging detection. It subtracts -6 from rolls to detect via infrared or similar sensors. \$1,500, 3 lb. (adjust by SM). LC3.

Programmable Camouflage

This electronic-camouflage system allows the wearer to choose a color scheme from any of eight different patterns – desert, snow/arctic, jungle, forest, underwater, urban, black, or high-visibility orange. It takes three seconds to reset the suit. A suitable camouflage pattern gives +2 to Camouflage rolls, but a -1 to Camouflage rolls in non-matching terrain, and a -2 in high-contrasting terrain.

Programmable camouflage systems are a significantly cheaper alternative to sensor-controlled systems, and are commonly used by civilian hunters, survey scouts, or lightly-equipped military forces. This can be added to any outfit that covers most of the wearer: \$1,000, 2 lb. (adjust for SM). LC4.

Radar Stealth

Many suits of personal armor incorporate radar-absorbent material as part of their structure. This subtracts -6 from detection by radar, imaging radar, or terahertz (T-ray) radar. Integral radar stealth systems are standard with many

armor suits. They may also be added to any sealed suit: \$1,500, 3 lb. (adjust for SM). LC3.

Scent Masking

This seal prevents any chemicals from leaving the clothing. It provides a +4 on Tracking when trying to cover your scent trail. Available for any sealed suit. \$200, 1 lb. LC4.

Invisibility Surface

This active optical camouflage system renders the user nearly invisible. Its fabric incorporates thousands of embedded nanocameras and projectors to create a seamless “projection stealth” system. Controlled by a fast dedicated computer, this captures images of the user’s surroundings, then displays photorealistic imagery that can fool observers from multiple angles and perspectives.

The user is invisible. They get +9 to Stealth rolls in most circumstances. The invisibility is effective against living things and machines, and will fool cameras. The user casts a visible shadow. They also appear as a shadow when silhouetted *directly* against the sun or any other extremely bright light source (such as a searchlight); reduce the Stealth bonus to +3 under these conditions. When they move, there is a faint shimmering that others can spot with a Vision-6 roll, and target in combat at -6 to hit.

The suit can also function as a video display terminal. The user can “paint” the suit with any desired color or pattern; this reduces the power drain by a factor of 10. This effect is only effective against visual and infrared (or thermal) imaging.

Invisibility Surface

The cost and weight includes coverage for gloves, boots, and a helmet of hooded mask. \$20,000, 4 lb., 2C/30 min. LC2.

Invisibility Cloak

This optical camouflage cloak can be wrapped around a person or object to conceal it. This works like an invisibility surface, but provides only a +3 bonus when moving. \$10,000, 4 lb., C/15 min. LC2.

Invisibility Net

This invisibility cloak is large enough to hide vehicles, heavy equipment, or a base camp. It covers 25 square yards. \$200,000, 50 lb., 2D/8 hr. LC2.

Computer Intrusion

These hardware devices retrieve data from computers or their interfaces. For online intrusion, use software tools (p. 13) for Computer Hacking or Computer Programming. For hacking encryption, see *Quantum Computers* (p. 26).

Computer Monitoring Gear

Computer equipment emits radio signals when in use. This gadget picks these up. It can detect whatever data is being typed or displayed on an interface screen at a distance, allowing someone to eavesdrop on computer activity. It cannot read what is stored inside the computer. It can scan through walls, provided they are not shielded.

Using the device requires an Aim maneuver for the duration of the surveillance; roll against Electronics Operation (Surveillance) to get clear data. High-security systems will likely be shielded against these emissions, but these tools remain useful when infiltrating less secure systems.

Mini Scanner: 100-yard range; -1 to skill per 10 yards range. %500, 0.1 lb., A/10 hr. LC2.

Long-Range Scanner: 1,000-yard range; -1 to skill per 100 yards of range. \$5,000, 5 lb., C/10 hr. LC2.

Keyboard Bug

This pinhead-sized adhesive bug can be stuck to the bottom of a terminal's keyboard. It uses induction to read the keystrokes, recording everything that gets typed in its memory. It can record a terabyte. The bug can be retrieved manually, or it can be programmed to send out the data as coded burst transmission using its radio microcommunicator (p. 24). It runs for a year. \$200, weight is negligible. LC3.

SQUID

A superconducting quantum interference device is used to interrogate a computer brain to retrieve data, *even if that system is offline*.

Contact SQUID: This SQUID must be physically attached to the target computer, it can then assist in reading the data stored within. \$20,000, 5 lb., 2C/10 hr. LC3.

Memory Scan: Any ultra-scan (p. TODO) active sensor with this modification can scan a computer that it has detected. +2 CF to the sensor. LC2.

Red Key

Also known as an "Oblivion Chip," this bizarre object was originally created from a corrupt blueprint found in the "Red" Spectral Codex also known by its title, *The Collection of Tools of Anti-Creation; Blessings of The Entropic Heaven*. It looks like a small, red data-drive. When connected to a computer, the drive infects the computer with a

bizarre virus which decrypts everything on the computer automatically. The virus then begins destroying all data. The only thing that can stop it is the removal of the key, upon being disconnected all the encryption and security systems return and any spread viruses vanish. LC0.

Also known as an "Oblivion Chip," this bizarre object is based on a design found in the "Red" Spectral Codex or *The Collection of Tools of Anti-Creation; Blessings of The Entropic Heaven*. It looks like a small, red data-drive. When connected to a computer, it begins devouring data bit-by-bit. Depending on the quality of the specific key, it consumes anywhere from 100 GB a second to 1 PB a second. This process can be taken advantage of, as it seems to destroy encryption as part of its devouring process, so if an intruder can risk deleting data, it can easily overcome most encryption. If the computer is connected to a network, the key also begins deleting data on any connected system.

While it may seem like the key is deleting everything it consumes, it actually seems to contain some storage. It is unclear how to access it, perhaps the answer lies in the Red Book?

Any fabricator which attempts to make a Red Key always run unusual and inexplicable errors, such as requesting seemingly random ingredients, creating a completely different objects, etc.

Spectral Codicies

These are a collection of Ravens which exist as texts. Untold number of books, scrolls, and digital documents which have a life of their own. Each offers the reader unique abilities and powers, but at a heavy cost.

The Red Book, also known as *The Collection of Tools of Anti-Creation; Blessings of The Entropic Heaven* is a well-known example. It is a database of unusual and dangerous blueprints. Objects created from these blueprints are bound to be destructive, and they are near-universally banned. The original database's location is unknown, as even though it is digital, full copies of it do not exist. Poor and corrupted copies of its blueprints are a valuable commodity on the black market. Its "red" name comes from the fact that all objects its designs produce are red.

Chapter 17

Security and Surveillance

Even as technology gives thieves and spies the ability to bypass old security systems, it creates new ones to replace them. As the average criminal becomes more sophisticated, so does the security that tracks him down. This chapter covers security systems that protect against both physical and electronic intrusion, as well as advanced law-enforcement tools that allow police and security forces to track, identify, and detain criminals more effectively – or simply suppress a riot.

It might be possible to build an impregnable security system – but more layers of security add more complexity and difficulty. Generally, security comes at the expense of convenience and efficiency.

Barriers, Mines, and Traps

Many dangerous traps have low LC.

In addition to the systems described here, construction foam (p. 53) can make useful barriers.

Armored Doors

A heavy door made of an inch of composite armor. It has HP 50 and DR 150. It is \$1,000, 200 lb., per 10 square feet. Typically, these are made from metal-matrix composites, though older (and weaker: DR 100) doors might use ceramic composites.

The lock is usually in the adjacent wall rather than the door.

Laser Fences

These project a continuous beam between two emitters, which may be built into fence posts, doorways, or corridors. Each emitter weighs 10 pounds and may be no more than 10 yards apart.

Open: This style of laser fence produces either a fixed or moving pattern of beams that can be avoided with an Acrobatics-3 or Escape-3 roll.

Tight: A thick, continuous energy field. It can't be avoided; anyone passing through takes damage. This requires significantly more power to generate, so many facilities take advantage of a computer-controlled system which

starts in the open pattern, then switches to a tight pattern if an intruder is detected.

Laser Fence: This inflicts up to 6d(2) tight-beam burn damage. \$5,000 per post for an open fence, double cost for a tight fence. LC3.

Electrolaser Fence: An electrical fence using energy beams instead of wires. It delivers a HT-6 (2) affliction attack plus linked 1d-3 burn damage; use the rules for military electrolasers (p. TODO). The fence can be set to “stun” or “kill.” \$5,000 per post for an open fence, double cost for a tight fence. LC3.

Rainbow Laser Fence: This inflicts up to 6d(3) tight-beam burn damage. \$3,000 per post for an open fence, double cost for a tight fence. LC2.

All of these fences use external power.

Electronic Locks

An electronic lock may be mounted on doors, consoles, briefcases, and anything else that needs to keep people out. It uses a numeric keypad, or a small electronic key card. Picking it requires Electronic Repair tools (p. 52) or an electronic lockpick (p. 59).

Simple Lock: Typical of homes, hotel or shipboard staterooms, etc. No modifier to Lockpicking rolls. Uses building power. \$25. LC4.

Complex Lock: Typical of secure installations. -4 to skill rolls to pick.

Electronic locks may also incorporate a scanlock (p. TODO) for additional security.

Remote-Controlled Weapons

These are usually connected to sensors with a cable and controlled by a computer, either manually or via an AI. Roll vs. Traps-9 to spot them first.

Defense Globe: A remote-control weapon mounted in a small turret, usually disguised as an ordinary light fixture or smoke detector. Install any ranged weapon up to 4 lb. It is SM-6, HP 8, and can't use active defenses. Beam weapons use building power. \$100/lb. of weapon, plus the cost of a weapon and a smart sight (p. TODO).

Spray Canisters: These do not require sophisticated mounting systems; they're normally disguised as building

fire extinguishers, or placed in air ducts. They can be built by adding optical cable or a communicator (p. 23) to a spray tank (p. TODO). Numerous types of gas and nano can be deployed – see *Gases and Clouds* (p. TODO). \$100 for installation.

Safes and Vaults

These delay or deter thieves. Safes use electronic locks (above) and biometric scanners (p. TODO) to limit access to valuables; add normal cost and weight to the safe.

Wall Safe: A typical home or business safe; one cubic foot, DR 150, HP 25. \$100, 50 lb. LC4.

Small Safe: A high-security safe; five cubic feet, DR 450, 80 HP. \$500, 0.5 tons. LC4.

Armored Vault: A small walk-in vault. 50 cubic feet, DR 1,200, 100 HP. \$30,000, 2 tons. LC4.

MT Vault: An MT booth (p. TODO) may be placed inside a room in a hidden location. LC3.

Sonic Barrier

This generates a curtain of high-intensity sound, inaudible until someone tries to cross it. It can be turned on or off remotely. They generate a faint ripple in the air (make a VIsion roll to notice) from the sonic field. It inflicts a HT-6 affliction attack on anyone trying to cross, with the effect of a sonic nauseator (p. TODO) beam weapon. \$3,000, 10 lb. per 10 square yards of field, external power. LC4.

Wire Fences

The fencing materials here are designed to be easily stored and quickly deployed. A typical “unit” of fencing stretches up to 15 yards when uncoiled or unfolded, and stands four feet tall. All fencing is free-standing, and flexible enough to form a curbed enclosure or surround an odd-shaped area. Stakes and other fixtures can make the fencing more permanent. Multiple layers of fencing can be “stacked” for extra protection.

It takes one man-minute per yard to deploy fencing. If protective gloves, wirecutters, and fasteners are not available, the time required is tripled.

Cutting Wire

Cutting wire comes coiled into tight rolls. The wire is wound with triangular segments of memory metal that extend when the wire is subjected to an electric pulse, forming thousands of small jagged cutting edges. Once “popped,” the wire cannot be returned to its original form. The inner core of the wire is flexible and shear-resistant, making it difficult to cut.

Passing through an area of cutting wire requires a roll at DX-5 each yard. Failure deals 1d-1 cutting damage, and requires a Will roll to avoid yelping or cursing as barbs tear clothing and skin (unless you have High Pain Threshold; add a -3 penalty with Low Pain Threshold). A 15-yard coil of cutting wire is \$100, 15 lb. LC4.

Fragwire

This looks like ordinary wire, but the core is tightly coiled memory-metal. When cut, the wire explodes outward with a loud *ping!* The burst of sharp fragments does 1d-1 cutting damage over a two-yard radius. Fragwire is often wound around cutting or sensor wire to dissuade infiltrators. A 15-yard coil of fragwire is \$200, 30 lb. LC2.

Sensor Wire

This wire includes an optical-fiber core. Each end of a strand terminates in a short wire plug that can be connected to another strand of wire or a hidden transmitter. If the wire is cut or snapped, the signal running between the two emitters is interrupted and the communicator sends an alert. Each coil has a unique identification code, allowing security monitors to determine exactly where the wire was breached. A 15-yard coil of sensor wire costs \$150 and weighs 15 lb. LC4.

Monowire

Deadly and nearly invisible, monowire (p. 52) can cut an intruder to pieces without warning.

Any roll to see monowire requires a Vision or Traps roll at -4 (-1 if a searcher is specifically looking for it). Anyone walking through a monowire “spiderweb” will take 2d(10) cutting damage per strand. This damage is reduced to 1d(10) if moving very slowly, and is increased to 3d(10) if running. Care must be taken to avoid injury when stringing monowire, since it is hard to see and cuts almost anything. On a critical failure when using it, the user takes 1d(10) cutting damage to one hand. LC3.

Neural Disruptor Field

This device is built into furniture or flooring. It produces an area effect identical to a neural disruptor (p. TODO). The grid can be left on, activated by sensors, or activated by remote control. Anyone moving through or ending his turn in an activated field must roll against HT-1 or suffer the effects of the neural disruptor. Add +1 to HT to resist for every DR 2 of sealed armor worn.

The effects lasts for as long as the power remains on and the victim remains on the grid, and for minutes equal to the margin of failure afterward. Neural disruptor fields producing a specific effect such as agony or paralysis are \$10,000 to install, plus \$1,000 per square yard. (Tunable fields cost double.) Neural disruptor fields run on building or ship power. LC3.

Gravity Web

This is a possible use of a gwhel generator (p. 49) as a form of defense by increasing the gravity to slow, disorient, or immobilize intruders.

Security Scanners

Security scanners are fixed sensor installations designed to identify intruders.

Biometric Scanner

A multipurpose identity scanner. It can identify fingerprints, retina prints, voiceprints, or DNA prints, if this data is in a database it can access. Fingerprints and retina prints must be taken from a one-yard range, while DNA prints require a hair or blood sample. All types of scans take one second.

Handheld Biometric Scanner: A handheld device used by security personnel to check identities. \$1,000, 1 lb., A/1 day.

Biometric Scanlock: Integrated into a lock on a door, case, or other device. Cost, weight, and power are the same as the handheld scanner.

Surveillance Sensors

Security sensors are designed to detect an intruder and then take action, whether sounding an alarm, activating gas, or closing doors. They run indefinitely using vehicle or building power; most have backup power cells. Make a Traps-2 roll to spot them. Electro-optical cameras (p. 35), infrared cameras (p. 36), hyperspectral cameras (p. 36), short-range terahertz radars (p. 40), and imaging radars (p. 39) are among the most common types. Add \$100/lb. to cover the mount and installation costs.

Portal Scanners

These are short-range, ultra-high resolution sensors that scan whatever passes between them. The device usually consists of transmitter and receiver with one- to three-yard range. They can be concealed in doorways or luggage conveyor belts, and may be set to trigger automatic doors, weapons, etc. if they detect anything. They are remotely controlled, with information displayed on a video screen or other interface. They work automatically, but their results must be interpreted by the Search skill roll of a person or AI.

X-ray Scanner: This device uses X-rays to see inside objects. It comes with a microcommunicator, a data port, and X-ray analysis software. Add +4 to Explosives (EOD) skill when using it to defuse a bomb, and to Search skill when examining the contents of a package. \$2,000, 5 lb. (2.5 lb. per module), C/4 hr. LC3.

T-Ray Portal Scanner This illuminates the target with tunable terahertz radiation. The absorption spectra of the resulting image is analyzed and cross-referenced with a database to check for chemicals of interest. This is good for locating drugs or other chemicals, explosives, and weapons. Gives +4 to Search skill for identifying non-living objects. \$10,000, 10 lb., C/4 hr. LC3.

Explosives Scanner: A nuclear quadrupole resonance (NQR) scanner excites a specific material (typically nitrogen) into a higher quantum mechanical energy state using a

radiofrequency beam. When the material “relaxes” it gives off a distinct signal. The scan provides an unambiguous yes/no answer to the presence of all chemical explosives, but does not detect energy-based explosives. It provides +4 to Search skill to detect chemical explosives. \$4,000, 10 lb., C/4 hr. LC3.

Ultrascan Portal: This uses para-radar to perform a fast atomic-level scan of the target’s body, including a detailed bio-scan. It gives a +5 (quality) bonus to Search rolls to find *anything*, and can match a person by their genetic code against a database. It can be fooled by distortion fields (p. 61). \$12,500, 10 lb., D/100 hr. LC3.

Security Swarm

A swarm of data-gathering microbots with short-range infrared, tactile, visual, and chemical sensors. They search anyone they contact with Search-12 and Diagnosis-8, crawling over the subject’s body and noting what is carried where. They are limited to performing either a skin search (+3 to Search skill) or a body cavity search (+5 to Search skill); see *Search* (p. B219). They also record the subject’s physical dimensions (height and build), species, gender, and can note if they’re running a fever.

Since a swarm can’t store data from more than one sweep, it should be uploaded to a computer where it can be reviewed.. Alternatively, the data can be accessed in real time as the swarm collects it. In addition to performing their own search, security swarms can be teleoperated to remotely perform skin or body cavity searches; as such, they provide a +1 (quality) bonus to Search skill. \$1,000/square yard. LC3.

Surveillance and Tracking Devices

Passive sensors (p. 36) and audio-visual recorders (p. 28) are the basic tools of surveillance. Active sensors (p. 38) are useful if the subject lacks appropriate detection gear, or if letting her know she’s being watched isn’t a problem.

The following devices are useful for covertly obtaining information, or for following people or objects.

Com Tap

This device can tap into an optical or electrical cable line. It is a 100-yard, hair-thin optical cable ending in a clip head, connected to a pocket-sized unit which includes both a monitor and a recorder that uses standard computer storage media. An Electronics Operation (Surveillance) roll is needed to succeed without damaging the line being tapped into; tapping an optical cable is at -3 to skill. \$500, 0.1 lb. A/100 hr. LC3.

Homing Beacon

A tiny tracer (SM -11) which can be set to activate when it receives a coded signal (sleeper mode), or to broadcast continuously. Its signal can be picked up by radio emissions scanners up to 50 miles away. \$40, negs., AA/100 hrs (1 year in “sleeper” mode). LC4.

Nanobug

A pinhead-sized sensor/recorder unit (SM -18) with an adhesive backing, which is usually placed somewhere it can scan an entire room. Its camera and microphone can record constantly, listen for a specific voiceprint before recording, scan at specific times of day, or scan when its sensors detect light or motion in the room. It includes a microcommunicator (p. 23) that can transmit recorded data in a short "burst" upon receiving a coded radio command. It can also be set to transmit after a specific time has passed. Once it transmits, it may be programmed to erase everything it has stored and begin recording again, or to self-destruct. It will also self-destruct if tampered with (roll vs. Explosives (EOD)-3 or Traps-3 to defuse). \$100, AA/1 yr. LC3

Emissions Nanobug: As above, but instead of audiovisual sensors, it has field-emission sensors that can read data sent to or from an electronic device that the bug is in direct contact with. It cannot read stored data that is not being accessed. Same cost, weight, power cost, and LC.

Microbot Nanobug: A single, tiny microbot spy, tiny microbot spy (SM -16). As a regular nanobug, but add any microbot swarm chassis (p. TODO) at 1% the usual cost. Mobility as per a cyberswarm. One hit destroys it.

Laser Microphone

This device turns any window or faceplate into a bug by reflecting an invisible laser beam off the glass and picking up vibrations caused by speech within the room. The user may roll Electronics Operation (Surveillance) to hear whatever is behind the window as if he were present on the other side of it. Extraneous noise such as loud music or running faucets is easily filtered out. Very heavy curtains, anti laser coating, or triple-glazing may defeat this method; bug stompers (p. 67) and privacy field white-noise generators (p. TODO) never do. Laser sensors (p. TODO) can sense a laser mic.

Laser Microphone: Range 6,000 yards. \$200, 2.5 lb., C/10 hr. LC3.

Pocket Laser Mic: Range 600 yards. \$40, 0.1 lb., A/1 hr. LC3.

Surveillance Worm

A flexible robotic snake only 0.1" wide and 2" long. A high-tech endoscope. It has a light which illuminates a two-yard cone and it has Infravision.

It comes with a small screen and remote connected via the built-in radio microcommunicator, but it can also be connected using a fiber-optic cable. A series of surveillance worms can also relay signals to each other, either by physically connecting or by transmitting. The user can see whatever the worm is looking at, but has No Depth Perception.

Surveillance worms provide +3 on Search attempts. A Vision-5 roll is required to spot the worm. \$100, 0.1 lb., A/1 hr. LC4.

Computer Pill

Designed to be disguised as a piece of candy, a raisin, a pill, or a seed, this is a disposable organic computer that ac-

tivates once swallowed. It attaches itself to the user's stomach, remaining in the body. It includes a radio microcommunicator, which only has a range of a few feet inside a body. This is enough range to contact any radio communicator implant in or carried by the person who consumed the pill.

The computer is Complexity 4, stores 1 PB, and costs \$50. Its integral power supply operates it for one week.

Messenger Pill: A computer pill that incorporates a genetic scanner that can determine if it's been swallowed by the right person (or family, or species, or whatever). If the scan comes up with a match, the pill will try to call the communicator of its host. If not, it self-destructs, and is dissolved by the body's own digestive system. Double the cost of a normal computer pill.

Surveillance Swarm ("Surveillance Dust")

This microbot swarm (p. TODO) mounts tiny video cameras and audio sensors, collectively the equivalent to a nanobug (p. 67). The swarm is programmed to remain in a particular place, observe for a period of time, and then return; it can also transmit information or be ordered to go to a different location. Base cost is \$50/square yard, modified by the *Swarm Chassis* (p. TODO). LC3.

Counter-Surveillance and ECM

These devices are used to warn of or defeat surveillance attempts.

Bug Detectors

RF Bug Detector: Detects and locates radio transmitters and microphones. This requires a Quick Contest between the operator's Electronics Operation (Surveillance) skill and the Electronics Operation (Surveillance) skill of whoever hid the bug. Locating a bug involves sweeping the room with the device. The detector has a range of one yard, and takes 10 seconds to scan 100 square feet. \$200, 0.1 lb., A/10 hr. LC4.

Multispectral Bug Sweeper: A counter-surveillance radio frequency detector integrated with IR sensors and sensitive microphones. Adds +2 (quality) to Electronics Operation (Surveillance) skill when used to sweep for transmitters (infrared, sonic, and radio), comm taps, microphones, recorders, sound detectors, and other bugs. Alternatively, it can automatically scan with its own skill of 15. It can check or monitor comm lines, or everything within a 10-yard radius. It folds up into a small briefcase. \$10,000, 5 lb. C/10 hr. LC3.

Bug Stomper

This is a pocket-sized "pink noise" generator, which prevents audio surveillance devices from picking up anything but static within three yards of the device. It will jam the listening ability of a programmable bug, but not its visual sensors. It has no effect on laser mics, and advanced bugs can be built to filter out the noise. \$600, 0.25 lb., B/24 hr. LC3.

Bughunter Swarm

This microbot swarm (p. TODO) is equipped with emissions sensors. Each square yard of bughunters can sweep one square yard per minute to locate nanobugs, comm taps, surveillance swarms, or other surveillance devices. They have Electronics Operation (Surveillance)-12 for this function only, or give +2 (quality) to an operator's skill. \$4,000/square yard. LC3.

Privacy Field

This sonic generator creates a spherical interference pattern that blocks all normal sound waves. No one inside the field's boundaries can hear any sound originating outside the field, and no sounds within the field are audible to anyone outside it. The generator can only be used within an atmosphere, with the diameter of the field increasing with atmospheric density. In a standard atmosphere, the bubble has a four-yard radius. A privacy bubble will block audio bugs, but not laser listening devices. It also gives DR 15 against sonic weapons fired across its boundaries. \$5,000, 4 lb. C/8 hr.

Chapter 18

Enforcement and Coercion

This equipment is used to enforce laws, control populations, and compel obedience. It can also easily be used for torture and mind control.

Forensics and Lie Detection

Forensic equipment is used to analyze clues, such as those at crime scenes. In addition to this specialized gear, investigators use chemsniffers (p. 36), portable labs (p. 41), and medscanners (p. TODO).

Lie detectors help determine whether the subject believes they are telling the truth. It is up to the investigator to decide if that subject is correct or if they have a faulty memory, is delusional, or was brainwashed. Even with modern, high-tech, the veracity of this technology is often contested.

Verifier Software

This computer program monitors a person's facial expression, especially facial movements near the eye muscles; different programs are needed for nonhumans. Creating software for other species requires knowledge of the species' biology and psychology. The software uses passive visual sensors (p. 35), and has Detect Lies-12. Complexity 4. LC3.

If the subject whose lies are being tested has any knowledge of the software being used, they can "fudge the test" giving them a +2 to Fast-Talk or other skill rolls when trying to fool the software. If they know the exact methods of the software, add an additional +1.

Neural Veridicator

A *veridicator program* provides highly accurate lie detection by monitoring brain waves transmitted through a braintap neural interface (p. TODO). It gives a human or computer a bonus of +5 to Detect Lies skill.

Neural veridicator helmets are *completely* reliable, providing an automatic success on a Detect Lies roll. However, people can forget, delude themselves, be fooled, or have their memories altered by brainwashing technology. A veridicator does not provide absolute truth; it just tells if someone believes they are telling the truth.

Veridicator Helmet: This incorporates a dedicated neural interface and veridicator software. The user wears the helmet; it signals if he is lying. \$12,000, 2 lb. B/24 hr. LC3.

Veridicator Program: Complexity 6. LC3.

Forensic Swarm

These swarms can provide detailed information on the room's occupants and visitors for the past several years by analyzing the buildup of organic and inorganic detritus: skin flakes, blood, clothing fibers, food residue, presence of other nano, etc. When gathering forensic evidence, each square yard of swarm can sweep one square yard per hour. The data collected from people or animals will reveal their sex, race, blood type, genetic pattern and approximate age. It can form the basis of a computer simulation of what they might look like, but will not identify someone unless she is listed in a database available to the investigator. Forensic swarms can also perform pathological analysis without an autopsy.

A forensic swarm gives a +3 (quality) bonus to Forensics skill for gathering evidence. Analyzing the data requires Forensics (or Biology) skill or an appropriate expert-system program. \$4,000/square yard. LC2.

Truth Croaker

This raven-tech device has the subject mostly consumed by a controlled oracle toad and then asked questions. By analyzing the brainwaves of the oracle toad, the operators can tell whether or not the statement is true according to the toad's oracle abilities.

This technology is experimental, not really understood, and considered physically and metaphysically dangerous. Construction requires a giant, captured oracle toad, making it particularly difficult to manufacture. Not generally available for sale, likely in the multi-millions. 800 lb. LC0.

Oracle Toads

Toad-like Ravens which are the size of a compact car. They have six eyes in their head and one on the tip of their long tongue.

Their name originates with their abilities; they have precognitive, retrocognitive, and more oracle-like abilities. They are capable of communicating with humans, offering them prophecies in exchange for heavy and often gruesome costs. They seem to universally hate humans and take pleasure in answering their questions in horrifying them with their prophecies and answering questions that people would be better off not knowing.

Capturing one is no small feat, given they can predict the future and are unlikely to ever be caught off guard.

Restraint and Riot Control Devices

This equipment is used by security forces to restrain individuals, or to control and disperse crowds of demonstrators or rioters. Other useful equipment includes:

Barricades: Construction foam (p. 53), construction swarms (p. 54), and slipspray (p. 53) allow quick erection of barricades to channel crowds and block streets. Holoprojectors (p. 29) may create illusionary barriers to divert an unwary mob.

Dispersion: Techniques useful for scattering crowds without leaving a field of stunned, injured, or dead bodies are microwave pain beams (MAD, p. TODO) and sonic nauseators (p. TODO). Launchers and sprays may deliver riot gas (p. TODO), sonic nauseators (p. TODO), or warbler warheads (p. TODO). Shock clubs (p. TODO) and neuro-lashes (p. TODO) let an officer defend themselves, and can be a painful but nonlethal deterrent.

Shields: Riot shields (p. TODO) can be used not only as defenses, but also to push or slam rioters.

Cufftape

This looks like duct tape, but the sticky side is a memory polymer that tightens if the prisoner struggles. A two-foot-long strip has ST 20, and is sufficient to restrain arms or legs. Each failure to escape does one point of damage to the taped area. Cufftape has DR 1; six points of cutting, corrosion, or burning damage severs it. \$10, 0.5 lb. per 100-foot spool. LC3.

Razortape

This cufftape has a thin strand of sharp wire embedded in it. On a successful attempt to break free using brute force (a Quick Contest of ST), the wire does thrust cutting damage using the escapee's own ST. \$40, 0.5 lb. per 100-foot spool. LC2.

Monowire Razortape: As razortape, but it costs twice as much and does +1d damage. The damage has an armor divisor of (10).

Electronic Cuffs

This is a rigid pair of handcuffs or leg irons, padded to avoid abrasions and used for restraining people or animals. It is controlled by an embedded remote-controlled radio microcommunicator, and incorporates a homing beacon (p. 66) for tracking the prisoner.

To break free of the restraints, win a Quick Contest of ST or make an Escape roll at -6 (-8 if both arms and legs are cuffed). The first try takes one second; further attempts require 10 minutes of struggle. Also available with color and 10' leash (same weight) for animals, slaves, etc. It may incorporate neuronic restraints or a neural pacifier (p. TODO).

Electronic Cuffs: This has ST 25 and DR 15. \$40, 0.25 lb., A/1 wk. LC4.

Heavy-Duty Electronic Cuffs: ST 45 and DR 20. Uncomfortable to wear. \$100, 0.5 lb., A/1 wk. LC3.

Explosive Collar

A locked, plastic-alloy collar that attaches around a prisoner's neck. It contains an inertial compass, secure radio, and a tiny computer (p. 12) – none of them usable by the wearer – along with explosives equivalent to a 15mm HE warhead (p. TODO). The radio and computer constantly broadcast the prisoner's exact coordinates.

A coded signal can detonate the explosive liner, decapitating the wearer. The collar can also be broken (it has DR 10 and 2 HP), but any attempt to damage it that fails to immediately remove it results in detonation next to the subject's neck. Disarming the explosives requires appropriate tools and a Traps-4 roll; failure means the collar explodes. \$200, 0.25 lb., B/100 hr. LC2.

Power Damper

A neural-feedback device that is designed to restrain espers, ravens, and witches; each requires their own devices. It prevents the subject from consciously making use of their powers.

The subject can attempt to overcome the device by deliberately pushing herself: each time she tries to use an ability that would be impeded by the device, she must win a Quick Contest of Will against the device's Will. She may add her relevant Talent (Magery for witches), if any. If she succeeds, she overloads the device, which burns out. If she fails, she cannot try again for hours equal to the margin of failure.

A power damper may be combined with neuronic restraints (below), triggering a "punishment circuit." This activates the neurolash after any attempt to overcome the damper.

Power-Damper Band: A small headband. The damper can also be built into electronic cuffs, a collar, or a sensory restraint. It has an effective Will 20. \$2,000, 0.1 lb., B/100 hr. LC3.

Power-Damping Field: This covers a 2-yard radius, it can be built into a cell, giant test tube, small prison, etc. Effective Will 22. \$20,000, 70 lb., E/100 hr. LC3.

Models which dampen witches or ravens are more expensive than the espers. Double the cost for ravens, and triple for witches.

Sensory Control Restraints

A single-piece device containing a video visor (p. 35) and ear muffs designed to control the reality perceived by the wearer. It can also see and hear what the prisoner does (and, if desired, record it). The visor can blank out the prisoner's vision or hearing, restore it, or let the controller overlay false sounds and images. It can be controlled by any external interface with the proper security codes. It includes a tiny computer, and can be equipped with its own AI (sold separately). It has DR 9.

Smart Blindfold: Locks onto the head, covering eyes and ears. Gives a +1 (quality) bonus to Interrogation skill against the wearer. \$100, 1.5 lb., C/100 hr. LC2.

Restraint Mask: A flexible helmet that covers the entire head and locks into place; it takes six seconds to attach or remove. It blocks the senses of smell and taste, and also includes a removable gag/feeding tube and respirator tube. Gives a +2 (quality) bonus to Interrogation rolls against the wearer. \$500, 2 lb., 2C/100 hr. LC2.

Sensory Deprivation Tank: Completely removes all sensations except that permitted by the operator by suspending the subject in a sense-deadening liquid medium (experimental gwel-contragravity versions have been made as well). Treat as a restraint mask, but the bonus to Interrogation rolls increases to +3 after the subject has been in the tank for an hour. Long stays require Fright Checks: use the *Size and Speed/Range Table*, reading "yards" as "hours" and rolling every time an interval passes at the listed penalty. An unrelated benefit of sensory deprivation tanks is that they provide espers bonuses, see *Sensory Deprivation* (p. 154). The tank includes a restrain mask, respirator, and feeding tubes. \$10,000, 200 lb. D/100 hr. LC3.

Advanced set ups can integrate or use neural interfaces (p. 26) and either sensie (p. 32) or total virtual reality (p. 31) technology for sensory control.

Neuronic Restraints

An add-on for electronic cuffs or collars, these use a tailored electrical impulse to deliver a neurolash effect (p. TODO) if tampered with, or if triggered by a communicator.

They are available in all standard neurolash settings, although the seizure, pain, paralysis, and ecstasy effects are most common (sometimes pain or ecstasy are purchased for recreational purposes). The effect is identical to a neurolash strike (roll vs. HT-5 to resist). However, since the victim is restrained and the effect can be continued each turn, these restraints are very effective.

This option can also be built into sensory restraints (above). A neurolash delivering pain or pleasure in a sensory deprivation tank is especially effective; add an extra -1 to

the roll to resist. \$200, 0.25 lb., B/100 sec. IC2. Tunable versions are +0.5 CF per setting.

Neural Pacifier

Used legally by police, prison guards, and hospitals, this restraint band projects a soothing hypnagogic field into the wearer's brain, keeping them sedated and compliant without using drugs or risking injury.

It has two settings: sleep and control. On "sleep," it places the wearer into a deep slumber. They cannot be awakened until the device is removed or turned off. On "control," the headband projects frequencies that allow the user to retain consciousness while suppressing aggressive tendencies, making the subject easily led. It effectively give them the Slave Mentality disadvantage.

The device can be resisted. After it is activated, the wearer gets a roll against the *higher* of HT-3 or Will-3 each second to avoid succumbing to the effects. Once a roll is failed, the effects persist for as long as the device remains on. \$500, 0.25 lb., B/100 hr. LC3. This option can also be built into sensory restraints.

Interrogation, Brainwashing, and Animal Control

Unlike passive lie detection gear, these systems are used to actively retrieve information, as well as to alter, erase, or enslave minds of people or animals. See also *Drugs and Nano*, p. TODO.

Biopresence Software

This software allows the user to teleoperate another living entity's body (the host). The host must have a puppet implant (p. TODO), and the user must be in telecommunication with the host, or physically jacked into him. The user must be using a direct neural interface (p. 26) connected to the computer running this software, or be a digital mind.

Control can be achieved automatically if the user has the appropriate passwords for full access to the puppet's mind; gaining these may require Computer Hacking skill.

The user remotely teleoperates the host's body, completely suppressing the host's personality. Her own body is in a trance; she may choose to return at any time, and must do so if the communications link is interrupted. Sleep does not break the link, but if it is ever jammed or out of range, the operator loses control.

The user gains the host's ST, DX, HT, and secondary characteristics calculated from these scores, as well as the host's physical advantages and disadvantages. The user keeps her own IQ, Perception, Will, and mental traits. Social traits may or may not apply. The user's IQ-, Perception-, and Will-based skills are unchanged. Other skills remain at the same relative skill level. For instance, if the user has Guns at DX+3, then she would have Guns-12 in a DX 9 body and Guns-14 in a DX 11 body.

The user has no access to the subject's memories.

If you have biopresence software and appropriate equipment implanted in your body, you must take the Puppet advantage (p. B78) for each Ally or Dependent (or group of them) whose mind you have access codes for.

The software is Complexity 7, double standard cost.

Brainwipe Machine

This technology uses focused energy fields to alter brain structure and destroy memories.

On some planets, brainwipes are used to punish criminals or dissidents. It is also used some places to erase sensitive information from the mind of those who know too much. A Brainwipe causes classic amnesia erasing all memories of the subject's personal life. It leaves personality and abilities intact. After brainwipe, a victim's skills and mental disadvantages remain unchanged. They can function in society, but cannot remember their name, or anything from their past, even when confronted with evidence. This gives the subject the Amnesia disadvantage.

Clinical Brainwipe Machine: This is a room-sized device incorporating a specialized diagnostic bed (p. TODO). It gives a +1 (quality) bonus to operator skill. \$100,000, 100 lb., D/10 days. LC2.

Portable Brainwipe Machine: A helmet-sized device, plus an attached briefcase-sized control unit. \$10,000, 5 lb. C/24 hr. LC2.

Message Bomb

A smart grenade (p. TODO) may be equipped with a tiny speaker and player. This lets it be programmed to deliver an audio message. This is usually set to play when the grenade is used with a time-delay fuse. The maximum duration of the message is 20 minutes. Add \$10 per weapon. LC3.

Neural Programmer

This uses a neural interface to "get inside" a subject's head, then alter his perceptions through subtle and overt applications of total virtual reality (p. 31).

The subject must be fitted with a neural interface (p. 26) and connected to a computer system running neural programmer software. He is then put through multiple scenarios, some realistic, some bizarre or even hellish. The operator does not require a neural interface. Neural programming may add or remove a permanent self-imposed mental disadvantage (p. B121). It may give the subject a set of false memories or beliefs, which take the form of Delusions (p. B130). It can also induce a Phobia (p. B149).

The process is handled as a regular contest of Brainwashing skill vs. the subject's Will; add the equipment bonuses given below, and apply a penalty of -1 to skill for every -5 points or fraction the disadvantage is worth. Base time is one day, but more or less time can be taken – see *Time Spent* (p. B346).

This process cannot actually erase memories (see *Brainwipe Machine*, p. 72) but it can give the subject the Delusion that a brainwashing, kidnapping, or other traumatic event was actually a dream or false memory.

Neural programmer software is Complexity 7. Good-quality software (+1 quality bonus) is Complexity 9; fine-quality software (+2 quality bonus) is Complexity 11. LC1.

Mechanical Mind Probe

This device, also called an extractor, probes a subject's mind and retrieves memories. As the operator questions the subject, the extractor stimulates the brain to recall specific memories. It then uses electrochemical means to read those memories as they are formed.

Use of the device requires a successful Electronics Operation (Medical) skill. Critical success retrieves the exact memory the questioner wishes to evoke. Success retrieves some of the desired memories, mixed with exaggerations, errors, or unrelated associations. Failure retrieves fragmentary memories of no interest to the interrogator, or obviously false memories. Critical failure results in the subject's brain constructing false memories that seem realistic.

All memories are in the form of a raw sensie feed. Its length depends on the duration of the probe. This information must be accessed via neural interface before the user knows whether the attempt succeeded or failed; see *Sensies* (p. 32).

A mind probe may be used as a fast or slow probe. A slow probe is safe, but takes eight hours per attempt. A fast probe takes only an hour per attempt, but is dangerous to the subject: whether the probe succeed or fails, she must roll bs. the lower of his HT or the operator's skill. Failure means brain damage (-1 to IQ); critical failure means she suffers the Coma mortal condition, and cannot be further interrogated until she recovers.

Clinical Mind Probe: This is a room-sized scanning device incorporating a specialized diagnostic bed (p. TODO). \$200,000, 200 lb., D/10 days. LC2.

Black Ops Robots

Robots are perfect for many security and intelligence missions.

In addition to the types covered below, combat androids (p. TODO), scoutbots (p. 49), and warbots (p. TODO) are often used for these jobs. Nursebots (p. TODO) also make effective interrogators.

Robobug

-32 points

This is single robot the size of a large insect (SM-9). It is bigger than most microbots, but still small enough to easily escape notice. It is designed for surveillance, forensics, scouting, or assassination. It may also patrol power conduits or air ducts, performing security or maintenance tasks. Its weapon mount can hold a weapon up to 0.01 lb. weight, such as a micro-laser or a drug injector.

Attribute Modifiers: ST-9 [-90].

Secondary Characteristic Modifiers: SM-9; Basic Move -3 [-15].

Advantages: Absolute Direction (Requires signal, -20%) [4]; Clinging [20]; Discriminatory Smell [15]; Doesn't Breathe [20]; DR 1 (Can't Wear Armor, -40%) [3]; Extra Arm (Weapon Mount, -80%) [2]; Infravision [10]; Machine [25]; Peripheral Vision [15]; Protected Vision [5]; Radio (Burst, +30%; Reduced Range 1/10, -30%); Secure, +20%; Video, +40%) [16]; Sealed [15]; Sharp Teeth [1].

Perks: Accessories (Flashlight, tiny computer) [2].

Disadvantages: Bad Sight (Nearsighted) [-25]; Disturbing Voice [-10]; Electrical [-20]; Increased Consumption 1 [-10]; Restricted Diet (Very Common, power cells) [-10].

Availability: \$50, 0.01 lb., A/4 hr. LC4.

Robobugs come in various shapes, not all of them bug-like.

Crawler (+16 points): a spider-bot that crawls along the ground. Add Extra Legs (6 legs) [10] and Super Climbing 2 [6].

Flier (+41 points): A dragonfly-like ornithopter. Add Extra Legs (4 legs) [5] and Flight (Small Wings, -10%) [36]. Double cost.

Rodent (-35 points): A mouse-sized robot. Add the Quadruped [-35] meta-trait.

Toy Soldier (-15 points): A humanoid robot, like a miniature figure. Remove Peripheral Vision [15].

Worm (-35 points): A serpentine robot slim enough to squirm through a keyhole-sized opening, along a drain pipe, or even down a throat to explore someone's stomach. Add the Vermiform [-35] meta-trait.

Vehicle (-80 points): A tiny robot all-terrain vehicle, like a toy car. Add Enhanced Move 1 (Ground) [20] and Ground Vehicle [-100], with wheels or tracks. Half cost.

Optional Upgrades

Water Jets (+10 points): Add Amphibious [10]. +50% cost.

Part VI

Weaponry

Chapter 19

Beam Weapons

These are directed energy weapons.

Lasers

Lasers are among the most versatile of beam weapons, with a wide range of offensive and defensive applications.

Lasers can be broadly classified by the effect on their target:

Dazzle lasers cause temporary blindness.

Blinding lasers cause permanent damage to eyesight or optics

High-energy lasers blind, and inflict physical burn damage.

While older laser weapons made use of chemical lasers, this technology has been made obsolete by solid-state lasers which use a solid crystalline material as the lasing medium. Alternatively, some modern laser systems use free electron lasers, these are usually found on vehicle systems – see p. TODO.

Laser Dazzler

A laser dazzler is a low-energy laser that fires a wide beam of coherent light. Dazzlers temporarily blind eyes and optical sensors, and are designed for personal defense and riot control. That said, they can be deployed offensively by blinding a target such that they suffer an accident. In the case that such an accident is fatal, dazzlers leave no evidence... unless the victim had laser sensors and recorded the attack.

A laser dazzler delivers a Vision-based affliction attack against anyone struck. To be affected, the target must be looking at the laser. The victim gets a HT roll to resist, at the penalty noted on the weapon table; add +3 to HT if he is beyond 1/2D range. DR has no effect, but Protected Vision adds +5 to resist. A Nictitating Membrane adds +1 per level. Failure to resist inflicts Blindness (p. B125) for minutes equal to the margin of failure.

Laser dazzlers deliver cone attacks – see *Area and Spreading Attacks* (p. B413).

Weapons

Dazzler Carbine: A long-range dazzler weapon, most often used for police or covert operations.

Penlights, Flashlights, and Searchlights: Most modern flashlights have a “laser dazzle” setting; see *Flashlights* (p. 46) for descriptions. The combat statistics are present below.

Dazzle Mode

Any high energy laser (see p. TODO) may be designed with a dazzle mode. Switching to or from this mode takes a Ready maneuver. When in dazzle mode, the laser fires a low-power laser beam that is identical to the effect of a dazzler laser, except it does not have a cone effect – it must strike the target’s face or eyes. A HT-5 is needed to resist the affliction. Dazzle mode uses up negligible power. The setting adds +0.1 CF to the laser.

Blinding Lasers

These weapons emit a medium-power laser beam that can cause permanent blindness, or fry optics, without burning flesh. The beam is wide enough that it need only be aimed at the target, not the eyes.

Dedicated blinding lasers are generally rare, as high-energy lasers are more effective. However, military active sensors, targeting systems, and electronic warfare systems that utilize lasers often incorporate a “high-power optical countermeasures” mode that is designed to blind sensors (and eyes).

A blinding laser delivers a Vision-based affliction attack. Anyone hit who is looking toward the laser can be affected. The victim gets a HT-10 roll to resist (HT-7 past 1/2D range). Protected Vision adds +5 to resist; a Nictitating Membrane adds +1 per level.

Failure to resist inflicts crippling Blindness (p. B125).

Dazzler Laser Weapons Table

BEAM WEAPONS (PROJECTOR) (DX-4, or other Beam Weapons-4)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Dazzler Carbine	HT-5 aff (3 yd)	6	1,500/4,500	5/C	1	9,000(3)	6†	-2	1	\$500	3	[1]
Laser Penlight	HT-4 aff (1 yd)	6	100/300	0.1/A	1	900(3)	1	-1	1	\$3	4	[1]
Mini Laser Flashlight	HT-5 aff (1 yd)	6	170/500	0.25/B	1	3,600(3)	1	-1	1	\$10	4	[1]
Heavy Laser Flashlight	HT-5 aff (1 yd)	6	330/1,000	1/2B	1	3,600(3)	1	-2	1	\$20	4	[1]
Laser Searchlight	HT-5 aff (2 yd)	12	7,000/20,000	10/C	1	1,800(3)	1	-5	1	\$500	4	[1]

Weapons

Blinding Mode: A high-energy laser (below) may be designed with a Blinding Mode, enabling it to fire a medium-power laser beam. Modify the laser's statistics as shown on the table below when using this mode. Changing to or from this mode requires a Ready maneuver. This mode adds +0.1 CF.

Military Ladar: These are military sensor arrays that can focus laser energy into a beam powerful enough to function as a weapon. The weapon statistics of these arrays are given here; the sensor statistics are covered on p. 39.

High-Energy Laser

The most common form of laser weapon. These emit near-infrared or visible coherent light in a narrow, tightly-focused beam that can burn through armor or explode flesh into steam. The beam has a duration of only a few microseconds; the lasers cycle multiple times per second.

Lasers inflict lower damage than equivalent-sized projectile weapons, particle beams, or plasma guns, but they're far more accurate and completely recoilless.

High energy lasers are available in different sub-types depending on the frequency of light used: infrared (below), blue-green (below), and ultraviolet (p. TODO). All inflict tight-beam burning damage.

Laser eye injuries are especially dangerous. If an eye takes enough laser damage to cripple it, the result is always permanent crippling (giving the victim the One Eye disadvantage, or if he only has one eye, Blindness).

High-energy laser beams are silent and invisible, but in dusty air, there will be a slight glow from incinerated dust particles.

Rain, fog, smoke, snow, and similar weather or atmospheric conditions interfere with all high-energy lasers, adding extra DR to the target equal to the vision penalty (per yard). Thus, if a yard of smoke would be -10 to vision, then each yard gives DR 10; if every 100 yards of haze gives -1 to vision, then 1,000 yards provides DR 10.

A high-energy laser beam can pass through material transparent to its particular frequency of light, which includes most glass, plastic canopies, etc. Increase the lasers armor divisor to (10) when it strikes glasses, visors, windows, etc. unless the material was specifically designed to be laser-resistant. Almost all modern transparent armor is laser-resistant.

Mirrored surfaces are not effective against a high-energy laser: any laser powerful enough to inflict damage destroys the mirror, ruining its reflectivity. However, if the mirror's reflectivity is capable of withstanding laser damage, then

a shield-sized mirror will provide its Defense Bonus vs. a visible-light laser.

High-energy lasers inflict tight-beam burning damage with a (2) armor divisor.

Chemical Infrared Lasers

A few older high-energy lasers are chemical lasers. They are continuous-beam weapons powered by highly reactive, energetic and corrosive chemicals – usually hydrogen-fluorine or oxygen-iodine. Chemical lasers should be issued to robots or troops in sealed suits, as fumes from the exhaust inflict 1 HP of toxic damage per second to anyone within a yard of the weapon. Carrying a man-portable chem-laser poses similar risks to a flamethrower – if the chemical tank is damaged, the spill can injure the wielder.

Infrared Laser

IR lasers emit a coherent beam of near-infrared frequency light. They are the most common high-energy laser, as they are more efficient to generate than other frequencies and propagate well in both air and space.

IR lasers inflict tight-beam burning damage with a (2) armor divisor. They can't penetrate more than a few inches of water, which reduces their underwater range to 0/1.

Option: Blue-Green

The standard laser light frequency for high-energy laser weapons shown on the weapon table is red or near-infrared light, but there are other alternatives. One of the most popular is the shorter blue-green wavelengths. Blue-green lasers require more power to generate, but permit greater ranges, and can also propagate underwater.

Any high-energy laser (except chemical lasers) can be designed to use a blue-green wavelength. Blue-green lasers inflict the usual tight-beam burn damage with the (2) armor divisor. Double the Range, but halve the RoF; treat each shot as consuming two shots for the purpose of power drain. Blue-green lasers can fire underwater.

A blue-green laser's underwater range depends on the water's clarity. The maximum Range can never exceed 150 yards in crystal-clear water, 60 yards in average water, or 15 yards in murky water. It is possible to fire into or out of water (out to normal ranges) as long as the maximum range *through* water is not exceeded.

Blinding Laser Table

BEAM WEAPONS (PROJECTOR) (DX-4, or other Beam Weapons-4)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Blinding Mode	HT-10 aff	var.	var.	var.	var.	10 ×	var.	var.	1	var.	var.	[1]
Military LADAR	HT-10 aff	24	×0.1/×0.3	—	1	—	—	—	1	—	—	[2]

[1] Use the high-energy laser's statistics for everything noted as var., with the exception that each shot in blinding mode counts as one-tenth of a normal shot (i.e., it has 10 times as many shots).

[2] Multiply range shown by the sensor system's detection range, e.g., a ladar with 100-mile range has a blinding laser range of 10/30 miles.

High-Energy Laser Table

BEAM WEAPONS (PISTOL) (DX-4, other Beam Weapons-4, or Guns (Pistol)-4)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	
Heavy Laser Pistol	4d(2) burn	6	300/900	3.3/2C	10	56(3)	6	-2	1	\$2,400	3	
Holdout Laser	2d(2) burn	3	100/300	0.35/B	10	22(3)	3	-1	1	\$300	3	
Laser Pistol	3d(2) burn	6	200/600	1.5/C	10	66(3)	4	-2	1	\$1,100	3	

Option: Ultraviolet

Some high-energy lasers fire a beam in the near-ultraviolet wavelength. An ultraviolet laser has superior range (in vacuum) compared to infrared or blue-green lasers, but its beam is rapidly absorbed by atmosphere. The beam is invisible, but it ionizes air molecules when fired in atmosphere of greater than trace density, producing a visible green glow along its path.

An ultraviolet laser has triple the usual Range, but due to its lower efficiency, its Damage is halved. Treat half-dice as a +2 modifier, e.g., 5d(2) becomes 2d+2(2). UV lasers are mainly used for space combat and on airless worlds. In atmosphere, the Range cannot exceed 500 yards divided by atmospheric pressure.

Mounted Lasers

Area Defense Laser: This is built to engage lightly armored targets, such as spacecraft and ballistic missiles, at a range of a few hundred miles.

Point Defense Laser: This is a vehicle-mounted system. It is designed to destroy soft targets like missiles, aircraft, and personnel at a range of several miles, with minimal collateral damage.

Semi-Portable Laser: This continuous-beam chemical-powered weapon is the size of a heavy machine gun. Its chemical tank is separate, and has SM-2, DR 10, HP 12. If disabled, the chemical splash inflicts 2d corrosion damage over a 2-yard radius.

Laser Cannon: A large vehicle-mounted weapon. It is a standard spacecraft and air defense system.

Strike Laser: A smaller version of the laser cannon, often used by fighter aircraft, and as a defensive weapon for armored vehicles or spacecraft.

Gatling Laser: A rapid-fire laser weapon. Infantry use these on a tripod; they're also often vehicle mounted or used as "small arms" by powered troopers.

Laser Pistols

Heavy Laser Pistol: A bulky but rapid-firing military-style laser sidearm, often used as an alternative to a machine pistol.

Holdout Laser: A tiny weapon disguised as an innocuous object, such as a wrist communicator or pen. Its mechanism uses non-metallic ceramics and exotic composites, so with the power cell removed, an ordinary scanner cannot distinguish it from a civilian electronic device.

Laser Pistol: The basic laser sidearm.

Laser Rifles

Chem Assault Laser: This is an older, chemical-pumped laser. It is most often used for microgravity combat. If its chemical power pack is attacked, it has SM-4, DR 10, HP 7; if disabled, it inflicts 1d corrosion damage in a 1-yard radius.

Chem Laser Sniper Rifle: A bulky but accurate chemical laser rifle, used as a battlefield sniping weapon. If its chemical pack is attacked, it has SM-4, DR 10, HP 7; if disabled, it inflicts 1d corrosion damage in a 1-yard radius.

Dinosaur Laser: A big laser sniper rifle, capable of stopping a battlesuit or a dinosaur (hence its nickname). Also called a "heavy laser." These are mostly military weapons, but sometimes are used to hunt big game.

Laser Carbine: A compact "assault" version of the laser rifle, favored by vehicle crews and special ops teams. Its low bulk makes up for its lack of range.

Laser Rifle: The standard infantry combat laser, capable of full automatic fire. Quite common across the universe.

Survival Laser: A carbine version of the heavy laser pistol. Survival lasers are designed to be broken down into four pocket-sized components, which take one minute to assemble/disassemble. Although it is not very powerful, it has excellent accuracy and only modest power drain.

BEAM WEAPONS (PISTOL) (DX-4, other Beam Weapons-4, or Guns (Rifle)-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Assault Laser	4d(2) burn	12+1	700/2,100	10/Dp	1	40(5)	7†	-5	1	\$10,000	2
Laser Sniper Rifle	5d(2) burn	12+2	1,100/3,300	20/Dp	1	20(5)	10†	-8	1	\$20,000	1
Dinosaur Laser	8d(2) burn	12	1,300/3,900	19/Dp	1	35(5)	10†	-5	1	\$19,000	1
Laser Carbine	5d(2) burn	12	500/1,500	5.6/2C	10	28(3)	5†	-3	1	\$4,600	2
Laser Rifle	6d(2) burn	12	700/2,100	8/Dp	10	83(5)	7†	-4	1	\$8,000	2
Survival Laser	4d(2) burn	12	300/900	3.3/2C	6	56(3)	6†	-3	1	\$2,400	3
GUNNER (BEAMS) (DX-4, other Gunner-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Area Defense Laser	6d×5(2) burn	18	36,000/110,000	8,000/10Fp	1	83(5)	20	-10	1	\$2,000,000	1
Point Defense Laser	3d×5(2) burn	18	9,000/27,000	1,000/Fp	1	66(5)	70M-10	1	\$250,000	1	
Semi-Portable Laser	6d(2) burn	18	1,400/4,300	70/Ep	10	100(5)	18	-8	1	\$32,000	1
Gatling Laser	6d×2(2) burn	18	2,900/8,700	70/Ep	4	100(5)	18M	-8	1	\$70,000	1
Laser Cannon	6d×10(2) burn	18	72,000/220,000	8,000/10Fp	1	83(5)	20	-10	1	\$4,000,000	1
Strike Laser	6d×5(2) burn	18	18,000/54,000	1,000/Fp	1	66(5)	70M-10	1	\$500,000	1	

Pulsed Energy Projectile (PEP) Lasers

A high energy laser can be modified so that it instead fires pulsed energy projectiles (PEP): a wider pulse of coherent light with an extremely short duration. A hit causes a surface explosion, concussion, and blunt trauma – sometimes enough to knock a person down – though it has less penetration than a standard laser.

The pulsed energy projectile option isn't listed on the weapon table; rather, it's available as an option that may be taken for any laser that does 10 or less damage, except for chemical lasers. Change the damage from burning to crushing, add the explosion damage modifier, and remove the armor divisor. The other statistics remain the same.

It is also possible to design a laser that can have a PEP setting. This is +1 CF; switching modes takes a Ready maneuver.

Electrolasers

Electrolasers use a pair of low-power far-ultraviolet laser beams to create an ionized path through the air, then transmit an electrical discharge that follows to the target. In effect, they are an electric stun gun that uses a laser beam instead of a wire. They're also called "zappers" or "stat guns."

Low-Power Electrolaser

These are non-lethal weapons. They deliver both an electrical shock and a minor laser burn.

The laser beam inflicts 1d-3 burn damage. It needn't penetrate to carry the charge. Smoke, fog, rain, or clouds give extra DR equal to the visible penalty. For example, if rain gives a penalty of -1 per 100 yards, a target 200 yards away gets an extra DR 2.

An electrolaser's shock is a HT-based affliction attack with a (2) armor divisor (each 2 DR on the location struck provides +1 to HT). Add +3 past 1/2D range. If the victim fails to resist, the shock stuns her. She may roll against HT every turn at the same penalty (but *without* the DR bonus) to recover. Electrolasers also affect machines that are Electrical.

Electrolaser weapons produce a "zap" sound, no louder than a silenced pistol, and the beam is visible. They are most effective in dry climates. In humid conditions they are less accurate; the electrical bolt jumps off the path to paths of lower resistance. This gives a -2 to hit in moist, humid environments, and a -6 to hit in rain, drizzle, or heavy fog. In a vacuum or trace atmosphere, there is no air to ionize; the electrolaser only inflicts 1d-3 burn damage from the laser, with no additional linked effect.

Electrolaser Weapons

Electrolaser Carbine: This compact rifle is one of the most common stun weapons. They are standard in almost every police vehicle universe wide.

Electrolaser Pistol: A wireless successor to dart-firing electric stun guns. Another weapon standard in police (and prison guard) loadouts.

Heavy Electrolaser: A heavy-duty electrolaser used against armored foes or large animals. Its ultraviolet carrier beam causes a more severe burn than lower-powered weapons, so it's best used on targets that have some protection.

Holdout Electrolaser: A palm-sized zapper.

Underbarrel Electrolaser This electrolaser is designed to be attached under the barrel of any weapon with Bulk -3 or more, providing a backup stun capability. Use the Bulk, ST, and sighting bonuses of the weapon it is installed in.

Semi-Portable Electrolaser: Also called a "tripod zapper," this powerful long-range electrolaser is usually mounted on a vehicle or tripod. Like the heavy electrolaser, its carrier beam can inflict nasty burns.

Lethal Electrolasers

Any electrolaser may have an optional "kill" setting that uses up to two shots instead of one. It takes a Ready maneuver to change settings.

On "kill" the weapon transmits a higher-amperage current. Any HT roll that fails by 5 or more triggers the Heart Attack mortal condition (p. B428). For electrical machines, a "heart attack" results in the target's electrical systems burning out until repaired.

Lethal electrolasers are all LC2.

Electrolaser Table

BEAM WEAPONS (PISTOL) (DX-4, other Beam Weapons-4, or Guns (Rifle)-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Electrolaser Pistol <i>linked</i>	HT-4(2) aff 1d-3 burn	4	40/80	2.2/C	3	36(3)	4	-2	1	\$1,800	4
Holdout Electrolaser <i>linked</i>	HT-2(2) aff 1d-3 burn	2	10/20	0.3/B	1	22(3)	3	-1	1	\$250	4
BEAM WEAPONS (RIFLE) (DX-4, other Beam Weapons-4, or Guns (Rifle)-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Electrolaser Carbine <i>linked</i>	HT-4(2) 1d-3 burn	8	160/470	3.7/2C	3	72(3)	4†	-4	1	\$3,900	3
Heavy Electrolaser <i>linked</i>	HT-6(2) aff 1d-2 burn	8	400/1,100	20/Dp	1	83(3)	10†	-5	1	\$20,000	3
Underbarrel Electrolaser <i>linked</i>	HT-3(2) aff 1d-3 burn	4	90/270	1.8/C	1	66(3)	4	-	1	\$1,300	4
GUNNER (BEAMS) (DX-4, other Gunner-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Semi-Portable Electrolaser <i>linked</i>	HT-8(2) aff 1d-1 burn	12	600/1,900	70/Dp	10	100(5)	18M	-8	1	\$70,000	1

Microwave Weapons

Microwave weapons project electromagnetic beams with wavelengths longer than infrared light, but shorter than radio waves. Microwave beam weaponry is usually used to stun people or machines, depending on the frequency used.

Microwave Area Denial (MAD)

These “pain beam” weapons use microwaves to heat the surface of the target’s skin to about 130°F, activating pain receptors without causing actual burning. The sensation is similar to touching a hot light bulb all over the surface of the body. MAD weapons are often used for riot control.

MAD beams deliver a HT-based affliction attack (modi-

fier varying by weapon) with no armor divisor; add the target’s DR to HT to resist. If they fail to resist, they suffer from the Agony affliction (p. B428) for as long as they are in the beam, and for one second afterward.

MAD beams are ranged cone attacks – see *Area and Spreading Attacks* (p. B413).

MAD Weapons

Portable MAD: A weapon the size of a light machine gun, used as a portable anti-riot device. It is sometimes built into vehicles as a secondary weapon.

Tactical MAD: A large semi-portable projector capable of breaking up a crowd at a thousand yards. It’s usually tripod-mounted or built into a vehicle.

Microwave Disruptors

These generate a directional pulse that can scramble and overload electronics and electrical systems.

Microwave disruptors project ranged cone attacks – see *Area and Spreading Attacks* (p. B413). Any target in the cone is struck by an affliction attack. This only afflicts electrical systems and those with the Electrical disadvantage. Make a HT roll or be shut down (or unconscious) for minutes equal to the margin of failure. Add +3 to resist beyond 1/2D range. The target’s SM adds to the HT roll to resist.

Microwave disruptors are contact agents that ignore DR

unless the target is sealed. Disruption can propagate along radar or communication antennas, power lines, and communication cables. Treat a target with unshielded electronic access as unsealed.

Microwave disruptors come in holdout-sized “scramblers” for sabotaging computers or other electronics, and heavier carbines and semi-portable weapons for disabling robots and vehicular targets. Very large microwave disruptors are rare, since most large vehicles are sealed; EMP warheads (p. TODO) are more effective.

MAD Weapons Table

BEAM WEAPONS (Projector) (DX-4, other Beam Weapons-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Portable MAD	HT-3 aff (1 yd)	12	400/800	20/Dp	1	300(5)	10†	-5	1	\$10,000	3
GUNNER (BEAMS) (DX-4, other Gunner-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Tactical MAD	HT-4 aff (3 yd)	18	600/1,200	70/Dp	1	100(5)	18M	-8	1	\$70,000	3

Microwave Disruptor Weaponry

Most microwave disruptors are personal weapons requiring Beam Weapons (Projector) skill to use.

EMP Gun: The basic portable microwave weapon, capable of stopping a robot or vehicle, or frying a room full of electronics.

Pulse Carbine: A more compact version of the EMP Gun, primarily used as an anti-robot weapon.

Scrambler: A pocket holdout microwave pulse weapon.

Tactical Disruptor: A semi-portable microwave cannon, usually tripod-mounted or installed in a vehicle or robot. It requires Gunner (Beams) skill to use.

High-Power Microwave Weapon Table

BEAM WEAPONS (Projector) (DX-4, other Beam Weapons-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
EMP Gun	HT-3 aff (1 yd)	6	90/270	1.8/C	1	33(3)	4	-2	1	\$650	2
Pulse Carbine	HT-4 aff (1 yd)	12	160/480	5/2C	1	28(3)	5†	-3	1	\$2,000	2
Scrambler	HT-2 aff (1 yd)	3	40/120	0.3/B	1	11(3)	3	-1	1	\$120	2

GUNNER (BEAMS) (DX-4, other Gunner-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Tactical Disruptor	HT-8 aff (3 yd)	18	600/1,200	70/Dp	1	50(5)	18M	-8	1	\$32,000	1

Particle Accelerators

Charged Particle Beams (“Blasters”)

These particle beam weapons accelerate ionized electrons to near-light velocities. They work best in an atmosphere – the beam collides with air molecules, creating enough ions of the opposite charge so that the beam is self-neutralized and remains coherent. The beam resembles a linear lightning bolt. In a vacuum, range is reduced, since the particles repel one another, but the beam is invisible.

Blasters inflict burn damage with a (5) armor divisor and the surge damage modifier. In a vacuum or trace atmosphere, the beam's Acc is halved (round up) and the beam's Range is divided by 5.

This technology is still new and experimental and see limited functional models.

Mounted Weapons

Blaster Cannon: A multi-ton weapon installed in the turret or hull of a spacecraft or tank.

Omni-Blasters

At +1 CF, a blaster may incorporate a stun setting, firing non-lethal energy bolt similar in nature to an electrolaser beam. A stun setting feels like a powerful electrical shock. Unlike an electrolaser, a blast's stun bolt works in any environment. It takes one turn to “switch to stun.”

When set to stun, the victim takes no damage, but must make a HT roll to resist falling unconscious. The HT roll is at a -1 penalty per die of damage the blaster usually inflicts, up to a maximum of -10. The victim adds one-third of his DR to HT – that is, the blaster gets a (3) armor divisor instead of its usual (5). A failed roll results in the victim falling unconscious for minutes equal to the margin of failure.

Particle Beam Table

GUNNER (BEAMS) (DX-4, other Gunner-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Blaser Cannon	5d×10(5) burn sur	15	30,000/90,000	4,000/10Fp	1	20(5)	160	-10	1	\$2,000,000	1

Sonic Weapons

Sonic beam weapons focus sound waves to hurt, incapacitate, or kill. Their range is multiplied by air pressure in atmospheres, up to a maximum of two times the listed range. They won't work in a vacuum or trace atmosphere unless physically touching the target (range C).

Sonic weapons will work underwater if designed for that medium. Underwater sonic weapons get double range, but their statistics are otherwise identical.

Sonic Nauseators

These weapons use acoustic heterodyning technology to process ordinary audible sound into a complex ultrasonic signal. The original sound is bound within the column of ultrasonic frequencies, becoming a tight beam that can travel hundreds of yards with no distortion or loss of volume. It causes pain, temporary hearing loss, and nausea. The weapons are not as reliable for self-defense as other weapons, but are effective for riot control.

Nauseator beams are audible only to the target, and the beam is invisible. Nauseator range is multiplied by air pressure in atmospheres. It has no range in vacuum or under-

water.

Nauseators emit a cone attack – see *Area and Spreading Attacks* (p. B413). The effect is a hearing-based affliction attack that ignores DR, but has no effect on someone who cannot hear. A victim gets a HT roll to resist at the penalty noted for the weapon; add +5 for Protected Hearing and +3 beyond 1/2D range. Failure means suffering the disadvantages Hard of Hearing and the Moderate Pain (p. B428) irritating condition for minutes equal to the margin of failure on the target's HT roll. Failure by 5 or more results in Deafness (making the target immune to further attacks) and retching (p. B429), plus loss of sphincter control, resulting in the Bad Smell disadvantage until cleaned up. The weapons are sometimes nicknamed "bowel disruptors" due to these unpleasant consequences.

Nauseator Weapons

Nausea Carbine: A short rifle-sized weapon.

Nausea Pistol: A pistol-sized version.

Tactical Nauseator: A tripod or vehicle-mounted riot-control weapon.

Sonic Screamers

These lethal sonic weapons fire a beam that vibrates, heats, and even liquefies the target. Although the primary beam is an inaudible subsonic or ultrasonic frequency, the nickname comes from the tooth-jarring whine produces as a side. Particularly baroque sonic designs may even have an audio trigger, modulating the user's battle cry or singing into an energy pulse!

Screamers deliver a cone attack – see *Area and Spreading Attacks* (p. B413) – that "shakes and bakes" victims, doing corrosion damage. Living targets suffer the symptoms of Hard of HEaring (p. B109) if the damage exceeds 1/2 HP or Deafness if over 2/3 HP; this doesn't heal until the injury that caused it recovers.

Screamer Weapons

Screamer Carbine: A short, stubby weapon with a large, bell-shaped aperture; this is the most common screamer.

Screamer Pistol: A pistol-sized version, also called a "sonic disruptor pistol."

Tactical Screamer: A heavy semi-portable weapon used by power troops, or mounted on a tripod or vehicle. It is also called a "tripod screamer."

Sonic Stunners

These advanced stunners fire a narrow, intense beam of ultrasonic sound that can shut down the target's nervous system. Unlike a nauseator, a sonic stunner can affect someone who is deaf.

A hit requires a HT roll to resist at the penalty noted for the weapon. Add +3 beyond 1/2D range, and +1 per 5 DR the victim has at the point struck. If she fails, she suffers the Unconsciousness (p. B429) incapacitating condition for minutes equal to the margin of failure. The beam is narrow enough that if a limb or extremity is hit, it is incapacitated instead of the victim being rendered unconscious.

Sonic Stun Weapons

Sonic Stun Cannon: A semi-portable weapon, usually tripod- or vehicle-mounted.

Dinosaur Stunner: A powerful stunner capable of stopping an elephant.

Sonic Stinger: A nonlethal alternative to the holdout laser, the stinger is a tiny sonic stunner that can be disguised as an everyday item or strapped to the wrist. Its construction means that when the power cells are removed, it is indistinguishable from a civilian electronic device to ordinary scanners.

Sonic Stun Pistol: A handgun-sized sonic stunner. Some police departments issue them as standard sidearms.

Sonic Stun Rifle: A basic stun rifle.

Sonic Weapon Table

BEAM WEAPONS (PISTOL) (DX-4, other Beam Weapons-4, or Guns (Pistol)-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Sonic Stinger	HT-1(5) aff	1	2/6	0.02/A	1	18(3)	1	0	1	\$15	4
Sonic Stunner	HT-2(5) aff	1	10/30	0.3/B	1	22(3)	3	-1	1	\$120	4
Sonic Stun Pistol	HT-3(5) aff	3	30/100	1.8/C	1	66(3)	4	-2	1	\$650	4

BEAM WEAPONS (PROJECTOR) (DX-4, other Beam Weapons-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Nausea Carbine	HT-4 aff (1 yd)	6	17/50	5/2C	1	56(3)	5†	-3	1	\$2,000	4
Nausea Pistol	HT-3 aff (1 yd)	3	9/27	1.8/C	1	66(3)	4	-2	1	\$650	4
Screamer Carbine	4d cor (1 yd)	6	33/100	5/2C	1	56(3)	5†	-3	1	\$4,000	4
Screamer Pistol	3d cor (1 yd)	3	18/54	1.8/C	1	66(3)	4	-2	1	\$1,300	4

BEAM WEAPONS (RIFLE) (DX-4, other Beam Weapon-4, or Guns (Rifle)-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Dinosaur Stunner	HT-6(5) aff	6	130/400	20/Dp	1	83(3)	10†	-5	1	\$10,000	3
Sonic Stun Rifle	HT-4(5) aff	6	60/180	5/2C	1	56(3)	5†	-3	1	\$2,000	4

GUNNER (BEAMS) (DX-4, other Gunner-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Tactical Nauseator	HT-8 aff (3 yd)	9	70/200	70/Dp	10	100(5)	18M	-8	1	\$35,000	2
Tactical Screamer	8d cor (3 yd)	9	130/400	70/Dp	10	35(5)	18M	-8	1	\$70,000	2
Sonic Stun Cannon	HT-8(5) aff	9	230/700	70/Dp	10	100(5)	18M	-8	1	\$32,000	2

Plasma Weapons

Flamers

These weapons fire a low-velocity jet of high temperature plasma. Hydrogen fuel is fed into a magnetic containment chamber, heated and compressed to form a plasma, then released as a continuous stream.

Flamers inflict burning damage, but not tight-beam burning damage.

Flamer Weapons

Assault Flamer: This rifle-sized plasma weapon is often used by armored infantry involved in spaceship boarding actions and house-to-house fighting.

Hand Flamer: This large pistol is used as a military sidearm or a terror weapon.

Heavy Flamer: An energy-based flamethrower with a backpack power supply.

Semi-Portable Flamer: Also called a “tripod flamer,” this heavy, semi-portable infantry weapon can be terrifying even to a fighter in heavy armor. A heavy flamer can be mounted on a tripod or carried by a soldier.

Plasma Flamer Table

BEAM WEAPONS (PROJECTOR) (DX-4, other Beam Weapons-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Assault Flamer	5d burn	Jet	50/150	5.6/2C	1	28(3)	5†	-3	1	\$2,300	2
Hand Flamer	4d burn	Jet	30/90	3.3/2C	1	56(3)	6	-2	1	\$1,200	3
Heavy Flamer	8d burn	Jet	130/390	20/Dp	1	35(5)	10†	-5	1	\$10,000	1

GUNNER (BEAMS) (DX-4, other Gunner-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Semi-Portable Flamer	6d×3 burn	Jet	150/450	70/Ep	1	31(5)	18M	-8	1	\$35,000	1

Plasma Guns

These weapons use a laser to zap a hydrogen pellet into a high-temperature plasma state. The plasma is magnetically confined for an instant, focused into a bolt, and then released at hypersonic velocities. When fired in atmosphere, the plasma bolt will ride a laser beam, which is used to create an evacuated channel, ensuring the plasma does not explode immediately upon contact with air.

Plasma bolts have greater range, force, and accuracy than a flamer beam, but dissipate rapidly compared to laser or

particle beams. However, they deliver a powerful explosive punch, thanks to their combination of thermal and kinetic energy effects, and are among the most energy-efficient beam weapons in terms of sheer destructive energy. The ionized plasma bolt can also short out electrical systems. Plasma bolts are bright and create a loud report as the bolt burns through air, followed by a noisy explosion when it strikes the target.

The technology underlying plasma weapons limits them, currently, to heavy weapons. A plasma gun inflicts burning damage with the explosive damage modifier. This is *not*

tight-beam burning damage. Unlike most beam weapons, plasma guns have significant recoil.

Plasma weapons use special power cells which include an integrated magazine of hydrogen fuel pellets. These cells are not interchangeable with those of other weapons or devices.

Personal Plasma Guns

Heavy Plasma Gun: Favored by powered troopers as an assault rifle, or as a squad support weapon.

Mounted Plasma Guns

Plasma Cannon: This heavy vehicle-mounted weapon is a short-ranged but effective alternative to particle beams and lasers.

Plasma Gatling Cannon: A light-weight multibarrel plasma cannon with a high rate of fire.

Semi-Portable Plasma: A powerful weapon designed for use on a tripod mount or by heavy battlesuits.

Plasma Gun Table

BEAM WEAPONS (RIFLE) (DX-4, other Beam Weapons-4, or Guns (Rifle)-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Heavy Plasma Gun	3d×5(2) burn ex	8+3	750/2,250	20/Dp	3	20(5)	15†	-6	2	\$40,000	1
GUNNER (BEAMS) (DX-4, or other Gunner-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Plasma Cannon	6d×25(2) burn ex	12	7,500/22,500	5,000/10Fp	1	40(5)	24†	-10	2	\$2,000,000	1
Plasma Gatling Gun	6d×5(2) burn ex	12	1,500/4,500	250/5Ep	10	100(5)	50M	-9	2	\$320,000	1
Semi-Portable Plasma Gun	20d(2) burn ex	12	1,000/3,000	70/Ep	3	100(5)	27†	-8	2	\$140,000	1

Chapter 20

Fluid Projectors

These weapons project streams of liquid or gas. They are fired using Liquid Projector skill (p. B205).

Sprays

These are pressurized aerosol spray cans or tanks. They can spray a variety of biochemical or nanotech substances.

Weapons

Pocket Aerosol: A palm-sized disposable tank that sprays a single dose. Respiratory agents must be sprayed into the face, but there's no location penalty to hit due to the size of the cloud. Contact agents can be sprayed onto the body.

Spray Can: The size of a can of bug spray, it holds 10 doses of gas. It can spray up to three doses at once to fill a one-yard radius. The cloud lasts 10 seconds indoors, but dissipates quickly in a strong wind.

Spray Tank: A spray gun attached by a short hose to a tank, which can be worn as a backpack. The tank has DR 10, but is under pressure: any penetrating damage can rupture it, releasing the entire store of chemicals. This has the same effect as a 10mm biochemical warhead (p. TODO). Spray tanks can (and often are) be integrated as part of a security system.

Vortex Ring Projectors

These advanced gas projector weapons consist of a reservoir tank, a chamber for mixing the delivery gas with a propellant, and a wave-shaping chamber that forms the ejected cloud into a *vortex ring* – a high-velocity smoke ring. This

allows the weapon to deliver doses of gas at long range. Vortex rings retain their momentum and cohesion for a long distance, and are not affected by light winds. They break up, depositing their payload, on direct collision with a solid object...but will bounce from a glancing impact. Thus, they can be bounced around corners, if the user is skilled and knows where their target is. Each bounce gives -2 to hit and -10% to range per bounce; e.g., a weapon with Range 30 could bounce four times at -8, but this would limit the total path length to 18 yards.

Vortex ring projectors can fire almost any gas. Some of the more exotic "gas missiles" include carbon dioxide to choke internal combustion engines, Halon to extinguish fires, and even explosive vapors.

Vortex ring projectors are regular ranged weapons that deliver a linked area-effect release of whatever gas they are loaded with. The vortex ring also has enough velocity to inflict crushing damage with double knockback.

Weapons

Underbarrel Vortex Ring Projector: A vortex ring projector that can be clamped under the barrel of a rifle or other long arm in place of a grenade launcher (Any weapon with more than -4 Bulk). Use the Bulk, ST, and sighting bonuses of the weapon it is installed on.

Vortex Pistol: A vortex ring sidearm the size of an ordinary automatic pistol.

Backpack Vortex Ring Projector: A heavy flamethrower-like device sometimes used by combat engineers or police for house-to-house fighting or riot control. It is also occasionally used for non-combat applications, such as projecting fire-extinguishing foam.

Fluid Projector Table

LIQUID PROJECTOR (SPRAYER) (DX-4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Backpack Vortex Projector <i>linked</i>	spec. (2 yd) 1d-3 cr dkb	3	30	12/12p	1	10(5)	10†	-4	1	\$1,200	3
Pocket Aerosol	spec.	Jet	1	0.1	1	1	1	-1	1	\$10	4
Spray Can	spec. (1 yd)	Jet	2	1/0.5	1	10(5)	2	-2	1	\$25	4
Spray Tank	spec. (1 yd)	Jet	3	8/5	1	10(5)	4	-4	1	\$400	4
Underbarrel Vortex Projector <i>linked</i>	spec. (1 yd) 1d-3 cr dkb	2	20/40	5/3	1	10(3)	–	–	1	\$150	4
Vortex Pistol <i>linked</i>	spec. (1 yd) 1d-3 cr dkb	2	15	1.8/0.8	1	5(3)	7	-2	1	\$100	4

Chapter 21

Guns and Launchers

The simplest way to kill or injure at a distance is with a projectile. Guns and launchers can carry inert slugs, explosives, or chemical weapons. The difference between guns and launchers is that launchers fire a self-propelled projectiles, such as rocket, that continue to accelerate after it has left the weapon.

Guns and launchers are described with the name of the weapon followed by a designation for the ammunition it fires. The designation is a projectile diameter in millimeters and a letter code used to differentiate it from others of the same diameter. The damage on the weapon tables assumes a solid projectile, but all guns and launchers (except ice guns) may also fire weapons with more exotic warheads. See *Warheads and Ammunition*, p. TODO.

Ammunition Tables

Projectile weapons require ammunition. The weight of a loaded magazine of ammunition is given in the Weapon Tables, after the weapon's weight. The price of ammunition is not included, however, and adventurers may also wish to buy individual rounds.

Ammunition Tables provide the following information about individual rounds of ammunition:

Name: The name of the ammunition, e.g., 7mmCL.

WPS: The weight per shot, in pounds.

CPS: The cost per shot, in dollars. This is increased if using specialized warheads (p. TODO)

LC: The legality class of the ammunition (if firing ordinary solid projectiles).

Different weapons can't share magazines except where indicated, but if the ammunition is identical, it's possible to remove individual rounds from one magazine and load them into another; e.g., ammo taken from any 7mmCL weapon will work in any other 7mmCL weapon.

Conventional and ETC Guns

These weapons use the expanding gases from a burning chemical propellant to push a projectile down a barrel.

Conventional Small Arms

They use light polymer-cased or caseless telescoped ammunition, in which a projectile is embedded into a block of solid propellant. This reduces the ammunition's weight and bulk so that more shots can be carried. The propellant is ignited with an electrical system; this is integrated into the weapon's smartgun electronics and uses the same power cell.

Preloaded Barrels: Some conventional guns replace their ammunition feed and ejection systems with alternating propellant charges and projectiles stacked *inside* the gun barrel. These are fired electronically, singly or in very rapid sequence. The theoretical rate of fire can exceed a million rounds per minute, but the shots that fit into a barrel limit the effective rate of fire! In practice, the rounds can be fired fast enough that any recoil impulse is minimized. The whole barrel must be changed to reload; most guns of this sort have more than one barrel.

Pistol

Heavy Pistol, 10mmCLP: This powerful pistol uses the same round as the machine pistol (below).

Holdout Pistol, 7.5mmCLP: This is a small, easily concealed semi-automatic pistol.

Magnum Pistol, 15mmCLP: This semi-automatic pistol fires a powerful magnum round. Its size makes it hard to conceal, and only a strong person can shoot accurately with it.

Medium Pistol, 7.5mmCLP: The standard semi-automatic pistol, with a sturdy plastic and alloy frame and a high-capacity magazine.

Submachine Guns

These are compact, fully-automatic assault weapons with pistol grips, folding front foregrips, and retractable telescoping stocks.

Machine Pistol, 10mmCLP: This weapon fires the same medium-velocity pistol-caliber round as the 10mm pistol. It is favored as it has good stopping power, but errant rounds are unlikely to tear through walls (or targets) and hit bystanders.

Personal Defense Weapon (PDW), 5.7mmCL: A PDW fires a small, high-velocity bullet that resembles a miniature rifle round, with better accuracy and range than the pistol ammo used in a submachine gun. This weapon has a big magazine that runs horizontally alongside the weapon. An ergonomic handgrip completely encloses the firing hand.

Urban Assault Weapon (UAW), 10mmCLR: A double-barrel weapon with a 10mm machine pistol and 18.5mm shotgun (use the underbarrel shotgun statistics).

Rifles

These weapons incorporate shoulder stocks, and are designed to be used two-handed. Too large to holster, they come with carrying slings.

Anti Material Rifle (AMR), 15mmCL: The 15mm AMR is a large-caliber sniper weapon powerful enough to cripple light vehicles more than a mile away. This weapon becomes especially fearsome when upgraded with electrothermal or liquid propellant. The rifle's Acc assumes an integral 8x telescopic sight (+3 bonus).

Assault Carbine, 7mmCL: This bullpup-configuration assault rifle is a basic but effective infantry weapon.

Gatling Carbine, 5.7mmCL: This triple-barreled, electric-motor-driven chaingun boasts a carbine format no larger than an ordinary assault rifle. It fires the same 5.7mm round as the PDW (p. 87). Its long magazine slides and locks into the back of the weapon. A separately loaded B cell provides power for 19,500 shots.

Hunting Rifle, 7mmCL: This plastic and alloy semi-automatic rifle fires the same high-velocity ammunition as the assault carbine.

Payload Rifle, 25mmCL: A bulky semi-automatic rifle, similar to an anti-material rifle, that fires a medium-velocity 25mm cannon shell. This provides a long-ranged alternative to a grenade launcher. It has a very effective muzzle brake.

Storm Carbine, 10mmCL: This weapon fires a more powerful 10mm caseless round. Its drawbacks include heavier ammunition and noticeably higher recoil.

Storm Rifle, 10mmCLR: A heavier semi-automatic version of the storm carbine, this fires a higher-velocity, full-sized ("10mm Caseless Long Rifle") bullet.

Machine Guns

These automatic weapons are designed to be fired in long bursts from a bipod or tripod mount. They use an ammunition belt, which is sometimes contained within a cassette. When firing on the move, machine guns can be carried in an articulated weapon harness or a gyrostabilized weapon harness (p. TODO).

Assault Cannon, 25mmCL: This is a tripod- or vehicle-mounted automatic cannon firing medium-velocity shells, similar to those of the payload rifle (above).

Light Support Weapon (LSW), 7mmCL: This light machine gun comes with a folding bipod for accurate prone firing. The LSW normally employs a belt feed, but it fires the same bullet as the assault carbine (above), and can use its magazines if necessary.

Minigun, 7mmCL: This portable, tripod-mounted gatling gun boasts six rotating barrels and an electric action, firing up to 100 rounds per second. A separately loaded C cell powers it for up to 15 minutes.

Storm Chaingun, 10mmCLR: This is an electric-motor-driven, machine-gun version of the storm rifle (above). It uses a 60-shot belt contained within an ammo cassette. It can also use the same 12-shot 10mmCLR magazines as the storm rifle, but it cannot fire storm-carbine ammunition. The storm chaingun incorporate a folding bipod for accurate prone firing. A separately loaded B cell provides 15 minutes of power.

Heavy Chaingun, 15mmCL: This electric-motor-driven, single-barrel machine gun fires the same round as the anti-material rifle. Normal humans can't handle its weight without a tripod, but powered troopers can use it as a handheld weapon. A separately loaded C cell provides 15 minutes of power.

Shotguns

Shotguns are a special category of slugthrower: low-powered, short-barrel smoothbores firing large rounds, often with multiple projectiles. Most fire 18.5mm (12 gauge) plastic-cased ammo.

Civ Shotgun, 18.5mmPC: A semi-automatic shotgun. It is fitted with a plastic shoulder stock.

Close Assault Weapon (CAW), 18.5mmPC: A fully-automatic assault shotgun favored for house-to-house fighting.

Underbarrel Shotgun, 18.5mmPC: A modular pump-action shotgun that can be clamped under any weapon with Bulk -3 or more. Use the Bulk, ST, and sighting bonuses of the weapon it is installed in.

Shotgun Pistol, 18.5mmPC: A wide-bore pistol that fires shotgun ammunition. It is ideal for house-to-house work or for firing from a vehicle. It's also a favorite police undercover weapon, despite its substantial recoil.

Mortars and Grenade Launchers

Underbarrel Grenade Launcher (UGL), 25mmPC: This is a tube-fed pump-action grenade launcher firing medium-velocity plastic-cased shells. It may be clamped under the barrel of any weapon with Bulk -3 or more. Use the Bulk, ST, and sighting bonuses of the weapon it is installed in.

Underbarrel Grenade Launcher (UGL), 40mmPLB: This grenade launcher fires low-velocity shells. Like its 25mm counterpart, it's designed to be clamped under another weapon with Bulk -3 or more. Each "magazine" is actually a preloaded barrel stacked with five 40mm shells and propellant charges. It can fire up to three grenades before any recoil impulse is felt. Use the Bulk, ST, and sighting bonuses of the weapon it is installed in.

Mortar Box, 40mmPLB: A four-tube version of the 40mm UGL. Designed for remote control firing, it has a cable jack and its own short-range radio (p. 24).

Mortar Box, 64mmPLB: A larger version of the 40mm mortar box, consisting of a pod holding six mortar barrels, each containing five stacked 64mm shells. This potent "area

denial weapon" can deliver as many as 30 shots in a single salvo!

Cannon

Tank Cannon, 100mm: A medium tank gun with an automatic loader. It is often upgraded with liquid propellant or electrothermal options, or loaded with APEP (p. TODO) ammunition.

Light Anti-Armor Weapons

Splat Gun, 15mmPLB (TL9): Designed to destroy light armored vehicles and battlesuit troopers, this is a favorite weapon of mercenaries fighting on low-tech worlds. It is a bulky, multi-barrel weapon resembling a short, thick bazooka, with a pistol grip, a padded shoulder stock, and a bipod. Nicknamed the "splat gun," it has six preloaded barrels stacked with 15mm shells and propellant. Its electronic ignition can fire up to 30 shells before any recoil impulse is felt. The shooter can also fire a smaller number of shells by adjusting a selector switch (this is a Ready action).

Conventional Smallarm Table

GUNS (PISTOL) (DX-4, or most other Guns at -2)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Heavy Pistol, 10mmCLP	3d pi+	2	180/2,00	2.5/0.7	3	20+1(3)	10	-2	3	\$540	3
Holdout Pistol, 7.5mmCLP	2d pi-	1	100/1,200	1/0.2	3	18+1(3)	6	-1	2	\$240	3
Magnum Pistol, 15mmCLP	4d+1 pi++	2	235/2,600	3/1	3	9+1(3)	11	-3	4	\$870	3
Medium Pistol, 7.5mmCLP	2d+2 pi-	2	150/1,900	2/0.5	3	30+1(3)	9	-2	2	\$450	3
GUNS (SMG) (DX-4, or most other Guns at -2)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Machine Pistol, 10mmCLP	3d pi+	2	180/2,000	3/1	1C	30+1(3)	1C	-2	3	\$750	2
Personal Defense Weapon, 5.7mmCL	4d pi-	4	350/3,000	4.5/1	10	100+1(5)	9†	-3	2	\$1,000	2
Urban Assault Weapon, SMG barrel, 10mmCLP	3d pi+	4	200/2,100	8/1	1C	40+1(3)	9†	-3	3	\$2,100	2
Shotgun barrel, 18.5mmPC	4d+4 pi++	2	100/500	-/0.75	2	5+1(3i)	1C	-	1		
GUNS (RIFLE) (DX-4, or most other Guns at -2)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Anti-Material Rifle, 15mmCL	15d pi++	6+3	2,000/9,000	30/2	3	10(3)	12B†	-6	4	\$8,000	3
Assault Carbine, 7mmCL	6d pi	4	700/4,000	7/1.5	15	50+1(3)	9†	-4	2	\$1,600	2
Gatling Carbine, 5.7mmCL	4d pi-	4	350/3,000	10/2	40	200(5)	9†	-4	2	\$2,400	1
Hunting Rifle, 7mmCL	6d+1 pi	5	750/4,200	7/0.3	3	10+1(3)	9†	-5	2	\$800	3
Payload Rifle, 25mmCL	10d pi++	4	700/8,500	38/10	3	8+1(3)	12B†	-6	4	\$8,000	2
Storm Carbine, 10mmCL	7d pi+	4	700/2,100	8/2	10	50+1(3)	10†	-4	3	\$1,800	2
Storm Rifle, 10mmCLR	9d pi+	5	1,300/5,800	10/1.2	3	12+1(3)	10†	-5	3	\$2,700	3
GUNS (SHOTGUN) (DX-4, or most other Guns at -2)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Civilian Shotgun, 18.5mmPC	4d+4 pi++	3	100/500	6/0.75	3	5+1(3)	10†	-5	4	\$450	3
Close Assault Weapon, 18.5mmPC	4d+4++	3	100/500	10/1.5	10	10+1(3)	11†	-5	4	\$800	2
Shotgun Pistol, 18.5mmPC	4d pi++	1	100/500	4/0.7	3	5+1(3)	10	-3	5	\$330	3
Underbarrel Shotgun, 18.5mmPC	4d+4 pi++	2	100/500	1.5/0.75	2	5+1(3i)	10†	-	4	+\$300	3

Infantry Support Weapons Table

GUNS (GRENADE LAUNCHER) (DX-4, or most other Guns at -4)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Underbarrel Grenade Launcher, 25mmPC	4d pi++	4	360/2,200	1.5/0.66	1	3(3)	10	-	3	+\$300	1
Underbarrel Grenade Launcher, 40mmPLB	1d pi++	2	75/450	3/2	3	5(5)	10	-	1	+\$200	1
GUNS (LIGHT MACHINE GUN) (DX-4, or most other Guns at -2)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Light Support Weapon, 7mmCL	6d pi	5	700/4,000	15/5	15	200(5)	9B†	-5	2	\$3,000	1
Storm Chaingun, 10mmCLR	9d pi+	5	1,300/5,800	20/6	10	60(5)	11B†	-6	3	\$11,000	1
GUNS (LAW) (DX-4, or most other Guns at -2)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Splat Gun, 15mmPLB	3d+2 pi++	4	220/2,000	20/10	30	30(30)	10†	-6	1	\$3,000	1

Mounted Weapons Table

ARTILLERY (CANNON) (IQ-5)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	
Mortar Box, 40mmPLB	1d pi++	2	75/450	12/8	4x4	16(20)	12M	-6	1	\$1,000	1	
Mortar Box, 64mmPLB	6d×2 pi++	3	360/3,00	160/80	6x5	30(30)	25M	-10	1	\$6,000	1	
GUNNER (CANNON) (DX-4, or other Gunner-4)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	
Tank Cannon, 100mmCL	6d×25 pi++	6	3,000/10,000	2,500/40	1	1(4)	150	-10	4	\$100,000	1	
GUNNER (MACHINE GUN) (DX-4, other Gunner-4)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	
Assault Cannon, 25mmCL	10d pi++	4	700/8,500	62/34	8	34(5)	20M	-8	2	\$17,000	1	
Heavy Chaingun, 15mmCL	15d pi++	6	2,000/9,000	75/12	12	50(5)	20M	-8	2	\$34,000	1	
Minigun, 7mmCL	6d pi	5	700/4,000	33/10	100	400(5)	15M	-7	2	\$14,000	1	

Conventional Ammunition Table

Pistol Ammo

Ammo	WPS	CPS	LC
7.5mmCLP	0.006	\$0.12	3
10mmCLP	0.014	\$0.28	3
15mmCLP	0.060	\$1.2	3

Rifle and PDW Ammo

Ammo	WPS	CPS	LC
5.7mmCL	0.009	\$0.18	3
7mmCL	0.027	\$0.54	3
10mmCL	0.04	\$0.8	3
10mmCLR	0.06	\$1.2	3
15mmCL	0.2	\$4	3

Shotgun Ammo

Ammo	WPS	CPS	LC
18.5mmPC	0.092	\$1.8	3

Payload Rifle and Cannon Ammo

Ammo	WPS	CPS	LC
25mmCL	1	\$20	2
100mmCL	40	\$400	1

Splat Gun Ammo

Ammo	WPS	CPS	LC
15mmPLB	0.27	\$7	2

Grenade Launcher and Mortar Ammo

Ammo	WPS	CPS	LC
25mmPC	0.22	\$4.4	3
40mmPLB	0.4	\$10	3
64mmPLB	2	\$40	2

Electrothermal-Chemical (ETC)

These weapons augment chemical energy with electrical power. A controlled plasma burn provides a smoother and

more complete utilization of propellant, increasing the projectile velocity without a significant increase in recoil.

ETC weapons are not shown on the weapon table. Instead, all conventional slugthrowers are also available in ETC-boosted versions

ETC guns have 1.5 times the piercing damage and range of a conventional caseless-propellant gun. They are also twice as expensive.

They require electrical power as well as ammunition, although this power requirement is much less than an electromagnetic gun or beam weapon. The grip or stock of an ETC slugthrower incorporates a removable A cell (for pistols), B cell (for SMGs, PDWs, shotguns, rifles), or C cell (for heavy weapons) to provide electrical power. Each power cell can fire 10 magazines of ammunition.

Liquid-Propellant Slugthrowers

Liquid propellants are an advanced option for chemical propellant. Propellant and oxidizer are kept in a separate bottle, then squirted into the firing chamber and ignited electrically when the trigger is pulled. Binary propellants are often used; the chemicals are inert until combined in the firing chamber.

Liquid propellant is a bit more powerful and easier to store, but its chief advantage is precise control of propellant velocities. In addition to standard velocity they have two other options:

Boosted velocity dumps extra propellant into the firing chamber: increase the piercing damage by +1 per die and multiply range by 1.3. Each counts as 1.5 shots for purposes of draining the propellant bottle.

Low velocity dumps much less propellant into the firing chamber, making the weapon subsonic. Reduce the piercing damage and range by half! Rolls to hear the weapon fire are made at -3. Each counts as 1/4 shot for draining the propellant bottle.

Liquid propellant weapons use the same statistics as conventional caseless weapons, but they get 1.5 times as many shots per magazine and are 1.5 times as expensive. A propellant bottle can fire three magazines of shots and takes five seconds to reload. Additional propellant bottles weigh

as much as a normal loaded magazine.

Gas-Powered Air Guns

These use air or carbon dioxide, compressed and stored in liquid form. When the trigger is pulled, the liquid is released and expands into a gas, propelling the projectile. Gas-powered air guns are quiet and have no muzzle flash. They are often used as sporting weapons, and tend to have a higher Legality Class than other weapons.

Weapons

Needler, 3mm: A small-caliber air gun that can fire a bullet, or a drugged dart holding one dose of any injectable biochemical poison. Also called a "needle pistol."

Needle Rifle, 3mm: A higher-powered air rifle, otherwise similar to the needle pistol.

Paint Carbine, 15mm: A large-caliber, low-velocity air gun used to fire plastic pellets containing paint or bio-chemical liquid ammunition (p. TODO). It is electrically powered (a B cell can fire 10 magazines of ammunition) and capable of automatic fire. It may be designed as a replica of an actual rifle or carbine.

Paint Pistol, 15mm: A large-caliber, low-velocity air gun used to fire plastic pellets containing paint or bio-chemical liquid ammunition (p. TODO). Some models are designed as replicas of pistols.

Tangler, 25mm: A compressed gas gun about the size of a shotgun, with a folding stock. It fires a 25mm projectile at a very low velocity. It usually fires tangler (p. TODO) ammunition, but can also fire other 25mm warhead rounds or solid metal slugs.

Tangler Pistol, 25mm: A pistol-sized tangler that uses a less powerful compressed air charge.

Wrist Needler, 3mm: A needler designed to be strapped to the wrist and concealed up a sleeve. It incorporates a simple neural input sensor reading muscle signals. A trained shooter can fire it with no more effort than pointing a finger, but it's tricky to use without practice. Double penalties for lack of familiarity.

Ice Gun: These use compressed gas to fire needles of frozen liquid. The needles dissolve without a trace in the target's body. They are intended for survival or assassination. Each 20-shot magazine includes a self-contained refrigeration unit. Pour a cup of water into the magazine, activate the refrigeration unit, and in half an hour, 20 new ice needles will be ready to fire. A single C cell can freeze 100 magazines' worth of ice needles.

An ice gun may also deliver drugged rounds. A dose of any hypo-injected drug or poison can be pre-frozen into a sliver and fired, with the normal follow-up effect if it penetrates. Add the cost of 20 doses of that drug or poison.

Partisan Needler, 3mm: This spring-rifle weapon is designed for low-tech guerrilla fighters, or for use by people planning a long stay in cultures that can't produce sophisticated ammo. The solar-powered flywheel foundry in the stock makes its own ammunition. It can produce 140 needles in an hour using a $2 \times 3 \times 1$ -inch metal block (\$1), which can be made by any village blacksmith with access to ore. After that, it must recharge for 10 hours in the sun.

Option: Non-Metallic

All these weapons except the partisan needler may be made of non-metallic materials for +0.5 CF, allowing an unloaded weapon to bypass ordinary metal detectors.

Conventional Smallarm Table

GUNS (PISTOL) (DX-4, or most other Guns at -2)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Needler, 3mmN	1d+2 pi-	1	50/150	1/0.5	3	100(3)	7	-2	2	\$500	3
Paint Pistol, 15mm	1d-4 pi++	1	14/90	1/0.5	3	20+1(3i)	8	-2	2	\$100	4
Tangler Pistol, 25mmT	1d pi++	1	20/130	2/0.5	1	4+1(3i)	10	-3	2	\$300	4
Wrist Needler, 3mmN	1d-2 pi-	1	25/100	0.1/0.03	3	6(3)	3	-1	2	\$200	3
Ice Gun, 3mm ice	1d-1(0.2) pi-	1	50/150	1/0.2	3	20(3)	7	-2	2	\$600	2

GUNS (RIFLE) (DX-4, or most other Guns at -2)											
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC
Needle Rifle, 3mmN	2d pi-	4	75/300	5/0.5	3	100(3)	7†	-4	2	\$600	4
Paint Carbine, 15mm	1d-4 pi++	2	20/130	4/1	10	50+1(3i)	6†	-2	2	\$400	4
Tangler, 25mmT	1d pi++	2	30/190	5/1	3	8+1(3i)	7†	-4	2	\$600	4
Partisan Needler, 3mmN	2d pi-	4	75/300	12/0.7	3	140(3)	10†	-5	2	\$1,500	4

Air Gun Ammunition Table

Ammo	WPS	CPS	LC
3mmN	0.005	\$0.1	4
15mm	0.025	\$0.5	4
25mmT	0.12	\$2.4	4

Electromagnetic Guns

These weapons use magnetic fields to accelerate projectiles to very high velocities. This translates into high accuracy, range, and kinetic damage. They do not require chemical propellant, which makes storing ammunition safer (less risk of fire or explosion) and reduces the magazine weight and volume.

The electromagnetic pulse produced when an electromagnetic gun fires may be detectable, but it will usually be difficult to localize. The only noise is the crack of the projectile breaking the sound barrier. Ammunition velocity can also be varied, exactly as for a liquid-propellant slugthrower (p. 89). The primary disadvantage of electromagnetic guns is their high power consumption.

Electromagnetic guns may use Gauss guns or railgun technology. Gauss guns – also called coilguns or massdrivers – accelerate a conductive projectile down a series of coils via a quickly changing magnetic field, and can achieve very high rates of fire. Railguns use two conductive rails to generate a current flow that accelerates a sabotized projectile to high velocities. In game terms, both use the same rules, differing only in their combat statistics. Railguns usually do more damage and have superior range to equivalent-size Gauss guns, but tend to have slower rate of fire.

Pistols

Gauss Minineedler, 3mm: One of the smallest machine pistols available, this is an ultra-compact holdout version of the Gauss needler.

Gauss Needler, 3mm: A short-ranged but rapid-firing machine pistol.

Gauss Pistol, 4mm: A long-barreled hyper-velocity pistol with more kinetic energy than a 15mm magnum pistol, but only a fraction of the recoil.

Submachine Guns

Gauss Machine Pistol, 4mm: The Gauss machine pistol's compactness, high rate of fire, and stopping power make it popular with military officers, special forces, and terrorists.

Gauss Personal Defense Weapon (PDW), 4mm: A compact assault weapon that accelerates bullets to a velocity between that of the Gauss pistol and Gauss rifle.

Rifles

Sniper Railgun, 7mm: An early sniper railgun used by and against battlesuits and combat robots, or for shooting down aircraft. It fires a 7mm dart at 10,000 feet per second, with twice the power of a 15mm sniper rifle. It has a comparatively low recoil, and can be fired without a bipod.

Portable Railgun, 10mm: This long-barreled, semi-automatic Gauss rifle fires 10mm slugs at hypersonic velocities.

Used as a heavy sniper rifle, its advantage over conventional weapons is its larger ammunition capacity and lighter weight, especially when loaded.

Gauss Needle Rifle, 3mm: This weapon fires 3mm darts at very high rate of fire.

Gauss Rifle, 4mm: The standard infantry rifle for most militaries across the universe. It is an automatic weapon that accelerates a 4mm bullet to almost 5,000 feet per second.

Shotguns

Gauss Close Assault Weapon (CAW), 18.5mm: Essentially a Gauss auto-shotgun, this is a fearsome close-combat weapon firing a swarm of 12-gauge projectiles at 150% of the velocity of a conventional shotgun.

Gauss Shotgun Pistol, 18.5mm: Similar to the Gauss CAW (above), but in pistol format. This big-bore, snub-nosed semi-automatic is a favorite police sidearm, due to the many types of warheads it can fire.

Machine Guns

Gauss Minigun, 4mm: This weapon spits out high-velocity projectiles at up to 10,000 rounds per minute. It is used as a heavy machine gun and point-defense weapon. The cryogenic cooling jacket surrounding the barrel and the huge ammo cassette allow sustained automatic fire.

Gauss Heavy Machine Gun (HMG), 7mm: This tripod-mounted 7mm machine gun fires the same round as the Gauss sniper rifle from a 200-round ammo cassette.

Gauss Light Support Weapon (LSW), 4mm: A heavy-barrel version of the Gauss rifle, used as a machine gun or battlesuit sidearm. It can fire 3,000 rounds per minute.

Cannon, Grenade Launchers, and Mortars

Electromag Grenade Launcher (EMGL), 40mm: An EMGL is a stubby, shotgun-like Gauss gun, similar in shape to 20th-century grenade launchers.

Electromag Auto Grenade Launcher (Auto EMGL), 40mm: A bulky weapon firing the same round as the EMGL, but at higher velocities. It's used as a tripod-mounted infantry support weapon, or by powered troopers.

Electromag Mortar, 64mm: This heavy base-mounted tube is a standard semi-portable infantry artillery piece. It's also found mounted in vehicle turrets.

Railgun, 40mm: An electromagnetic cannon with a very long barrel, firing a projectile at hypersonic velocities. It's a suitable main gun for a tank or small warship.

Underbarrel Electromag GL, 25MM: This is a Gauss grenade launcher that can be attached under any weapon with Bulk -3 or more. It's also called a mini-GL. Use the Bulk, ST, and sighting bonuses of the weapon it is installed in.

Electromagnetic Gun Table

ARTILLERY (CANNON) (IQ-5)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Electromag Mortar, 64mm	6d×3 pi++	4	1,000/6,000	50/10	1	4(5)	12	-10	2	\$40,000	1	[4]
GUNS (PISTOL) (DX-4, or most other Guns at -2)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Gauss Minineedler, 3mm	1d(3) pi-	1	50/200	0.1/0.03	4	25(3)	3	-1	2	\$800	3	[1]
Gauss Pistol, 4mm	3d(3) pi-	3	500/2,100	2/0.5	3	40(3)	9	-2	2	\$1,700	3	[2]
GUNS (SMG) (DX-4, or most other Guns at -2)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Gauss Machine Pistol, 4mm	3d(3) pi-	3	500/2,100	3/0.5	20	40(3)	9	-2	2	\$2,600	2	[2]
Gauss Needler, 3mm	2d(3) pi-	2	100/300	1.5/0.5	12	100(3)	7†	-2	2	\$2,000	2	[2]
Gauss PDW, 4mm	4d(3) pi-	6+	700/2,900	4.6/1	16	80(3)	9†	-3	2	\$3,600	2	[3]
GUNS (RIFLE) (DX-4, or most other Guns at -2)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Sniper Railgun, 7mm	6d×2(3) pi	7-	2,400/10,000	20/1.4	1	30(3)	11	-6	2	\$18,000	2	[4]
Gauss Needle Rifle, 3mm	2d+1(3) pi-	4	500/2,000	6/1	20	100(3)	8†	-3	2	\$3,000	2	[3]
Gauss Rifle, 4mm	6d+2(3) pi-	7-	1,200/4,800	8.5/1.4	12	60(3)	10	-4	2	\$7,100	2	[3]
Portable Railgun, 10mm	5d×3(3) pi+	7	3,000/12,000	20/1.5	3	25(3)	10†	-6	3	\$18,000	1	[3]
GUNS (SHOTGUN) (DX-4, or most other Guns at -2)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Gauss CAW, 18.5mm	8d pi++	4	200/1,000	10/1.5	15	30(3)	10†	-4	3	\$2,400	2	[3]
Gauss Shotgun Pistol, 18.5mm	8d pi++	2	200/1,000	3/0.5	3	10(3)	10	-3	4	\$2,000	3	[3]
GUNS (GRENADE LAUNCHER) (DX-4, or most other Guns at -4)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
EMGL, 40mmG	4d pi++	3	150/1,000	10/3	1	3(5)	8†	-5	2	\$7,000	1	[3]
Underbarrel EMGL, 25mmG	4d pi++	4+2	360/2,200	2/1	1	3(3)	10	-	2	+\$1,000	1	[3]
GUNS (LMG) (DX-4, or most other Guns at -2)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Gauss LSW, 4mm	6d+2(3) pi-	7+2	1,200/4,800	20/7	20	300(5)	12B	-5	2	\$13,000	1	[3]
GUNNER (CANNON) (DX-4, or other Gunner at -4)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Auto EMGL	8d pi++	4	300/2,000	64/10	1	20(5)	14	-8	2	\$54,000	1	[4]
Railgun, 40mm	6d×25(3) pi++	8	8,000/29,000	4,000/150p	20	200(5)	57M-10	-	2	\$630,000	1	[5]
GUNNER (MACHINE GUN) (DX-4, or other Gunner at -4)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Gauss HMG, 7mm	16d(3) pi	8	3,000/12,000	64/20	20	200(5)	20†	-8	2	\$44,000	1	[4]
Gauss Minigun, 4mm	10d(3) pi-	8	1,800/7,200	64/20	100	1,000(5)	20M	-8	2	\$44,000	1	[4]

[1] Powered by a B cell.

[2] Powered by two B cells.

[3] Powered by a C cell.

[4] Powered by a D cell.

[5] External power.

The weapon's power cell provides enough energy for firing its specified number of Shots, and is included in the weight.

Electromagnetic Gun Ammunition Table

Ammo	WPS	CPS	LC
3mm	0.004	\$0.04	3
4mm	0.006	\$0.06	3
7mm	0.024	\$0.24	3
10mm	0.08	\$0.8	3
18.5mm	0.037	\$0.37	3
25mmG	0.09	\$0.9	3
40mmG	0.33	\$5	3
40mm	6	\$60	2
64mm	2	\$20	2

Gyros

Gyrostabilized rocket launchers fire spin-stabilized rockets the size of bullets. Ancient rocket pistols such as the Gyrojet were notably inaccurate and slow to accelerate. Modern developments in rocket fuels and micro-electromechanical systems stabilize even unguided rockets, and allow miniaturized homing systems at extra cost. (Not all "gyros" actually use gyrostabilization – some have smart skins that steer them in flight via tiny aerodynamic bumps or fins.)

Gyroc Launcher Table

Weapon	GUNS (Gyroc) (DX-4, or most other Guns at -4)											
	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
Gyroc Carbine, 15mm	6d pi++	2	1,900	4/1	3	10(3)	7†	-3	1	\$500	2	
Gyroc Launch Pistol, 15mm	6d pi++	1	1,900	2/0.7	3	6(3)	10	-2	1	\$300	3	
Gyroc LSW, 15mm	6d pi++	2	1,900	12/3	10	30(5)	10†	-4	1	\$1,400	1	
Gyroc Pistol, 15mm	6d pi++	1	1,900	1/0.4	3	4(3i)	9	-2	1	\$200	3	
Holdout Gyroc, 15mm	6d pi++	0	1,900	0.25/0.1	1	1(3i)	6	-1	1	\$50	3	
Underbarrel Gyroc, 15mm	6d pi++	2	1,900	1.5/0.7	3	6(3)	6†	-	1	\$150	2	[1]

[1] May be attached to any weapon of Bulk -3 to -6; use that weapon's Bulk.

Gyroc Ammunition Table

Ammo	WPS	CPS	LC
15mm gyroc	0.1	\$5	3

Since they are propelled by a rocket motor, gyrocs have a flat trajectory with a maximum range similar to the 1/2D range. Gyroc launchers are also light compared to conventional guns – almost half a typical gyroc weapon's weight is its ammunition. They're effectively recoilless, and quieter than ordinary guns. The hissing sound the rockets make is hard to localize: a Hearing roll is needed to spot the firer by sound alone.

Gyrocs have a few disadvantages. They're less accurate than conventional bullets. Also, like most rockets, they take some time to accelerate: divide their piercing damage by 3 at one or two yards and by 2 at three to 10 yards. This limits their utility as civilian or police weapons unless using specialized (e.g., explosive) ammunition. Gyroc ammo is also bulky and expensive, which limits the number of shots their magazines can be loaded with. Users often rely on homing ammunition (see *Gyroc Micromissiles*, below), substituting precision for volume of fire.

Gyroc Weapons

Gyrocs are available in several configurations. Typical gyroc weapons include:

Gyroc Carbine, 15mm: This is a popular infantry weapon, especially when loaded with armor-piercing explosive rockets (such as HEMP ammunition, p. TODO).

Rockets and Missiles

These are missile launchers larger than the gyroc weapons. The standard weapons are solid propellant rockets.

Infantry Missile Launcher (IML)

This is a single-shot launch tube with a pistol grip and an electronics system. It holds one mini-missile, but can be reloaded after each shot if extra missiles are carried. It is light enough (six pounds loaded) that every soldier could carry one.

The launcher fires a supersonic missile with a 64mm war-

Gyroc Launch Pistol, 15mm: A semi-automatic magazine-fed rocket pistol.

Gyroc Light Support Weapon, 15mm: An electrically powered machine gun-sized gyroc with a large ammunition cassette and full automatic fire capability. A B cell provides up to 15 minutes continuous fire.

Gyroc Pistol, 15mm: A simple and compact weapon – basically a four-shot revolver. Different rockets can be loaded in each chamber.

Holdout Gyroc, 15mm: Also called the "sleeve gyroc," this is a single-shot rocket launcher. It's often worn attached above the wrist.

Underbarrel Gyroc, 15mm: An alternative to a grenade launcher, this compact weapon is designed to be clamped onto (or built into) an assault rifle (any weapon with -3 or greater Bulk) for extra firepower. Use the Bulk, ST, and sighting bonuses of the weapon it is installed in.

Gyroc Micromissiles

Gyrocs are often equipped with homing projectiles (sometimes called "micromissiles" or "viper gyrocs") – see Homing Projectiles, p. TODO. Micromissiles are quite expensive, so troops may not be issued full magazines of them, receiving a few as "silver bullets" in addition to the regular gyroc ammo load.

head. It produces a dangerous backblast when fired, doing 2d burning damage to everyone within a cone up to two yards behind the launcher.

Each missile costs \$100 without a warhead; homing missiles (p. TODO) cost more. The usual warhead is a solid "kinetic kill" projectile inflicting the listed piercing damage. The warhead costs \$10; multiply this figure for the more expensive warheads listed under *Warheads and Ammunition* (p. TODO).

Missile Launcher Table

ARTILLERY (GUIDED MISSILE) (IQ-5, or other Artillery at -4)												
Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	
IML, 64mm	6d×5 pi++	3	750/6,000	4/2	1	1(5)	7†	-4	1	\$2,000	1	
MLAWS, 64mm	6d×5 pi++	3	750/6,000	35/12	1	6(5)	11B†	-8	1	\$23,000	1	
TML, 100	6d×25 pi++	3	1,500/15,000	35/25	1	1(20)	11B†	-8	1	\$10,000	1	

All statistics are for “baseline” high velocity rockets with solid warhead. Most weapons will fire homing projectiles (below) with a more specialized warhead.

Multiple Light Anti-Armor Weapon System (MLAWS), 64mm

The MLAWS is a six-tube launcher with a loaded weight of 35 pounds. It is quite hefty, but its lack of recoil allows an ordinary person to fire it. The MLAWS is used as a squad support weapon, although it's not uncommon to see them attached to post mounts on vehicles or hung under the pylons of attack aircraft. The MLAWS fires the same missile as an IML (see above), with the same options and backblast hazard.

Tactical Missile Launcher (TML), 100mm

This bulky launch tube holds a single pre-packaged missile. An unguided rocket costs \$400; missiles with guidance systems cost more. The basic warhead is a 100mm solid “kinetic kill” projectile that inflicts the listed piercing damage. This costs \$40; multiply this figure for the more expensive warheads listed under *Warheads and Ammunition* (p. TODO). It has a potentially lethal backblast when fired, doing 4d burning damage to everyone within a cone up to three yards behind the launcher.

Homing Projectiles

Modern projectile weapons may contain sensors and steering systems that enable the projectile to home in on a target by itself.

Gyroc, missile, and rocket launchers often fire homing projectiles. Guns may fire homing projectiles if the homing system can fit in the bullet or shell – this requires advanced technology for small caliber rounds and is not always available. Homing projectiles use the Homing Weapon rules (p. B413). The firer rolls against Artillery (Guided Missile) to aim. On a success, the missile gets its Acc bonus. The weapon’s “1/2D” range is its speed in yards/second. The missile’s skill and type of homing attack depends on the type of homing systems installed:

Infrared Homing (“Viper”)

These inexpensive systems are available for 10mm or larger projectiles.

They make a Homing (Infravision) attack. Projectiles 15mm or larger have a skill of 14, smaller projectiles have a skill of 13. +3 CF.

Multi-Spectral Homing

These sophisticated guidance systems are available for 25mm or larger.

They can be set for “passive” homing, making a Homing (Hyperspectral Vision) attack. They can be set for “anti-radiation” to track any radio or radar signals the target emits, making a Homing (Detect Radar and Radio) attack. Finally, they may be set for “active” homing, making a Homing (Imaging Radar) attack.

40mm or larger projectiles have a skill of 15, smaller projectiles have a skill of 14. +9 CF.

Brilliant Weapons

These are robotic missiles capable of autonomous flight and target selection. Unlike a normal homing weapon, which the user locks onto a target he can see or otherwise detect, a brilliant weapon is simply released to look for targets on its own. See *Robot Weapons* (p. TODO) for examples of various brilliant weapons.

Hand Grenades

Traditional hand grenades are convenient and deadly weapons in close combat – and a powered suit (p. TODO) or robotic body can throw them much further than humanly possible!

There are three standard grenade sizes:

Hand Grenade: This is the standard grenade, about the size of a baseball. It has the same effect as a 64mm warhead. \$40, 1 lb.

Mini Hand Grenade: An easy-to-conceal grenade the size of a golf ball. It has the effect of a 40mm warhead. \$10, 0.25 lbs.

Thimble Grenade: A tiny grenade one inch in diameter. It has the same effect as a 25mm warhead. \$2.5, 0.06 lbs.

The effect of a grenade and its LC depends on the grenade’s warhead. See *Warheads and Ammunition* (p. TODO). The cost given is the base cost for a high explosive fragmentation grenade. Other warhead types may have a multiple to cost.

Standard grenades have an activator handle and a two-second delay. To use the grenade, take one second to “pull the pin” and arm the grenade. The grenade will explode two seconds after the user releases the grenade (usually by throwing it).

Smart Grenades

These grenades incorporate a computer chip and micro-communicator (p. 23). A smart grenade can be controlled by any computer terminal, usually a wearable system. To activate them, the user must first press an arming switch on the grenade (this is manual, to prevent unauthorized remote activation). The grenade sends out a signal, and if the user is in range, a grenade arming display pops up on the user's interface. She can then select any menu option for the grenade.

The options are: a specified time delay (up to two weeks), command detonation (detonates by radio command; each grenade carried has its own frequency), impact fusing (goes off if struck, dropped, or thrown against a hard surface), or anti-tamper fusing (as per command or delay, but goes off if touched). The user can reprogram the grenade if she uses its unique code, or she can lock the grenade so that its commands cannot be changed.

It takes three Ready maneuvers to program a smart grenade. Smart grenades also have a conventional pin that can be pulled, turning the grenade into an ordinary grenade that will go off two seconds after the grip is released. Sometimes a regular fuse is enough, especially when there's no time to mess around with computer menus!

All hand grenades can be smart at no additional expense.

Smart grenades may have a message option – see *Message Bombs* (p. 72).

Saucer Grenades

These grenades come in a aerodynamic disk shape, and are sheathed in a flexible rubberized plastic. They are armed the same way as other grenades, and come in both ordinary and smart versions. Their effect is the same as a mini-grenade, but they're bulkier due to their shape; only one can fit in a large pocket.

Use Throwing skill to hurl them, but instead of using the throwing rules, treat them as a thrown weapon with the statistics shown below. The rubberized sheath allows them to be bounced around corners: roll at -3 to get the grenade to do this. If a saucer grenade misses and scatters (p. B414), and an obstacle blocks it before it travels the full scatter distance, the grenade will bounce back the remaining yards in the opposite direction.

Limpet Mines

Limpets are similar to hand grenades, but are not balanced for throwing. Instead, they can stick (or unstick) to almost any surface upon receiving the correct communicator pulse. They can also be used as handheld weapons (with any preset delay) by slapping them on a target, from a human to a starship.

Limpets may be worn on armor as defensive decoys: e.g., limpets filled with prismatic smoke can be set to trigger instantly if laser sensors detect a laser beam. To remove a limpet without the proper code, roll vs. ST-5, one try per second. Pulling one off of flesh does one point of damage. Otherwise, limpet mines have the same statistics as smart grenades.

Hand Grenade Table

Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Cost
Hand Grenade	64mm warhead	0	per ST	1	1	T(1)	6	-2	\$40
Mini Hand Grenade	40mm warhead	0	per ST	0.25	1	T(1)	5	-1	\$10
Thimble Grenade	25mm warhead	0	per ST	0.06	1	T(1)	4	-1	\$2.50
Saucer Grenade	40mm warhead	2	x3/x5	0.5	1	T(1)	5	-1	\$40

Chapter 22

Firearm Accessories

In combat, any edge can mean the difference between life and death – and technology is a great way to get that edge. This section presents devices and modifications to enhance almost any weapon.

Smartgun Electronics

Every modern firearm has a laser sight (p. 96), a HUD link (below), a recognition grip or transponder ring (p. TODO), a tiny computer (p. 12), and a diagnostic computer (p. 98) for free. These electronics are powered by an integral B cell, which is included in the basic weight of the gun.

Targeting Systems

These help the shooter find their target and hit it.

HUD Link

Connected to a heads-up display (p. 13), this shows augmented-reality targeting imagery in the user's field of view. The link shows him exactly where his firearm is pointing (+1 Acc within 300 yards, not cumulative with the Acc bonus for other targeting systems), the number of shots remaining, and – if using a laser sight or other active targeting device – the distance to the target. The user can exploit this to see around corners, exposing only his weapon.

Multispectral Laser Sight

This device projects a low-powered eye-safe laser beam, placing a laser spot at the point where the weapon will hit.

A laser sight gives a +1 to skill when used out to the weapon's 1/2D range, provided the dot is visible to the shooter. It can be set to use any one of these frequencies:

Visible Light: This projects a visible red, blue, or orange spot. The laser beam itself is only visible in dusty or smoky environments.

Infrared: An infrared laser beam projects a dot that is invisible without an infrared or hyperspectral vision system.

Ultraviolet: The dot of this ultraviolet laser beam is invisible without an ultraviolet or hyperspectral vision system.

Compact Targeting Scope (CTS)

This video sighting system provides hyperspectral vision. It has telescopic optics for normal viewing in daylight, and interfaces with the weapon's HUD sight. It provides a +2 bonus to aimed shots.

The scope can also be used as a passive sensor, providing Hyperspectral Vision with Restricted Vision (Tunnel Vision). It has 4× magnification. The user must aim the weapon at the target she is observing. \$1,000, 0.5 lb., A/100 hr. LC4.

Enhanced Targeting Scope (ETS)

A powerful video sighting system used by snipers or heavy weapon gunners. It provides hyperspectral imaging (p. 36), plus telescopic optics for normal viewing in daylight. It interfaces with the weapon's HUD sight.

The weapon's sight automatically measures wind conditions, air temperature, and local gravity conditions, adjusting the weapon's velocity to compensate.

The scope adds a +3 bonus to aimed shots. Used as a passive sensor, it provides Hyperspectral Vision with Restricted Vision (Tunnel Vision) with 8× magnification. The user must aim their weapon at the target they're observing. \$8,000, 2 lb., B/400 hr. LC4.

Tactical Programs

These programs augment the tactical or strategic acumen of combat personnel by automating error-prone tasks. They assist the user without replacing him.

Silhouette

This optical recognition program specializes in identifying targets of interest and providing background or technical data. The quantity and accuracy of supporting information depends on the databases used. High-quality commercial

databases offer expensive subscriptions and constantly updated content, but lack detail. Military databases are usually encrypted and contain very detailed information, including hyperspectral emission profiles, countermeasure tactics, and usage instructions. Military databases require Military Rank or Security Clearance. Complexity 5; double normal cost.

TacNet

A software tool (p. 13) useful for combat troops, TacNet helps a leader monitor a combat force by tracking and displaying their positions, firing arcs, blind spots, command relationships, and more. This gives a bonus to Tactics if all parties are in communication. Complexity 5 (+1 Tactics), LC3 or Complexity 6 (+2 Tactics), LC2. 10 times normal cost.

Targeting

This software tool augments the capabilities of a HUD link (above) by improving target acquisition speed, ballistic modeling, environmental compensation (adjusting for air pressure, wind, humidity, temperature, etc.), and prioritizing targets for threat assessment. The program gives a bonus to a single Gunner or Guns specialization if used with a HUD link. Complexity 3 (+1 skill) or Complexity 4 (+2 skill). Five times normal cost. LC2.

Target Tracking

Used in conjunction with a sensor system (see *Sensors and Scientific Equipment*, p. 35) such as a radar, radio direction finder, or hyperspectral optics, this tracks up to 10 distinct targets or emission sources at a time. It displays size, signal strength, bearing, vectors, and other appropriate information on a moving-map display. Complexity 2; five times normal cost. Add +1 to Complexity and double cost per tenfold increase in tracking ability. LC4.

Targeting with Active Sensors

The most accurate way to aim a weapon is to connect a targeting program (above) to a “tactical” active sensor (see *Sensors and Scientific Equipment*, p. 35) that has locked onto a target. This feeds real-time ranging data to the gunner and shows the gunner exactly how to move the weapon (or vehicle, if a fixed weapon) to hit the target.

This can only be used for a mounted weapon (i.e., one using Gunner skill). The combination of targeting program and active sensor gives the maximum possible targeting bonus. Replace all bonuses for scopes, computers, sensors, etc. with a bonus equal to the weapon’s base Acc, up to a maximum of +9. (Acc does still increase normally with Aim maneuvers.)

In order to gain this bonus, the target must be in range of the active sensor, and the program must be able to provide data directly to either the vehicle operator or whoever is operating the weapon’s mount.

Other Accessories

These accessories can be added to most weapons.

Accessory Rails

Fire arms often have accessory rails for attaching optional systems such as sights and grenade launchers. Up to four accessory rails per weapon are allowed (under barrel, over barrel, side of stock, top of stock) but this will vary with weapon size and configuration. \$100 and 0.2 lb. each.

Gyrostabilized Weapon Harness

This articulated weapon harness (below) cancels the penalty for a Move and Attack (see p. B365). It is \$1,000, plus \$200 and 1 lb. per pound of loaded weight. LC4.

Access Control

This electronic access system limits usage to authorized persons. The weapon will not fire for unauthorized users. Access control can be assigned to individual owners, but in military and paramilitary organizations it is common to set it so everyone in a unit can share the same weapons. Deactivating or reprogramming the safety system requires an Armoury (Small Arms) or Electronics Operation (Security) roll at -2 penalty. The first attempt takes 10 seconds; subsequent attempts require 10 minutes per try.

Transponder Ring: A ring worn by the user that contains a radio transmitter with a one-inch range. The transmitter sends a coded authorization message to the weapon, which will not fire unless the correct ring is worn. The ring may be permanently built into an armored suit glove, if desired. \$100. LC4.

Recognition Grip: A multi-function biometric scanner built into the grip. It can respond to palm prints or voice prints. It may also require both identifiers for maximum security. \$100. LC4.

Self-Destruct Anti Theft

A miniature biosensor in the weapon’s handgrip automatically scans the genetic pattern of the holder. If the pattern matches one of the authorized users in its memory, the weapon will fire. If not, the weapon will lock its firing circuits and begin a destruct sequence. It may or may not warn its holder!

To abort the destruct sequence, the unrecognized holder must give the weapon’s computer a verbal authorization code. If the correct code is not given in 10 seconds, the gun self-destructs, doing $6d \times 4$ explosion damage.

With the correct code (a single word and number combination) the weapon can be reprogrammed to accept the biopattern of the holder. Each code is unique to each weapon. Special codes are also possible, such as one to delete biopatterns, or one which causes the weapon to destroy itself immediately when fired. Any attempt to circumvent the anti-theft system requires proper tools and a roll against Electronics Operation (Security)-3. Each attempt

takes half an hour; failure activates the destruct sequence, while critical failure causes an immediate explosion. \$100. LC3.

Articulated Weapon Harness

This is used to steady very heavy weapons. It straps on and has a chest plate in front, with a supporting arm and three hydraulic joints positioned to allow universal motion and easy suspension. It has the same effect as a bipod (ST requirement of the weapon is reduced by 2/3 and the weapon counts as braced), but can be used while standing up or moving. The user must still operate the weapon normally, using his own hands to aim and fire it.

The harness must be built for a specific weapon, and is generally limited to weapons with Bulk -4 or more. It is \$50 and 0.5 lb. per pound of loaded weight for the weapon it is built for – e.g., a harness for a 20-lb. machine gun is \$1,000, 10 lb. LC4.

Diagnostic Computer

These smart integrated electronics give +1 to skill rolls to fix damage or malfunctions. Diagnostic computers are standard in all modern firearms at no extra cost. Bought separately, \$10, neg. weight. LC4.

D-Tag

This is a tiny receiver built into a weapon or other item. Upon receiving a coded signal on a specific radio frequency, it sends out a return signal. D-tags are often built into police equipment, and all major arms corporations (excluding ExoCaliber) include them standard in their products. A successful Electronics Operation (Security) roll is required to find it; a second roll (at -2) must be made to deactivate it without disabling the weapon or notifying the authorities. Bought separately it costs \$20, neg. weight. LC4.

IFF Interrogator

Friendly fire casualties are a constant problem on chaotic battlefields. An IFF interrogator identifies friends and foes before a soldier pulls the trigger on the wrong target.

This uses an eye-safe multispectral, invisible signal beam to transmit an identification number, communication response frequency, and an encrypted code at the target.

If the target is wearing an IFF system (p. TODO), then it can decipher the code and transmit a brief message in reply. The interrogator then identifies the target as friendly, unidentified, or known hostile. Feedback is displayed on the soldier's HUD sight or augmented reality display. Older models may instead use a blinking LEDs to indicate.

IFF systems have some disadvantages: over-reliance on technical identification, difficulty using the IFF interrogator in cluttered environments, and the potential for compromising the user's presence. The range of the IFF system is also limited: they have a range of 1,000 yards. Beyond this range, an Electronics Operation (Sensors) roll is required to

get a clear identification, with potentially disastrous results in the case of failure. \$100.

Power Holster

This is available for any pistol-type weapon or knife. It consists of three parts: a wrist sensor unit, a homing sensor on the handgrip of the weapon, and a break-away holster. When the wrist sensor detects nerve impulses that mean the wearer wants to draw, the holster ejects the weapon toward the hand. This lets the weapon be readied instantly. Each make of item requires a separate holster. A power holster adds +5 to Knife, Pistol, or Ammo specialization of Fast-Draw. \$1,000, B/100 uses. LC4.

Sniper Mirror

A laser gunner using a visible-light laser may set up a high-quality optical mirror for ambushes. The sniper can fire at the target's image in the mirror; the beam will reflect off and strike the target. The mirror can be remotely controlled with a communicator.

The range is equal to the range of the target to the mirror, plus the range from the mirror to the sniper. The sniper is at -4 to skill when performing this maneuver.

When strategically placed (usually requiring a Tactics or Traps roll), these mirrors allow a laser sniper to fire around corners, and may confuse the enemy about the direction from which fire is coming. The standard mirror is about two feet across when in use, but folds to the size of a paperback book. \$500, 1 lb. LC4.

Tripod

A tripod may be added to any mounted weapon (M notation next to ST), allowing it to be set up on the ground rather than on a vehicle.

Ignore a weapon's ST requirement when it is tripod-mounted. Removing the weapon from its tripod or reattaching it takes at least three Ready maneuvers.

A tripod provides a 180° arc of fire and allows the weapon to be elevated or depressed. The weapon requires two hands to use, and the user must usually sit or kneel behind the tripod. A typical tripod can mount a weapon that requires ST 25 or less, or any non-weapon sensor that weighs up to 125 pounds. \$1,250, 25 lb. LC4.

Powered Tripod Mount

A tripod can have an electric motor built into it. If the weapon has a sensor such as a radar or motion detector plugged into it (see *Plug-in Gadgets*, p. TODO), it can be remotely controlled via computer. If the computer has appropriate AI software, it can fire autonomously. A typical powered tripod can fire any weapon that requires ST 25 or less, or direct any non-weapon sensor up to 125 lb. \$5,000, 50 lb. D/100 hr. LC4.

Shoulder Servomount

This is a strap-on half-backpack with a gyrostabilized servo arm. It holds a single weapon over the user's shoulder. The weapon is aimed with a heads-up display, and can swivel to fire at any target in front of the user.

The device has the same effect as a gyrostabilized weapon harness (p. 97), with the addition that the user does not use her hands to control the weapon. This is equivalent to the Extra Arm (Weapon Mount) advantage.

A servomount weapon should be used with a HUD. If not, the user fires the weapon at -2 penalty, and may not take Aim maneuvers. An AI can also control a servomount, freeing up the user for other activities, such as firing a handheld gun.

It's possible to wear up to two shoulder servomounts, one over each shoulder. The gear is heavy, so shoulder servomounts are most often used by battlesuit troopers, or by nonhuman or disabled warriors who lack usable limbs.

A shoulder servomount is \$5,000 plus an extra \$1,000 and 3 lb. per pound of weapon loaded weight. Thus, a servomount for a seven-pound weapon is \$12,000 and 21 lb. LC3.

Smartgrip

A smart-matter pistol grip and trigger can be added to any firearm. It automatically adjusts to the user's strength and hand shape. This makes the weapon easier to fire, reducing the ST requirement by 1. \$500, LC4.

Chapter 23

Warheads and Ammunition

The default warhead for guns and missiles is an inert metal projectile, such as a jacketed lead slug. However, most modern weapons are designed to be able to fire more sophisticated (and deadly) rounds. The warheads described below are additional options.

For mines and hand grenades, there is no default warhead; each grenade or mine must be given one of the options described below.

Some types of warheads are only available for certain size classes – for example, swarm warheads must be at least 25mm.

Conventional

Conventional rounds are ordinary kinetic-energy, chemical, explosive warheads.

Armor-Piercing Hard Core (APHC)

These bullets or darts have a dense, armor-piercing core. Add a (2) divisor for most guns or missiles; this is not available for Gauss and railguns, which already use similar ammunition. If the gun caliber is below 20mm, damage type degrades: pi++ drops to pi+, pi+ to pi, and pi to pi-. There is no effect on pi-. Unavailable for hand grenades or mines. Double normal cost. LC2.

Armor-Piercing Discarding-Sabot (APDS)

A sub-caliber tungsten dart encased in a plastic sheath that falls away when the round leaves the barrel. APDS works like APHC (above), but has a higher velocity: add 50% to range and +1 damage per die. This option is unavailable for railguns (which already use sabot ammunition), hand grenade, or mines. Five times normal cost. LC1.

Armor-Piercing Enhanced Penetrator (APEP)

An APDS round with a core made of tungsten-reinforced bulk amorphous metal. This provides equivalent or superior performance to depleted uranium without toxic residue. Double range and give a (3) armor divisor for most guns and missiles; this is not available for Gauss and railguns,

which already use similar ammunition. Reduce the class of piercing damage by one step (to a minimum of pi-) unless the gun is 20mm caliber or larger. Unavailable for hand grenades or mines. Ten times normal cost. LC1.

Armor-Piercing Hardcore Explosive (APHEX)

A warhead with a high density penetrator and a small charge fused to explode after penetrating. APHEX inflicts normal piercing damage with a (2) armor divisor, along with the damage shown below as a follow-up attack:

APHEX Warhead Table

Warhead	Damage
10mm	1d-3 cr ex [1d-2]
15mm	1d-1 cr ex [1d-1]
18.5mm	1d cr ex [1d]
25mm	1d+1 cr ex [1d-1]
40mm	2d+2 cr ex [2d]
64mm	4d+4 cr ex [3d]
100mm	8d+8 cr ex [5d]

Damage in brackets is cutting fragmentation damage.

This warhead is only available for 10mm or larger rounds; it is unavailable for hand grenades or mines. The normal armor divisor of Gauss guns and electromagnetic guns is downgraded to (2) when using APHEX ammunition.

APHEX warheads have four times normal cost. LC1.

Biochemical Aerosol

This releases an airborne chemical agent (see *Gases and Clouds*, p. TODO). The cloud fills the indicated area, usually lasting for about five minutes if there's no wind. The effect depends on the agent.

Biochemical aerosol is available for any 10mm or larger round. A 10mm round will only affect a target if he's struck in the face; it carries too little gas to affect a significant area. Grenades and satchel charges inflict the damage shown below. Guns and launchers replace their normal piercing damage with the damage shown below. The table also shows the number of doses required to fill a typical warhead – for example, filling a hand grenade (64mm) will require 150 doses of chemical.

Biochemical Aerosol Table

Warhead	Damage	Doses
10mm	spec. (face)	1
15mm	spec. (1 yard)	3
18.5mm	spec. (1.5 yard)	5
25mm	spec. (2 yards)	10
40mm	spec. (4 yards)	40
64mm	spec. (7 yards)	150
100mm	spec. (10 yards)	300

They are normal cost *plus* the cost of filler times the number of doses. See *Gases and Clouds* (p. TODO) for the cost of various fillers, their effects, and their LC.

Biochemical Liquid

This is designed to release a ground-covering heavier-than-air liquid or foam. The effects are the same as biochemical aerosol, but with a different burst radius. Most liquids are persistent, remaining until cleaned up or evaporated.

Biochemical liquid is available for any 15mm or larger round.

Biochemical Liquid Table

Warhead	Damage	Doses
15mm	spec. (1 yard)	1
18.5mm	spec. (1.5 yard)	2
25mm	spec. (2 yards)	4
40mm	spec. (4 yards)	16
64mm	spec. (9 yards)	65
100mm	spec. (18 yards)	250

They are normal cost *plus* the cost of filler times the number of doses. See *Foams and Liquids* (p. TODO) for the cost of various fillers, their effects, and their LC.

Flare

These release a pillar of smoke and burn brightly, removing all combat penalties for darkness over their illumination radius. They may start fires if in contact with flammable material, and will do 1d burning damage to anyone directly struck. They work normally underwater.

When a flare is set off, anyone within 1% of the illumination radius who is looking in that direction must succeed at a HT roll or be blinded for seconds equal to the margin of failure; this is a vision-based affliction effect. Roll at HT-3 if the flare is set off in darkness.

Flares burn for five minutes. They are visible to the horizon if fired at ground level and for up to 20 miles if fired in the air (weather and intervening terrain permitting). Flares are usually equipped with a small parachute to allow them to stay in the air for the duration of the burn.

Flares are available for any 15mm or larger round. The radius shown under damage is the illumination radius.

Flare Table

Warhead	Damage
15mm	spec. (150 yards)
18.5mm	spec. (185 yards)
25mm	spec. (250 yards)
40mm	spec. (400 yards)
64mm	spec. (600 yards)
100mm	spec. (1,000 yards)

Flares are double normal cost. LC4.

High Explosive (HE)

A warhead with a large explosive charge and a fragmenting case. This is the basic warhead for fragmentation hand grenades, and is also commonly used by grenade launchers and light artillery. It is available for any 10mm or larger round.

Modern HE projectiles (except hand grenades) incorporate a programmable fuse that can be set for either impact or, if the target is at least 40 yards away, for proximity detonation – see below.

Grenades and satchel charges with HE warheads inflict the damage shown below. When set for impact detonation, guns and launchers with HE warheads inflict their normal piercing damage with a (0.5) armor divisor, plus a follow-up attack causing the damage shown below.

HE Warhead Table

Warhead	Damage
10mm	1d+1 cr ex [1d-2]
15mm	2d+2 cr ex [1d-1]
18.5mm	2d+4 cr ex [1d]
25mm	4d+4 cr ex [1d+1]
40mm	10d+1 cr ex [2d]
64mm	8d+8x2 cr ex [3d]
100mm	6d+6x5 [5d]

Damage in brackets is cutting fragmentation damage. HE warheads are normal cost. LC2.

Proximity Detonation

If the warhead is fused for proximity detonation, a sensor will detonate it when it is in the air, close to the intended target. Use the *Attack an Area* (p. B414) rules: roll to hit +4, and the square of the margin of failure is the distance missed by. Proximity-fuse airbursts can attack areas in space or the air as well as an area of ground.

A proximity detonation round inflicts only fragmentation damage, typically in a cone in the direction of the shot. If used for indirect fire, apply the rules for *Airbursts* (p. B415): the fragments rain down from above, bypassing any cover that is not overhead and negating attack penalties to hit crouching, kneeling, sitting, or prone targets. Most HE rounds use laser proximity fuses, which are immune to radio-frequency jamming.

High Explosive Concussion (HEC)

This has a light body to minimize fragmentation. It is available for any 10mm or larger round. Grenades and satchel charges with HEC warheads inflict the damage shown below. Guns and launchers with HEC warheads inflict their normal piercing damage with a (0.5) armor divisor (no armor divisor for electromagnetic guns), along with a linked attack causing the damage shown below:

HEC Warhead Table

Warhead	Damage
10mm	1d+1 cr ex
15mm	2d+2 cr ex
18.5mm	2d+4 cr ex
25mm	4d+4 cr ex
40mm	8d+8 cr ex
64mm	8d+8×2 cr ex
100mm	6d+6×5 cr ex

Concussion warheads are normal cost. LC2.

Hollow-Point (HP)

These bullets expand in flesh, causing bigger wounds. This improves damage type: pi- becomes pi, pi becomes pi+, and pi+ becomes pi++. However, HP ammo has trouble penetrating berriers or armor; add an armor divisor of (0.5). Unlike much older hollow-point ammo, modern hollow-points never have problems expanding. They're unavailable for grenades, mines, or weapons of 15mm+ caliber. Normal cost. LC4.

Shaped Charge

This is a precision shaped charge with secondary explosive and fragmentation effects. The explosion forges the warhead into a high-velocity, high-temperature metal jet which can punch a small hole through most types of armor.

These warheads are available for any 25mm or larger round. Grenades and satchel charges use the damage listed below. Guns and launcher replace their normal piercing damage with the damage shown below.

Shaped Charge Warhead Table

Warhead	Damage
25mm	5d+5×3(10) cr inc + linked 2d cr ex [1d+1]
40mm	6d+6×4(10) cr inc + linked 4d cr ex [2d]
64mm	6d+6×7(10) cr inc + linked 8d cr ex [3d]
100mm	6d+6×10(10) cr inc + linked 8d×2 cr ex [5d]

Damage in brackets is cutting fragmentation damage. Shaped charge warheads are double normal cost. LC1.

Memory Baton

These expanding memory-plastic slugs are available for all weapons of 15mm or larger caliber. Change damage to crushing, add a (0.25) armor divisor and double knockback

modifier, and reduce range to 1/5 range. They're unavailable for grenades or mines. Five times normal cost. LC4.

Monochain

This duplex-type round consists of two slugs with a foot-long strand of monowire slung between them. They spread apart after leaving the barrel, creating a high-speed flying garrote that slices anything in its path. Monochain has half the damage range of an ordinary solid round, but gets +1 to hit. If it hits a neck, face, skull, extremity, or limb (or anywhere on a foe who has SM -2 or less) it does cutting damage with a (10) armor divisor. Unavailable for mines or hand grenades. Five times normal cost. LC2.

Shotshell

Multiple-projectile rounds are available for grenade launchers, shotguns (including Gauss shotguns), and gyrocs. Divide the damage by 4, reduce the damage type from pi++ to pi, halve Range, add a ×9 multiplier to RoF, and reduce Rcl to 1. Normal cost. LC4.

Smart Explosively Forged Projectile (SEFOP)

This is a multi-purpose sensor-fused round capable of top attack. The round will detonate several feet away and usually above the target, forging the warhead into a high-density slug that attacks from overhead.

SEFOP warheads are only available for homing projectiles. If fired to overfly the target, they may choose to attack the side they are facing or the top. If the warhead attack from the top, it ignores penalties due to posture and cover that does not protect from above.

SEFOP warhead damage replaces the piercing damage of the weapon. They can, alternatively, be programmed before firing to function as APHEX warheads (p. 100). Decide which mode to use before the weapon is fired.

SEFOP Warhead Table

Warhead	Damage
15mm	4d+4(2) imp inc
18.5mm	5d+5(2) imp inc
25mm	5d+5×3(3) cr inc
40mm	6d+6×4(3) cr inc
64mm	6d+6×7(3) cr inc
100mm	6d+6×10(3)

SEFOP Warheads are five times normal cost. LC2.

Tangler

A tangler warhead releases a mass of sticky weblike polymers. Anyone struck is grappled and rooted in place. The victim cannot select the Move or Change Posture maneuvers or change facing, and is at -4 to DX. The ST of this effect depends on the warhead size; see the table below. Additional hits *layer* over a victim; each extra layer further increases ST.

To break free, the victim must win a Quick Contest of ST or Escape skill against the ST of the attack. Each attempt takes one second. If the victim fails to break free, they lose 1 FP but may try again. Alternatively, they may try to destroy the tanglestrands. Innate Attacks hit automatically; other attacks are at -4. External attacks take no penalty, but risk hitting the victim on a miss (see *Striking Into a Close Combat*, p. B392). The tanglesstrands have DR = ST/3 (round down). Each point of damage reduces ST by 1. At ST 0, it is destroyed and the victim is freed.

The 64mm and 100mm tangler warheads fill a one-yard radius: anyone standing next to the target struck will also be affected, as an area-effect attack. Hand grenades and mines use the warhead damage. Guns and launchers replace their piercing damage with the damage shown below.

Tangler Warhead Table

Warhead	Damage	+ST per layer
25mm	ST 15	+1
40mm	ST 24	+2
64mm	ST 36; 1-yard radius	+2
100mm	ST 60; 1-yard radius	+3

Tangler warheads are double normal cost. LC4.

Thermobaric

These volumetric-slurry warheads produce high temperatures and massive overpressures by releasing a flammable explosive mixture and then igniting the cloud. They are used in mortars, missiles, and grenades, and their devastating effectiveness is one reason for the popularity of sealed combat armor.

They are available for 25mm or larger warheads. Hand grenades and mines use the warhead damage. Guns and launchers with thermal warheads replace their normal piercing damage with the warhead damage shown below.

Thermobaric warheads rely on combining with air for much of the blast. Divide the damage by 4 in trace or vacuum conditions, and by 2 in very thin atmospheres.

Thermobaric Warhead Table

Warhead	Damage
25mm	8d+8 cr ex inc
40mm	8d+8×2 cr ex inc
64mm	6d+6×5 cr ex inc
100mm	6d+6×10 cr ex inc

Thermal warheads are five times normal cost. LC1.

Burrow Darts

These needles or bullets flex and change shape once they enter flesh, enlarging the wound channel and burrowing into the body. Burrow darts are only available for guns doing small piercing (pi-) or piercing (pi) damage (i.e., under 10mm). They have a (0.5) armor divisor, plus a special

cyclic follow-up attack: if even 1 point of injury was inflicted, the darts will burrow, inflicting 1 HP of injury each turn until the victim is dead, or seconds have passed equal to the caliber in mm. Digging a burrowing projectile out requires a sharp instrument and a First Aid roll (at -1 per second it has burrowed). Success or failure does 1 HP of injury; success also removes the projectile. If a victim tries to remove a burrowing projectile from his own body, the shock penalty from the damage applies. Triple normal cost. LC2.

High Explosive Multi-Purpose (HEMP)

This shaped-charge warhead can be miniaturized to fit into a bullet-sized projectile. HEMP is available for any 10mm or larger round. Guns and launchers replace their normal piercing damage with the damage shown below.

HEMP Warhead Table

Warhead	Damage
10mm	8d(5) imp inc + linked 1d-2 cr ex [1d-2]
15mm	5d×2(5) imp inc + linked 1d cr ex [1d-1]
18.5mm	6d×2(5) imp inc + linked 1d+1 cr ex [1d]
25mm	6d×3(10) cr inc + linked 2d cr ex [1d+1]
40mm	6d×5(10) cr inc + linked 4d cr ex [2d]
64mm	6d×8(10) cr inc + linked 8d cr ex [3d]
100mm	6d×12(10) cr inc + linked 8d×2 cr ex [5d]

HEMP warheads are double normal cost. LC1.

Stingray

A stingray round is a charged capacitor sheathed in an insulator which is burned off in flight. This warhead is only available for 10mm or larger rounds, and not for hand grenades or mines. A stingray round inflicts half normal piercing damage with a (0.25) armor divisor, then discharges a linked attack that inflicts the lethal electrical damage (p. B432) shown below.

Stingray Round Table

Warhead	Damage
10mm	1d-3 burn sur
15mm	1d-1 burn sur
18.5mm	1d burn sur
25mm	1d+1 burn sur
40mm	2d burn sur
64mm	3d burn sur
100mm	5d burn sur

Singray rounds five times normal cost. LC2.

Swarm

This a padded container designed to release swarmbots (p. TODO). They are available for 40mm or larger warheads. The number of one-square-yard swarms carried by the warhead is shown below.

Hand grenades and mines use the warhead effect. Guns and launcher replace their normal piercing damage with the warhead damage shown below

Swarm Warhead Table

Warhead	Damage
40mm	spec. (1-square-yard swarm)
64mm	spec. (4-square-yard swarm)
100mm	spec. (16-square-yard swarm)

They are five times normal cost plus the cost of the swarm. See *Swarmbots* (p. TODO) for the cost of various swarms, their effects, and their LC.

Nuclear and Antimatter

Mininuke

A mininuke uses a small laser diode, nuclear isomer, metallic hydrogen explosive, or microscopic pellet of antimatter to trigger a nuclear fusion; similar technology is also used to create the fuel pellets for nuclear pulse drive spacecraft. This results in a “clean” nuclear fusion explosion with limited radioactive fallout (although there is still radiation from the blast itself).

Nuclear weapons are rated for their yield in kilotons of TNT. They inflict crushing damage with the explosion damage modifier, plus additional linked burning damage with the explosions, radiation, and surge damage modifiers. About half the energy is in the blast wave, and the rest is in the heat and radiation pulse. (Mininukes produce more radiation and less concussion than larger bombs.)

A mininuke has a dial-a-yield setting that can be set from 0.01 kilotons to one kiloton of explosive force. This takes a Ready maneuver. The *minimum* size of the mininuke is 64mm.

Mininuke Warhead Table

Warhead	Damage
0.01 kiloton	6d×200 cr ex
<i>linked</i>	4d×200 burn ex* rad sur
0.1 kiloton	6d×600 cr ex
<i>linked</i>	6d×400 burn ex* rad sur
1 kiloton	6d×2,000 cr ex
<i>linked</i>	4d×2,000 burn ex* rad sur

* Divided by distance from the blast center, rather than by 3 × distance.

Cost is 1,000 times normal. LC0.

Micro-Antimatter Warheads

These warheads contain a small amount of antimatter in a shielded magnetic “bottle.” When the warhead is detonated, it reacts with ordinary matter and is annihilated, converting 100% of its own mass, and the same mass of ordinary matter, to energy. This inflicts burning damage with

the explosion and surge damage modifiers, plus linked toxic radiation damage.

Unlike mininukes, antimatter warheads are not dial-a-yield. They create an immediate explosion greater than conventional munitions but smaller than a nuke, with a high gamma radiation output but no significant nuclear fallout. The *minimum* size of microantimatter warheads is 100mm.

There are three typical sizes of antimatter warhead: 0.1 micrograms (μg), 1 microgram, and 10 micrograms:

Micro-Antimatter Warhead Table

Warhead	Damage
0.1 μg	6d×4 burn ex sur*
<i>linked</i>	6d×10,000 tox rad†
1 μg	6d×12 burn ex sur*
<i>linked</i>	6d×100,000 tox rad†
10 μg	6d×40 burn ex sur*
<i>linked</i>	6d×1,000,000 tox rad†

* Divided by distance from the blast center, rather than 3 × distance.

† Divided by square of the distance.

The cost is 10 times that of a normal round, plus the cost of the antimatter (p. 55). LC0.

Energy

Energy warheads contain a disposable power cell or explosive power cartridge and some form of energy emitter. Some energy warheads destroy themselves while emitting energy. Others activate for several seconds, and can be picked up or attacked.

EMP

This uses an explosive power cartridge to energize a non nuclear electromagnetic pulse. Anything electrical (or anyone with the Electrical disadvantage) in the radius of the special effect (below) must make a HT-8 (2) resistance roll or be knocked out of action for seconds equal to the margin of failure. Robots become unconscious, while total cyborgs suffer the Seizure incapacitating condition (p. 429), ignoring FP loss if they have the Machine meta-trait.

EMP warheads are available for any 15mm or larger round. Grenades and satchel charges inflict the damage shown below. Guns and launchers replace their normal piercing damage with the damage shown below.

Expendable Jammer

These neutralize all enemy radio equipment within a certain radius, swamping it with static. They are available for any 10mm or larger round.

When a jammer goes off, it gives a -10 penalty to all Electronics Operation (Comm) rolls made to operate radio and radar equipment in the radius of effect. The enemy will know immediately that a jammer is operating, but not where it is. Duration is 30 minutes.

Jammer Warhead Table

Warhead	Radius
10mm	10-yard radius
15mm	15-yard radius
18.5mm	20-yard radius
40mm	40-yard radius
64mm	60-yard radius
100mm	100-yard radius

Jammers include a digital timer that can trigger at any time desired. They are five times normal cost. LC3.

Strobe

Strobe warheads emit intense light, pulsating at frequencies that can induce seizures in many individuals. Anyone within the area of effect who is facing the strobe warhead when it goes off suffers a vision-based affliction attack. Failing the HT roll results in stunning and Blindness for seconds equal to the margin of failure. Failing by 5 or more (or *any* failure by someone with the Epilepsy disadvantage) results in an incapacitating seizure for minutes equal to the margin of failure. The effects dissipate with distance: add +1 to HT to resist for every yard away from the center of the effect.

The strobe option is available for any 25mm or larger warhead. Strobe grenades and satchel charges inflict the damage shown below, and guns and launchers replace their normal piercing damage with this damage.

Strobe Warhead Table

Warhead	Radius
10mm	10-yard radius
15mm	15-yard radius
18.5mm	20-yard radius
40mm	40-yard radius
64mm	60-yard radius
100mm	100-yard radius

Strobe warheads are four times normal cost. LC3.

Warbler

Warblers are sonic area denial warheads that produce an ear-splitting shriek. This hearing-based affliction area effect dissipates with distance: add +1 to resist for every yard from the center of the effect. A failed HT roll results in both Deafness and moderate pain (p. B428) for minutes equal to the margin of failure. A failure by 5 or more causes lingering hearing loss (recover as per a crippling injury).

The warbler continues to function for up to 10 seconds. Repeated resistance rolls will be required if someone fails to succumb but remains in the zone – most people without hearing protection *leave!* Anyone within the area of effect is also at -10 to any Hearing rolls; anyone within twice the radius is at -5, and anyone within five times the radius is at -2.

The warbler option is available for any 25mm or larger warhead. Hand grenades and mines use the warhead damage. Guns and launcher replace their normal piercing damage with the warhead damage shown below.

Warbler Warhead Table

Warhead	Damage
25mm	HT-3 aff (3-yard radius)
40mm	HT-4 aff (4-yard radius)
64mm	HT-6 aff (6-yard radius)
100mm	HT-10 aff (10-yard radius)

Warbler warheads are four times normal cost. LC3.

Force

These warheads emit an omni-directional gravity pulse. A force warhead inflicts crushing damage with the explosive and double knockback damage modifiers. Force warheads are often preferred for fighting in vehicles or buildings, since they are not incendiary and produce no fragmentation.

The force option is available for any 15mm or larger warhead. Grenades and satchel charges inflict the damage shown below. Guns and launchers inflict the damage shown instead of their normal piercing damage.

Force Warhead Table

Warhead	Damage
15mm	2d cr dkb ex
18.5mm	2d+2 cr dkb ex
25mm	4d cr dkb ex
40mm	8d cr dkb ex
64mm	8d×2 cr dkb ex
100mm	6d×5 cr dkb ex

They are five times normal cost. LC2.

Plasma

Plasma warheads are essentially one-hot power cartridge. When armed, the warhead's internal plasma generator compresses a pellet of hydrogen fuel, then releases it as a blast of ionized plasma. Guns that fire small-caliber plasma warheads are often confused with energy weapons.

Plasma is available for any 10mm or larger warhead. Plasma warheads inflict burning damage with the explosion and surge damage modifiers.

Hand grenades and mines use the warhead damage. Guns and launchers with plasma warheads replace their normal piercing damage with the warhead damage shown below.

Plasma Warhead Table

Plasma warheads are 10 times normal cost. LC1.

Warhead	Damage
10mm	1d+2 burn ex sur
15mm	3d burn ex sur
18.5mm	3d+2 burn ex sur
25mm	6d burn ex sur
40mm	6d×2 burn ex sur
64mm	6d×4 burn ex sur
100mm	6d×10 burn ex sur

Chapter 24

Biochemical and Nanotech

This section presents the gases and drugs most commonly used in combat, including lethal and nonlethal biochemical weapons, as well as chemical obscurants.

Gases and Clouds

These come in varieties, from sleep gas and nerve gas to smoke and prismatic smokes. They create a cloud with a radius depending on the dispersal mechanism (see below). Chemical clouds may disperse within a few seconds or linger for minutes, depending on the wind. Most chemical clouds last for 300 seconds before dispersing; in winds of one mile per hour or more, divide this duration by the wind speed in mph. Most chemicals have no effect once dispersed, but some virulent poison gases cause injury even when greatly diluted.

The usual dispersion methods are a biochemical warhead (p. 101), an aerosol spray (p. 84), or a vortex ring projector (p. 84).

Riot Gas

A non-lethal incapacitating gas often used for crowd control. Any living being within the cloud who breathes the gas must make a HT-4 roll to resist every second. If the roll fails, he is nauseated (p. B428) for as long as he remains in the cloud. If it fails by 5 or more, he will become violently ill, retching (p. B429) for as long as he remains in the cloud; after leaving it, he will be nauseated for minutes equal to his margin of failure. \$2 per dose. LC3.

Musk

This malodorous fluid boasts a chemical formula similar to skunk oil. Highly persistent and almost impossible to wash away, it is used by police to mark demonstrators or fleeing suspects, and can also be a self-defense weapon! Anyone sprayed suffers the Bad Smell disadvantage. The effects wear off after two weeks. Each hour of washing with detergents can reduce the duration of the stench by one day. A sealed suit protects the wearer but not the suit. \$2 per dose. LC4.

Nerve Gas, Lethal

Nerve gases are aerosolized liquids which disrupt the enzyme that transmits nerve signals. After exposure, the nerves become uncontrollable, resulting in a loss of motor function, breathing problems, pain, vomiting, convulsions, and death.

This is an area-effect contact agent with no delay and a HT-6 roll to resist (HT-3 if touching a contaminated area after the initial attack). Failure to resist inflicts 1d toxic damage. This is repeated at one-minute intervals until six cycles have passed.

Loss of 1/3 HP results in coughing and the Neurological Disorder (Mild) disadvantage. Loss of 1/2 HP results in being nauseated plus the Neurological Disorder (Severe) disadvantage. Loss of 2/3 HP adds the Neurological Disorder (Crippling) disadvantage. The victim suffers only one disorder due to the nerve gas, with the severity increasing as she loses HP. The severity of the disorder is decreased as the victim recovers HP, and the disorder is removed when the HP lost has recovered to less than 1/3 HP. \$10 per dose. LC0.

Sleep Gas

An advanced sedative, such as an engineered variant of the heroin molecule, mixed with a skin-penetrating agent. It causes rapid incapacitation. It is a contact agent that requires a HT-6 roll to resist. Failure results in unconsciousness lasting for minutes equal to the margin of failure, followed by ordinary sleep. \$0.50 per dose. LC2.

Smoke

Smoke is used to obscure or mark an area. Screening smoke is white, gray, or sand-colored and gives a -10 penalty for visually aimed attacks or sighting through them (see Obscure, p. B72); it also blocks radar. Smoke clouds take one second per five yards of burst radius to form. They linger for one to four minutes, depending on weather conditions.

Colored Smoke: Used to mark targets or landing zones, but also difficult to see through (-7 penalty). \$0.1 per dose.

Hot Smoke: Has the same effects as normal smoke. It also penalizes Infravision, Hyperspectral Vision, and Night Vision. \$0.15 per dose. LC4.

Prism Smoke: Has the same effects as hot smoke, but also blocks most lasers. It has no effect on X-ray or gamma-ray lasers. \$0.2 per dose. LC4.

Electromagnetic Smoke: Has the same effects as hot smoke, but is also effective against Radar and Imaging Radar. \$0.3 per dose. LC4.

Anti-Tangler Aerosol

This dissolves stick foam (tangler) bonds in one second. \$1 per dose. LC4.

Mask

This agent neutralizes a wide spectrum of signature traces left behind by living beings. Any Forensics roll to detect chemical traces left by an individual or to track people by scent suffers a penalty of -6 if the trail passes through a Masked area. The masking agent itself is easily identified and tacked, making it somewhat less helpful to spray yourself with it! \$30 per dose. LC2.

Paralysis Gas

This is an advanced nerve gas. It is a nonlethal area contact agent. For every turn spent in a para-gas cloud, the victim must make a HT-6 roll to resist. If they fail by 1 or 2, they fall down and cannot move that turn. If they fail by 3 or more, they fall and are paralyzed for minutes equal to the margin of failure. On a critical failure, the paralysis gas causes 1d damage and results in a coma (p. B429). \$10 per dose. LC2.

Pheromone Spray

Pheromone spray is a biochemical agent which enhances sexual attractiveness to members of the same species; aliens, Ravens, and uplifted animals are almost never affected. It is a respiratory agent that requires a HT-2 roll to resist. Failure results in the Lecherousness (CR 9) disadvantage for as long as the victim is in the cloud, plus minutes equal to the margin of failure. \$20 per dose. LC3.

Radiant Prism

A combination of prism and electromagnetic smoke. It lasts half as long, but also impairs infrared- and radar-aimed attacks or sighting (-5 penalty). If this smoke is breathed without a filter, it inflicts one point of damage per second. \$3 per dose. LC3.

Foams and Liquids

These agents may be dispensed by liquid projectors or in biochemical liquid warheads.

Firefoam

These fire retardant chemicals put out any fire dealing 2d damage or less within its area of effect, and temporarily reduces the damage of larger fires by 2d for 3d seconds. \$1 per dose.

Metal Embrittlement Agent (MEA)

This category of chemical agents induce rapid corrosion. Each agent is designed to weaken a specific metal, inflicting 3d corrosion damage per hour to any object mostly made of that alloy, or with exposed vital parts made of it. If an SM+2 or larger object is completely within the area of effect, multiply the damage by the object's SM. The effect continues for 12 hours or until the object is decontaminated. \$5 per dose. LC2.

Poisons

Poisons may also be delivered by a hypo or by drug rounds, or as a contact poison (below).

Nerve Poison

This is also available as a drug – a single dose injected into the body (by hypo, needler, etc.) requires a HT-7 roll to resist. Failure inflicts 1d toxic damage. This is repeated at one-minute intervals, until six cycles have passed.

Loss of 1/3 HP results in coughing and the Neurological Disorder (Mild) disadvantage. Loss of 1/2 HP results in being nauseated plus Neurological Disorder (Severe) disadvantage. Loss of 2/3 HP adds the Neurological Disorder (Crippling) disadvantage. The victim suffers only one disorder due to the nerve poison, with the severity increasing as he loses HP. The severity of the disorder is decreased as the victim recovers HP, and the disorder is removed when the HP lost is recovered to less than 1/3 HP. \$10 per dose. LC0.

Sleep Poison

A sleep dose for hypnos and dart guns is available. The victim must roll vs. HT-6.

Failure results in the subject becoming drowsy (p. B428), while failure by 5 or more results in unconsciousness, lasting for minutes equal to the margin of failure. \$0.50 per dose. LC2.

Contact Poisons

Contact versions of both nerve and sleep poisons may be placed on a blade (but not a vibroblade), smeared on a flat surface such as a doorknob, etc. As contact poisons, these are less effective. The HT roll not to succumb is at +2. Contact versions cost 10 times as much. If applying the poison in haste as a Ready maneuver (otherwise taking a minute per application), roll against DX or Poison skill to avoid accidentally dosing yourself. LC1.

Metabolic Nanoweapons

These nanomachines are designed to enter a living body and wreck havoc. They won't effect someone with immunity to metabolic hazards, such as a machine. Metabolic nanoweapons can be delivered the same way as any other poison:

Blood Agent: This is a liquid spray that must enter a mucous membrane (eyes, mouth, open wound, etc.) to have effect. Use the *Blood Agent* rules (p. B437). Double normal cost.

Contact Agent: A nanoweapon mist designed to penetrate skin. Double cost for a gel that may be smeared onto an object (takes 1 minute, but may applied quickly with a Ready maneuver with a successful roll against DX or Poisons skill; failure means you dose yourself), 10 times normal cost as a gas. Use *Contact Agent* rules (p. B437).

Digestive Agent: A pill that can be dissolved in food or drink. Use the *Digestive Agent* rules (p. B437). Normal cost.

Follow-Up Poison: The nanoweapon must be injected, often via a hypo or drug projectile. Use the *Follow-Up Poison* rules (p. B437). Normal cost.

Respiratory Agent: A mist of active nanoparticles that must be breathed to have effect. Use the *Respiratory Agent* rules (p. B437). Five times normal cost.

Nanoburn

A nanotech nerve agent using a suspension of nanomachines designed to invade the body and break down bodily

functions. Nanoburn is effective against all carbon-based life forms. A HT-6 roll is required to avoid being paralyzed for three minutes times the margin of failure. If paralyzed, the victim takes 1d-1 toxic damage every three minutes over the next 30 minutes. Normal nerve poison antidotes are ineffective, but the drug Torpine (p. TODO) stops the damage once taken. Aegis Nano (p. TODO) is also effective. \$5 per dose. LC1.

Nanotracers

These nanomachines function like a homing beacon (p. 105) except that they diffuse within the body. They are very difficult to remove without blood filtration (which requires a life support unit) or using Aegis or pharmophage nano (p. TODO).

It takes one minute for nanotracers to spread through the body before they can begin signaling. They may use a radio signal, or they may cause the body to exude coded chemical cues which can be tracked by appropriate chemsniffers or someone with Discriminatory Smell. These will persist for a day or more, giving a +5 bonus to any tracking rolls to anyone who knows what the cues are and can detect them.

Nanotracers are designed to hide. Aegis nano (p. TODO) get a roll against their skill to find them when they first enter the body, but roll at a penalty of -2.

Diagnostic nano can also find nanotracers: roll each hour of searching, at the penalties listed above. If diagnostic nano has identified them, Aegis nano can automatically destroy them. \$100 per dose.

Chapter 25

Melee and Thrown Weapons

Physical Weapons

These weapons inflict damage by cutting, crushing, or impaling their victim, or by delivering explosive devices.

Karatands

These memory plastic glove are flexible, but harden into an edge when the user strikes someone. They have the same effect as brass knuckles, but they're not as obvious. They can also be installed in flexible armor. \$100 each, net weight. LC3.

Limpet Mine Dispenser

A close-combat weapon designed to attach to a battlesuit or a robot's arm. It is a "sleeve dispenser" for sticky limpet mines to slap onto the target. The mines attach themselves with molecular suction pads, then detonate after a preset interval.

To plant one, use Brawling or X. A successful hit does no immediate damage; instead it sticks a limpet mine onto the target.

The dispenser may be programmed to set mines with a time delay from 0 (going off at the end of the attacker's turn) to 100 seconds. Removing a limpet requires a Ready action and a successful ST roll, minus one-tenth the DR of whatever the mine is stuck to or -20, whichever is less.

If the mine was stuck to flesh, it does 1 HP damage when pulled off. If a mine is slapped on a part that cannot be reached (for instance, the small of the back), it can't be removed without help.

Limpet mine dispenser magazines hold 10 limpet mines. Each mine has a 25mm warhead, and is identical to a shapecharge limpet mine grenade. Limpet mines can be also stuck to the floor, walls, etc. for use as booby traps, but may not be thrown.

Rocket Striker

A great axe, pick, scythe, spear, or warhammer may be fitted with a rocket striker, a small liquid-fuel engine that amplifies the force of the user's swing, thrust, or throw. A button the weapon's haft triggers the rocket engine; skilled

users activate it at the right moment. It has enough fuel for 12 boosted attacks.

The rocket striker must be activated before the to-hit roll. It adds +6 to Striking Strength. However, it also adds +3 to the weapon's ST requirement – it is easier to lose control of the weapon! This drawback does not apply to thrown spears. Add \$500 and 1 lb. LC3.

Superfine Blade

Superfine blades are advanced alloy, ceramic, or crystalline blades superior to steel. Any edged weapon that does cutting or impaling damage can have a superfine blade. It adds +2 to cutting and impaling damage and has a (2) armor divisor. Superfine blades are six times normal cost. LC4.

Monowire Blade

Monowire weapons owe their superior cutting ability to a strand of super-strong wire a few molecules thick, which is stretched along the edge of a reinforced sword or knife.

Monowire blades inflict +2 cutting damage and get a (10) armor divisor. Since the monowire is only along a blade's edge, it cannot cut into a flat surface. Any melee or thrown weapon that inflicts cutting damage can be made into a monowire version for 10 times the normal cost. This upgrade is incompatible with superfine or vibroblade weapons. For other rules, see p. B406. LC3

Monowire Whip

This is a weighted length of monomolecular wire attached to a short handle. It is a dangerous weapon, especially in the hands of an unskilled user (who may lose control of the weapon and injure himself with it). A control allows the wielder to vary length from one to seven yards, changing both reach and ready time. Adjusting the length requires a Ready maneuver.

When used to snare an opponent or weapon, the whip cuts into its target, inflicting $\text{thrust}+1d(10)$ cutting damage every turn it is pulled taut until the victim escapes. A "drop weapon" critical miss indicates the wielder hit themselves or a friend. LC2.

Monowire Switchblade

This weapon combines elements of both a monowire blade and whip. It consists of a weighted monomolecular memory wire attached to a powered knife hilt. As long as the hilt feeds an electrical current into the "smart" wire, the wire remains rigid like a sword. Toggle switches in the hilt allow the user to play out more wire to vary the blade from 0 inches (retracting into the hilt) to 15 feet, or to turn the current on or off. If the current is off, the wire becomes a flexible razor-sharp monowire whip. Changing length or switching the current on and off requires a Ready maneuver.

As a rigid weapon, the monowire switchblade's reach may vary from C to 5. It does swing +1d +R(10) cutting damage, where R is the current reach (treat C as 0). It cannot thrust. The switchblade requires Force Sword skill when rigid. It can parry normally. The user must have enough room to swing the weapon: reach 3 to 5 isn't possible without many yards of vertical or horizontal space. As a flexible weapon, the reach may vary from 1 to 5 yards, and it functions like a monowire whip (p. 110). If it runs out of power, the memory wire can no longer stay rigid, and the weapon functions only as a whip. B/10 hr. LC2.

Vibroblade

These blade weapons vibrate thousands of times per second. Any edged weapon that does cutting or impaling damage can be a vibroblade. Turning on the vibro effect takes a Ready action. A successful Fast-Draw roll activates it as the blade is drawn.

A vibroblade adds +1d to cutting damage and has a (3) armor divisor. This armor divisor increases to (5) if the blade is also superfine. If the vibro effect is turned off, it functions like an ordinary blade (with the normal benefits of superfine construction, if applicable).

The blade vibrates so rapidly that its movement is invisible, and it is impossible to tell a vibroweapon from a regular weapon of the same type. A Hearing roll made from one yard away will detect a faint hum that marks a vibroweapon for anyone familiar with it. Anyone parrying (or whose weapon is parried by) a vibroblade will recognize its nature as the blade cuts into their own.

Vibroblades are not compatible with monowire blades.

Vibroblades are powered by C cells; the cell powers them for 300/weapon weight seconds. Thus, a half-pound knife operates for 600 seconds. Vibroblades cost 10 times as much as regular weapons (30 times as much if it also superfine). LC3.

Energy Weapons

These include contact energy-discharge weapons, as well as weapons that generate a blade of energy.

Electric Stun Wands

Also called shock clubs or stun sticks, these batons use low-powered electric currents to disorganize nerve function – an effect called electromuscular disruption.

The victim gets a HT-5 roll to resist. Nonmetallic armor gives a bonus equal to its DR, for other armors the stun effect has a (0.5) armor divisor: add +2 to HT for every DR 1. On a failure, the victim's voluntary muscles convulse, and he is knocked down and paralyzed. He may roll vs. HT-5 each second to recover (armor provides no bonus to these rolls); however, the user may take a Concentrate maneuver to hold the baton in contact. This prevents recovery until it is removed, but drains a charge per second.

Stun wands are wielded using Shortsword skill. They use a B cell and strike 20 times before losing power. They may be purchased either as batons or jointed for the same cost. Jointed only does the stun effect, while batons do damage as a baton (swing or thrust cr). \$100, 1 lb. LC4.

Zap Glove

A zap glove looks like a heavy glove, but it contains electrical insulation (for the wearer) and a high-voltage generator. A person can attack with a zap glove by touching the victim. Boxing, Brawling, or Karate allow the zap and normal damage simultaneously; Judo, Wrestling, or a normal grapple apply the zap before any other effect. No attack roll is needed in social situations such as shaking hands.

A zap glove has two settings: "stun" and "kill." Changing settings takes a ready maneuver. On "stun," the effect is the same as an electric stun wand. On "kill," the zap glove does 2d burning damage and uses the rules for lethal electrical damage (p. B432).

A B cell in the lining of the glove provides sufficient power for 10 zaps (each zap on "kill" setting counts as two). The glove protects the hand with DR 5. It can also be built into existing armor or vacc suit gauntlets. This increases the armor's cost and weight by \$400 and one pound. LC3.

Neurolash

These contact neural disruptor weapons use neural induction technology to stimulate paralysis, pain, or orgasmic pleasure in the brain and nervous system.

Neurolashes deliver a HT-5 (2) affliction attack. Failure means the victim suffers a particular affliction for minutes equal to the margin of failure. The affliction suffered depends on the type of neurolash:

Agony: The victim suffers the Agony incapacitating condition* (p. B428). After recovery, she suffers Moderate Pain (p. B428) for an equal length of time.

Ecstasy: As above, but the victim suffers Ecstasy* followed by Euphoria (p. B428).

Neural Stun: The victim suffers the Unconsciousness incapacitating condition (p. B429).

Paralysis: The victim suffers the Paralysis incapacitating condition (p. B429).

Seizure: The victim suffers the Seizure incapacitating condition (p. B429).

*If struck by the Agony or Ecstasy attack, a failure by 5+ causes a Heart Attack mortal condition (p. B429).

A neurolash is usually integrated into a baton or whip, but may be added to any melee weapon. A neurolash generator is not compatible with force blade, sonic, vibro, or

monowire weapons. Add \$500, 0.5 lb., and a B cell (20 strikes). LC3.

Neuroglove

The neuroglove delivers a neural shock by touch. It functions like a neurolash, but the largest contact area of the glove makes it more effective: it delivers a HT-6 (2) affliction attack. It can be used to strike with, or to ambush unsuspecting victims by shaking hands with them. Gloves of all neurolash varieties are available.

A neuroglove resembles an ordinary winter glove, and has DR 2. Any damage to the hand that penetrates its DR has a 1-in-6 chance of wrecking it as a weapon. \$500, 0.5 lb., B cell (20 strikes). LC2.

Sonic Shuriken

This throwing weapon is designed for use by assassins and commandos. A sonic shuriken appears to be a one-inch plastic disk. When activated and thrown it emits a disk of coherent sound twice its own diameter. Due to its small power source, the sonic blades only last for a second, but this is enough time for it to hit its target.

For an extra \$50, a sonic shuriken may be fitted to spray a drug, poison, or virus along the disk (two doses are required). This is a follow-up attack – if the shuriken penetrates armor, it delivers its payload.

A sonic shuriken uses an A cell, which is completely drained after one use. It is reusable, if its power cell is replaced. LC2.

Chapter 26

Combat Robots

Warbots and Combat Androids

A warbot is a fighting machine designed to replace soldiers and supplemental combat vehicles.

A combat android is a humanoid machine that can use the same equipment and facilities as ordinary soldiers.

Combat Android

371 points

This is a humanoid combat machine, strong and heavily armored.

Attributes: ST+10 [100]; DX+3 [60]; HT+2 [20].

Secondary Characteristic Modifiers: None.

Advantages: Absolute Direction [5]; Detect (Radio, Lasers, and Radar; Signal Detection, +0%) [20]; Discriminatory Hearing [15]; Doesn't Breathe [20]; Hyperspectral Vision [25]; Machine [25]; Sealed [15]; Silence 1 [5]; Temperature Tolerance 20 (-85°F to 210°F) [20]; Ultrahearing [5]; Vacuum Support [5]. 60 points chosen from among Ambidexterity [5], Appearance [var.], Combat Reflexes [15], Enhanced Time Sense [45], High Pain Threshold [10].

Perk: Accessory (Microframe computer) [1].

Disadvantages: Electrical [-20]; Restricted Diet (Very Common, power cells) [-10].

Lenses

Select *one* of these model age lenses. Then choose a machine intelligence lens (p TODO) and biomorphic lens (p. TODO), and consider one of the optional lenses below.

Old Model (+145 points): Add DR 30 [150]; Maintenance (one person, weekly) [-5]. \$300,000, 150-300 lb., 2D/8 hr. LC2.

Modern Model (+231 points): Add DR 45 [225], Maintenance (one person, bi-weekly) [-3], Reduced Consumption 2 [4], and Telescopic Vision 1 [5]. \$200,000, 100-300 lb., 2D/24hr. LC2.

Optional Lenses

Combat Exoskeleton (-20 points): The robot resembles a metallic skeleton. Add Numb [-20], -0.1 CF.

Infiltrator (+40 points): The robot is covered with living flesh and appears human. Add 30 (outer layer)(Ablative, -80%)[30] and Mimicry [10]. +0.2 CF.

Chameleon (+21 points): Add Chameleon 3 (extended, Infravision, and Ultravision, +40%) [21]. +0.02 CF.

Nuclear-Powered (+20 points): Add Doesn't Eat or Drink [10]; remove Restricted Diet (Very common, power cells) [-10]. +0.1 CF.

Weapon Mount (+2 points): Add Extra Arm 1 (weapon Mount, -80%) [2]. +0.02 CF.

Warbot

290 points

The warbot is a nonhumanoid fighting machine the size of a subcompact car. It weighs half a ton (without weapons) and is available in submarine, walking tank, and aircraft versions. All models have a pair of manipulator arms.

Attribute Modifiers: ST+15 (Size, -30%)[105]; DX+2 [40].

Secondary Characteristic Modifiers: SM+3; HP+15 (Size, -30%) [21]; Per+5 [25].

Advantages: Extra Arms 3 (Weapon Mount, -80%) [6]; Hyperspectral Vision [25]; Lifting ST +15 (Size, -30%) [32] Machine [25]; Payload 5 [5]; Protected Senses (Hearing, Vision) [10]; Radiation Tolerance 5 [10]; Sealed [15].

Perk: Accessory (Microframe computer) [1].

Disadvantages: Electrical [-20]; Restricted Diet (Very Common, E cell) [-10].

Availability: \$200,000, 1,000 lbs. *plus* the cost of its brain. LC2.

Lenses

Select *one* of these model age lenses, plus a configuration lens. Then choose a machine intelligence lens (p. TODO).

Old Model (+115 points): Add DR 50 (Cannot wear armor, -40%) [150], Maintenance (3 person, weekly) [-15], and Numb [-20].

Modern Model (+229 points): Add DR 75 (Cannot wear armor, -40%) [225], Maintenance (one person, weekly) [-5], Reduced Consumption 2 [4], and Telescopic Vision 1 [5].

Configuration Lenses

Select one of these lenses.

Submarine (+62 points): Basic Move becomes Water Move; ground Move is 0. Add Absolute Direction [5], Aquatic [0], and Enhanced Move (Water) 1 [20], Pressure Suppot 1 [5], and Sonar (Increased Range 10×, +30%; LPI +10%; Targeting, +20%) [32].

Walking Tank (+87 points): An insectoid ground combat machine. Add Absolute Direction [5], Enhanced Move 1 (Ground) [20], Extra Legs (4 legs) [5], Radar (Increased Range 10×, +30%; LPI, +10%; Multi-Mode, +50%; Targeting, +20%) [42], Super Jump 1 [10], and Vacuum Support [5].

Vertol (+142 points): This robot can fly and hover using ducted fans. Basic Move becomes Air Move; ground Move is 0. Add 3D Spatial Sense [10], Aerial [0], Enhanced Move (Air) 3 [60], Flight (Small wings, -10%) [36], Noisy 3 [-6], and Radar (Increased Range 10×, +30%; LPI, +10%; Multi-Mode, +50%; Targeting, +20%) [42].

Vertol (Contragrav) (+140 points): The machine uses contragravity gwhel-generators for lift and thrust. Its Basic Move becomes Air Move; ground Move is 0. Add Aerial 0, [Enhanced Move (Air) 3 [60], Flight (Planetary, -5%) [38], and Radar (Increased Range 10×, +30%; LPI, +10%; Multi-Mode, +50%; Targeting, +20%) [42]. +0.5 CF.

Robot Weapons

Robotic missiles are designed to destroy the target in a self-destructive attack.

Genius Missile

The most advanced homing missiles are small, autonomous combat robots. They seek out and destroy their targets using programmed tactics such as loitering and stealthy low-altitude approaches. In game rules they're trained animals.

Instructing a genius missile requires an Artillery (Guided Missile) skill roll. Use the guidelines on p. B458 for what the missile can do. Missiles are very good at recognizing sensory profiles of particular targets, and can receive new target information and other updates through their communication links.

Genius missiles are also useful as reconnaissance machines.

Hunter Missile

An arm-sized missile powered by a turbojet engine. It can fly at up to 1,000 mph, but can't slow down below 1/4 its

speed. A hunter missile's payload may be any 64mm warhead. It can be fired from a 64mm missile launcher, such as the IML or MLAWS (p. 93). It flies for one minute and then will crash and self-destruct.

A hunter missile uses a low-probability intercept multi-mode radar (2,000-yard range) as its main sense. It can also detect laser, radar, and radio emissions and use that to find targets. It can receive command updates via radio, and use inertial guidance to fly to map coordinates.

The hunter missile's maximum straight-line range is 16 miles.

ST 3; DX 14; IQ 5; HT 12.

HP 6; Will 5; Per 12; Speed 6; Dodge 9; Move 0 (Ground).

SM-4; 5 lb.

Traits: Absolute Direction; Aerial; AI; Automaton; Blindness; Deafness; Detect (Lasers, Radio, and Radar, Signal Detection); Electrical; Enhanced Move 2 (Air speed 480); Flight (Cannot Hover; Limited Use, Fast Reload, 1 minute; Air Move 120); Injury Tolerance (No Head, No Neck); Mute; No Manipulators; No Sense of Taste/Smell; Noisy 4; Numb; Payload 3; Radar (LPI, Multi-Mode); Radio (Burst, Secure).

Cost: \$500. LC2.

Striker Missile

A larger, smarter, and faster version of the hunter missile. It has a maximum speed of 2,000 mph and a maximum range of 32 miles. Its radar has a 4,000-yard range, but it can turn that off and use Hyperspectral Vision instead. A striker missile's Payload may be any 100mm warhead. It can be fired from any 100mm missile launcher such as the Tactical Missile Launcher (p. 94).

ST 6; DX 14; IQ 6; HT 12.

HP 12; Will 5; Per 12; Speed 6; Dodge 9; Move 0 (Ground).

SM -2; 17 lb.

Traits: Same as Hunter Missile except delete Blindness, add Hyperspectral Vision, upgrade to Enhanced Move 3 (Air speed 480), and give Radar (Increased Range ×2).

Skills: Aerobatics-10, Observation-11.

Cost: \$3,400. LC1.

Floater Missile

Similar to the striker Missile, but its reactionless thrusters and contragravity, gwhel-generator technology enhance maneuverability and range (320 miles).

ST 3; DX 14; IQ 6; HT 12.

HP 6; Will 6; Per 13; Speed 8; Dodge 11; Move 0 (Ground).

SM -4; 5 lbs.

Traits: Absolute Direction; Aerial; AI; Automaton; Blindness; Deafness; Detect (Lasers, Radio, and Radar, Signal Detection); Electrical; Enhanced Move 2 (Air speed 480); Flight (Limited Use, Fast Reload, 10 minutes; Air Move

120); Injury Tolerance (No Head, No Neck); Mute; No Manipulators; No Sense of Taste/Smell; Noisy 4; Numb; Payload 3; Radar (LPI, Multi-Mode); Radio (Burst, Secure).

Skills: Aerobatics-12, Observation-11.

Cost: \$5,000. LC1.

Devourer Swarm

These swarmbots have small diamond jaws; a swarm can chew through almost any barrier or armor, given time. They inflict 1d(2) corrosion damage per second to anyone caught within the swarm. This is considered an area-effect attack, and only sealed DR will protect against it. \$8,000 per square yard. LC1.

Gremlin Swarm

This swarm is equipped with tiny drills and cutters. It is programmed to crawl inside electronic or mechanical devices, then jam up the works by slicing through wires, eating circuits, and so on. Only sealed machinery or electronics, or devices lacking mall moving parts, will be safe. The sabotage is not immediately obvious.

Each square yard of swarm does one point of damage per turn to unsealed machinery, ignoring armor DR. The machinery acquires a malfunction number (p. B407) or 17,

with an extra -1 each time it loses 10% of its HP. Check nonweapon devices for malfunction when they are turned on and each minute they are in use.

Damage caused by gremlins doesn't physically destroy an object, but is treated like other damage for repair purposes. \$2,000 per square yard. LC2.

Sentry

These microbots are equipped with weapons optimized for combating other microbots. Each hex inflicts 2d damage per turn on other microbot swarms. \$5,000 per square yard. LC3.

Stinger Swarm

These microbots have stinging needles with soporific venom. The swarm does one point of Fatigue damage per second to living beings (only) in contact with it unless they have Sealed protection. \$1,500 per square yard. LC2.

Terminator Swarm

These microbots have tiny jaws or poison needles. The swarm does one point of toxic damage per turn to living beings (only) in contact with it, unless they have Sealed protection. \$1,500/square yard. LC1.

Part VII

Defenses

Chapter 27

Body Armor and Protective Gear

Materials

Smart Bioplastic

This is a tough, flexible, pseudo-alive smart material. Every square inch of it contains electrically-active muscles, fibers, and nerve endings. A coded electrical impulse can command these muscles to move, allowing an item constructed of bioplas to change its shape.

Threat Protection

High DR doesn't provide much defense against chemical weapons, great heat, microbes, and so on. These dangers demand specialized protection that corresponds to particular advantages. Below are several common classes of "threat protection" used in descriptions of protective gear:

Climate Control: The equipment provides protection against climatic extremes equivalent to the Temperature Tolerance advantage. Climate control system remove waste heat as well as providing insulation and air conditioning. They extend the wearer's comfort zone to the range noted. If the suit is not sealed, treat as if it were merely air conditioned and insulated. If the wearer's own comfort zone is greater, the equipment may fail before its user does!

Air Supply: The equipment provides air for the wearer. The air supply times listed are an approximation and assume an external pressure of one atmosphere or less. For game purposes, assume that the standard applies to most adults, while children under 12 consume half as much. It takes 10 seconds to hook up a tank and two seconds to jettison it. Air refills are \$5 per hour, but most vehicles with life support systems incorporate air compressors that can top them up for free.

Glare-Resistant: The equipment screens out bright light. It is equivalent to Protected Vision (p. B78), and works against deleterious effects of "dazzle," "flash," and "strobe" weapons.

Hearing Protection: The equipment screens out noise, and is equivalent to Protected Hearing (p. B78).

Radiation PF: The equipment has a radiation Protection Factor. Divide radiation (when listed in rads) by the PF before applying its effects, as if the user had Radiation Tolerance (p. B79).

Pressurized: The equipment is resistant to pressures greater than one atmosphere. Pressurized comes in three levels, each equivalent to a level of Pressure Support (p. B77). This protects against crushing ocean depths and superdense atmospheres like thos of Venus and Jupiter.

Sealed: Impervious to penetration by liquids and gases. This corresponds to the Sealed advantage (p. B82). It prevents all harm from noncorrosive bioweapons, chemicals, and nano, as well as ordinary rust and waterlogging.

Vacuum Support: Protects the wearer or occupants from the deleterious effects associated with vacuum and decompression (other than lack of air). This corresponds with the Vacuum Support advantage (p. B96)

Body Armor

These unpowered suits and armored garments require no special skill to use.

All desired body armors are sold in any number of colors and patterns (including camouflage). It takes three seconds per piece to don or remove most body armor.

Body Armor Styles

Body armor comes in a variety of styles:

Bodysuit: This outfit covers the torso, groin, arms, and legs. The neck, head, or extremities are uncovered, making it easy to add customized boots, gloves, and helmets.

Gloves: A pair of armored gloves. They're made of thinner material than other armor types to avoid compromising the wearer's manual dexterity.

Jacket: This is a heavier outfit that covers the torso and arms. It zips up and has plenty of pockets.

Suit: This head-to-toe outfit includes a hood and face mask with eye slit. It is used as the basis for tailored armor (p. TODO).

Trousers: A pair of long pants, protecting the groin and legs (but not the feet). It is not obviously armor, and can pass for a normal pair of work pants or jeans.

Vest: A sleeveless t-shirt covering the torso.

All concealable armor styles can pass as normal clothing, although bodysuits and complete suits are likely to be conspicuous.

Additional styles can be created using the tailored armor (p. TODO) rules.

Ballistic Armor

This armor uses flexible materials to resist high velocity projectile attacks as well as cutting blows. It is the modern successor to ancient bulletproof vests.

Ballistic armor is flexible with a split DR: it provides full protection against piercing and cutting attacks, and uses its

reduced DR against all other types of damage.

Advances in material technology has led to improvements in ballistic armor. Modern ballistic armor is generally *nanoweave*. This armor is a fabric woven from para-aramid fibers, polyethylene, or synthetics inspired by the molecular structure of spider silk. This fabric is then reinforced by woven carbon nanotubes. It can be fitted with various accessories, using “smart” properties that can be engineered into it.

Ballistic Armor Table

Armor	Location	DR	Cost	Weight	LC	Notes
Nanoweave Bodysuit	body, limbs	18/6*	\$900	6	3	
Nanoweave Gloves	hands	9/3*	\$30	neg.	4	
Nanoweave Jacket	arms, torso	18/6*	\$450	3	3	
Nanoweave Suit	all	18/6*	\$1,200	8	3	
Nanoweave Trousers	groin, legs	18/6*	\$280	2.8	3	
Nanoweave Vest	torso	18/6*	\$300	2	3	

* Flexible.

Tactical Vest

This thick, sleeveless, jacket-like vest covers the torso and groin, with front and back pockets for inserting rigid ceramic or alloy plates.

A tactical vest is made of similar materials to concealable

body armor, but is heavier, and is obviously body armor. It provides full protection against cutting and piercing damage, and reduced protection against all other attacks. Its trauma plates provide full protection against all damage types. It takes three seconds to insert or remove the plates.

Tactical Vest Table

Armor	Location	DR	Cost	Weight	LC	Notes
Nanoweave Tactical Vest <i>trauma plates</i>	torso, groin torso	24/10* +46	\$900 +\$600	9 +9	2 2	

* Flexible.

Assault Boots

These armored boots add metal or ceramic inserts to the sole of a ballistic fiber. They provide their full DR against attacks to the underside of the foot (e.g., stepping on a stake, a contact-detonation mine, etc.) but half DR against

attacks from other angles.

Hiking: Modern combat boots incorporate smart-matter responsive fabrics and biomaterials that treat or prevent blistering from long marches. They count as the best quality equipment and add +5 to Hiking skill.

Assault Boots Table

Armor	Location	DR	Cost	Weight	LC	Notes
Assault Boots	feet	18/9	\$150	3	4	

Laser-Resistant Body Armor

These forms of armor are optimized to counter laser weaponry.

Ablative Nanoplas

This is similar to nanoweave armor, but made of plastic fabric (strengthen with tailored carbon nanotubes) designed to vaporize when struck by a laser beam. Since the armor is damaged by the attack, ablative armor is more useful

against single assassin than it is a lengthy combat mission!

Ablative armor has a split DR. Its full DR is used against the burning or crushing explosive damage inflicted by any type of laser. This DR is also semi ablative: For every 10 points of basic laser damage rolled, remove one point of DR from the locations struck, regardless of whether the attack penetrated or not.

Its lower DR is used against all other attacks, and is not ablative.

Reflec

Reflec is a light, highly-reflective armor of polished metallic fibers that reflects laser fire. It is useless against other attacks, but can be worn over other armor. Reflec has a split DR: It gets its full DR against microwaves and lasers (but not X-ray or gamma ray lasers), but provides no protection against other weapons.

Reflec is an excellent radar reflector: any stealth benefits against radar are negated, and add +1 (+2 if wearing a full suit) to rolls to detect its wearer.

Any rigid helmet can be made reflective for \$50. It gains +20 DR vs. lasers and microwaves.

Laser-Resistant Armor Table

Armor	Location	DR	Cost	Weight	LC	Notes
Reflec Helmet	head	20/0*	\$25	0.5	4	
Reflec Jacket	torso, arms	20/0*	\$150	1	4	
Reflec Suit	all	20/0*	\$300	2	4	
Ablative Nanoplas Jacket	arms, torso	36/6*	\$450	3	3	
Ablative Nanoplas Suit	all	36/6*	\$1,200	8	3	
Ablative Nanoplas Trousers	groin, legs	36/6*	\$280	2.8	3	

* Flexible

Bioplas Armor

Bioplas is a strong, pseudo-alive smart matter material that is light and comfortable to wear – see *Smart Bioplastic* (p. 117). Flexible armored suits and clothing are made out of this material. Like other bioplastic equipment, it can heal rips and tears if it has access to moisture and heat, such as sweat and body heat. Bioplas is also a popular material for swimwear and other sports clothing.

Bioplas is flexible armor with a split DR. Unlike ballistic body armor, bioplas provides its full DR against burning and piercing damage, but gets only one-third DR vs. other damage types. Thus, it's very effective against a bullet or most energy beams, but not that much use against a powerful blow or vat of acid.

See *Space Biosuit* (p. 123) for a sealed environmental suit version.

Bioplas Armor Table

Armor	Location	DR	Cost	Weight	LC	Notes
Bioplas Bodysuit	body, limbs	15/5*	\$1,800	3	3	
Bioplas Gloves	hands	15/5*	\$60	neg.	4	
Bioplas Suit	all	15/5*	\$2,400	4	3	

* Flexible

Transparent Bioplas

This is an option for any bioplas outfit and the space biosuit (p. 123). It does not protect against laser fire, but is otherwise the same as any other bioplas vest or suit. The suit adjusts around the user's body, and is almost invisible when worn. (A Vision roll from a yard or less will spot it, and anyone touching the wearer will notice it.) Transparent bioplas comes in translucent colors. Transparent bioplas costs twice as much as ordinary bioplas, but is otherwise identical.

Tailoring Armor

For a combination of fashion and safety, individuals may wear flexible armor in styles other than those described on the armor tables. Specialty shops, such as those provided by Urban Ephemera, design tailored armor to order using computerized manufacturing systems.

Armor Type

Select ballistic (p. 118), reflec (p. 119), ablative (p. 118), or bioplas body armor. Recrod the statistics of the

suit version of that armor type. Its DR, cost, weight, and LC will be used as the basis of the rest of the outfit.

Coverage

Choose the locations that are covered by that outfit. Each location has its own multiplier; add the multipliers for all locations covered. This will give the “coverage multiplier” of the entire outfit. The numbers add up to 1 (all locations covered). This multiplier is applied to the armor’s weight and cost.

Coverage Table

Multiplier	Location
0.05	skull
0.05	face and eyes
0.025	neck
0.125	both arms
0.05	both hands
0.25	torso
0.10	groin
0.25	both legs
0.10	both feet

Outfits may be designed that only protect a location (other than eyes or face) from the front (such as a low-cut dress) or the back (such as a cape). Halve the multiplier.

Outfits can be designed to protect only part of a location. For example, a miniskirt protects just part of the legs; a bikini bottom provides skimpy coverage to the groin. Halve the coverage multiplier for *halve-coverage*; multiply by 0.25 for *skimpy* coverage (about 25% of the area). If a partly-covered location is struck, make an activation roll (see p. B116) using 3d to see if the protected area was struck. This is an 11 or less for armor with half-coverage, or 8 or less for skimpy coverage. Any armor on the upper torso *always* protects the vitals, and any armor on the face always protects the eyes.

Style

Now that the coverage has been selected, decide whether the clothing is heavy, normal, light, diaphanous. This will multiply DR, cost, and weight, and may affect LC.

Heavy: Trench coats, winter clothing, etc. If it is supposed to be anything else, it’s easily recognized as a protec-

tive outfit. Multiply weight, cost, and DR by 1.5. Reduce LC by 1.

Normal: The outfit can pass as typical civilian attire, such as shirts, jackets, skirts, and trousers. Use the base values.

Light: This is typical of T-shirts, evening wear, summer wear, and many undergarments. It can be easily worn *under* clothing. Multiply weight, cost, and DR by 2/3. Increase LC by 1.

Diaphanous: This is typical of wispy lingerie or swimsuits. It doesn’t look like armor at all, and can be worn under other outfits. Multiply weight, cost, and DR by 1/2. Increase LC by 1.

Cut

Finally, decide whether the outfit is of average cut (no extra cost), stylish (four times cost), or a fashion original (20 times cost). These multipliers are cumulative with all others, including accessories that were added to the outfit, except power supply costs.

Accessories

Any appropriate accessories or clothing options (e.g. buzz fabric) may be added at the usual cost.

Rigid Body Armor

These are non flexible pieces of non sealed armor used to protect particular body parts.

Headgear

This armor protects the head or eyes. It is made of rigid armor plastic or composites.

Armored Shades

Sunglasses with armored lenses. They are glare-resistant and can be built into any video glasses (p. 35).

Light Infantry Helmet

These helmets resemble those used by 20th-century soldiers. They have no built-in electronics, and are often worn with armored shades (above) or an optional visor attachment. The visor is glare-resistant, and is often fitted with a HUD (p. 13), although this is not standard.

Rigid Body Armor Table

Armor	Location	DR	Cost	Weight	LC	Notes
Armored Shades	eyes	15	\$100	+0.1	4	
Light Infantry Helmet	skull	24	\$250	3	3	
+ Visor	eyes, face	20	+\$100	+3	3	

Clamshell Armor

This hinged cuirass consists of sloped, molded composite laminate reinforced by an inner layer of flexible armor. It is favored by soldiers who don't want to carry around the weight of a full suit of armor, but do want plenty of

protection where it counts.

As a laminate armor, clamshell armor is especially effective in protecting against shaped explosions and plasma guns. Reduce the armor divisor of such weapons by 1; (10) becomes (5), (5) becomes (2), and (2) becomes none.

Clamshell Armor Table

Armor	Location	DR	Cost	Weight	LC	Notes
Heavy Clamshell	torso	60	\$900	18	2	
Light Clamshell	torso	45	\$600	12	2	

Environmental Gear and Suits

These masks and suits are designed to protect the user from the environment as well as from injury. Environmental suit styles vary widely; civilian workers' styles are loud, garish colors for easy recognition, Urban Ephemera offers stylish streetwear cuts, and combat outfits generally come camouflaged.

Air Masks and Breathing Gear

These are used when full-equipped suit is unavailable or inappropriate. Each mask covers the entire face, providing the Protect Vision and Protect Smell advantages.

All masks take three seconds to put on, one second to remove. In all instances, a warning light blinks when power (or air, or filtration) capacity is 90% gone. All systems contain microcommunicators (p. 23) for presenting remaining capacity on a HUD.

Air Mask

This mask is used in environments with an unbreathable but otherwise harmless atmosphere. It requires air tanks (below) or a filter (below).

Air Tanks

Lightweight tanks that store pressurized air mixtures for breathing. All durations assume the use of rebreather systems that recycle and reuse air.

Large Tank: Holds 36 hours. \$200, 10 lb.

Medium Tank: Holds 18 hour. \$80, 4 lb. LC4.

Mini Tank: Holds 15 minutes. \$50, 0.5 lb. LC4.

Small Tank: Holds six hours. \$60, 2 lb. LC4.

Artificial Gill

An artificial gill extracts oxygen from water and mixes it with buffer gases, allowing the user to breathe normally while submerged in any body of water that contains dissolved air. This includes most terrestrial sease, but not polar waters and some freshwater bodies. The gill is backpack-mounted, and includes a mask, an intake system, and a device for separating dissolved air from the water. It runs on a D cell; endurance is 24 hours.

Filter Mask

This mask can filter out ordinary contaminants such as dust, pollen, smoke, and even tear gas. It is only effective against nerve gas or other contact agents if combined with a Sealed outfit. The filter medium must be replaced periodically; cost varies from a \$10 cartridge (to filter heavy dust or pollen) to replacing the whole mask (in a chemical-warfare environment).

Respirator

This makes thin or low-oxygen atmospheres breathable by concentrating the oxygen. It includes goggles to protect the eyes from the effects of thin air. It runs on a B cell for three days.

Reducing Respirator

This mask makes dense or very dense oxygen atmospheres breathable by chemically reducing the partial pressure of oxygen. It includes glare-resistant goggles to protect the eyes from the burning effects of too much oxygen. It requires power and a monthly chemical recharge (\$50, 1 lb.). It runs on a C cell for three days.

Environmental Gear Table

Type	Location	DR	Cost	Weight	LC
Air Mask	eyes, face	10	\$100	1	4
Artificial Gill	eyes, face	10	\$2,000	25	4
Filter Mask	eyes, face	10	\$100	3	4
Respirator	eyes, face	10	\$300	3	4
Reducing Respirator	eyes, face	10	\$500	5	4

Civilian Survival Suits

These are flexible, multi-environmental, and fully-insulated survival suits, including gloves and a hood with clear visor. The suits are light and comfortable. With the hood sealed and the addition of an air mask or respirator, they protect against atmospheric pollutants or chemical or biological contamination; use NBC Suit skill, but there is no DX penalty.

These suits are popular with natives of hostile regions, survey teams, and rangers; while not armor, their compound-fiber fabric is resistant damage. The suits are generally legal, but people may frown upon individuals wandering about with the mask sealed. The suits don't protect the face when the mask is rolled up.

Survival suits are often equipped with programmable camouflage (p. 62) for safari or tactical purposes.

Desert Environmental Suit

This full-body survival suit insulates the wearer from the extremes of desert heat and cold. It provides climate control (-20°F and 120°F). It also recycles 90% of the wearer's body fluids, collecting pure water in a reservoir from which the wearer may drink; the user can survive on one-tenth as much water as normal. The water recycling system also acts as part of the suit's cooling system. If the suit is out of power, it can't recycle.

Drysuit

A one-piece, light underwater survival suit that is sealed and insulated. It is useful for diving in cold or toxic water. It covers the user's entire body except the face. With a gill mask, the suit is sealed and provides climate control (-50°F to 90°F).

Civilian Survival Suits Table

Type	Location	DR	Cost	Weight	Power	LC
Desert Environment Suit	all	2*	\$1,000	10	C/1 wk.	4
Drysuit	all	2*	\$200	5	—	4
Heatsuit	all	2*	\$500	10	C/24 hr.	4
Protective Suit	all	2*	\$50	3	—	4
Expedition Suit	all	5*	\$1,500	6	2C/1 wk.	4
Gill Suit	all	5*	\$2,000	10	D/24 hr.	4

* Flexible

Flexible Combat Suits

These are sealed suits made of flexible armored fabric. All come with pockets, attachment points, and harnesses for weapons or gadgets.

Nanoweave TacSuits

These tactical suits are chemically-coated, contamination-proof coveralls made of flexible nanoweave ballistic fab-

Heatsuit

A heated suit for survival in freezing conditions, including a mask to protect the face. It provides climate control (-250°F to 100°F). With a respirator (above), it's useful at very high altitudes or on some alien worlds. If the heatsuit runs out of power, it still provides some benefits due to its insulation: climate control is -50°F to 90°F.

Protective Suit

A simple sealed suit, with a fireproof and chemical-retardant coating but no other features. Cargo handlers, hazmat teams, hangar-bay crews, and some industrial workers often wear them, usually in white or a bright color such as orange or yellow. A rip in the suit causes the smart fabric to change color at the rip. It is sealed with the addition of an air mask (p. 121).

Expedition Suit

This suit uses nanocatalytic filtration systems and transistor thermocouples woven into the fabric for heating, cooling, and recycling liquid waste. It recycles 95% of the user's body fluids and provides climate control (-120°F to 120°F). It prevents heat exhaustion with micropores which enable it to "breathe." These pores can also seal shut in hostile environments. Worn with an air mask (p. 121), it is sealed. If the suit runs out of power, it provides climate control (-50°F to 90°F) and cannot recycle.

Gill Suit

This full-body suit is identical to the drysuit (p. 122) in all respects, except that its surface absorbs oxygen from water. This allows the user to breathe underwater as long as the power supply lasts. It includes a belt-mounted power pack.

ric. The suit has a split DR: it provides full DR against cutting and piercing damage, and half DR against other damage types. NBC Suit skill is used to get in or out of the suit quickly or gauge its state of repair, but a tactical suit does not limit DX. In fact, the suit is very comfortable to wear, thanks to its internal microclimate control system.

TacSuits incorporate biomedical sensors (p. TODO). With an air mask (p. 121) or combat infantry helmet (p. TODO), the suit is sealed and provides climate control (-40°F to 120°F).

Tacsuit Table

Type	Location	DR	Cost	Weight	Power	LC
Nanoweave	all	30/15*	\$3,000	15	C/18 hr.	2

* Flexible. See above for the split DR explanation.

Counterpressure Vacc Suits

These vacc suits do not inflate. They incorporate a mechanical counter-pressure (MCP) system which uses elastic layers in direct contact with the skin to prevent the expansion of gases and water vapor in blood vessels and tissues.

Several types are available. All require Vacc Suit skill to use.

Skinsuit

A form-fitting elastic garment resembling a body stocking, with a rigid collar ring for attaching a helmet. A skinsuit is much thinner than a conventional vacc suit (see below), omitting radiation shielding and heavy-duty climate control. It is often worn as normal day-to-day clothing by space crews who don a full suit only for extravehicular excursions. It is also worn on worlds with poisonous atmospheres but moderate climates. The suit does not include air tanks (p. 121), which must be provided separately. With the addition of a vacc suit helmet (p. TODO), it is sealed, providing climate control (-50°F to 150°F) and vacuum support.

Vacc Suit

A vacc suit covers the whole body, including a rigid, removable helmet and life support pack. It's usually festooned with exterior pockets, sticky patches, straps, and hooks for access to equipment, plus at least two lifeline hooks for safety when outside a vessel. The suit has a back-mounted life-support pack (LSP), which provides heat regulation, cooling, and energy for the suit's systems. It also includes an air tank with a 12-hour air supply.

The suit has built-in biomedical sensors (p. TODO). It is sealed with the addition of a vacc suit helmet (p. TODO), providing climate control (-459°F to 250°F) (p. 117), pressure support (p. 117) up to 10 atmospheres, radiation protection (PF 2) (p. 117), and vacuum support (p. 117). A

vacc suit takes 30 seconds to put on or take off, though this time can be halved with a successful Vacc Suit skill roll.

Different vacc suit models are available:

Civilian Vacc Suit: An ordinary vacc suit worn by most spacers.

Nanoweave Vacc Suit: A heavy-duty tactical vacc suit reinforced with impact-resistant ballistic armor. It has a split DR: Use the higher DR against piercing and cutting damage, and the lower DR against all other damage types.

Smart Vacc Suit: An improved civilian vacc suit design using advanced nano catalytic system to reduce the life support system's bulk.

Space Biosuit

This flexible "living" counterpressure vacc suit resembles a form-fitting jumpsuit. Made of smart bioplastic, it absorbs sunlight and recycles waste, giving it an extended air supply (some wastage occurs, but the suit provides full life support for six weeks as long as its power supply can be charged). A small belt pack contains the air needed for recycling and a power pack to supplement the solar system.

The space biosuit is self-sealing for punctures up to an inch in diameter, and more extensive damage is slowly repaired. It is powered by the user's body heat and lives off his waste products. The suit also includes flexible bioplas gloves and transparent hood-helmet, which are stored in the belt pack when not in use. These meld seamlessly with the suit worn. No clothing or armor can be worn under a space biosuit.

The suit is sealed with the hood on, providing climate control (-459°F to 250°F), pressure support up to 10 atmosphere, and vacuum support. Like bioplas, the biosuit has a split DR: use its higher DR vs. most attacks, but its lower R against corrosion, crushing, and toxic damage. The suit is also a small computer (p. 12) with the "printed" option for flexibility.

Counterpressure Vacc Suit Table

Type	Location	DR	Cost	Weight	Power	LC
Civilian Vacc Suit	all	6*	\$10,000	25	2C/24 hr.	4
Skinsuit	all	2*	\$1,500	4	—	3
Smart Vacc Suit	all	6*	\$5,000	15	2C/36 hr.	4
Space Biosuit	all	15/3*	\$10,000	5	2C/6 wk.	3
Nanoweave Vacc Suit	all	30/15*	\$12,000	30	2C/36 hr.	2

* Flexible.

Sealed Combat Armor

These enclosed suits of rigid combat armor are designed to resist modern rifle fire as well as explosive and biochemical munitions. Thanks to advances in micro-climate control systems and power supplies, they are comfortable to wear, but more expensive than flexible armor.

Combat Hardsuit

This is a sealed suit of combat armor designed for operations in a terrestrial environment. It is heaviest over the torso, but articulated plates and molded pieces also protect the rest of the body. An anti-radiation layer provides radiation PF 2.

It incorporates an inner garment including biomedical sensors (p. TODO), a waste relief system (p. TODO), and a microclimate control system (p. 117). The back of the torso clamshells open so the user can step into the armor (it takes three seconds to step in or out). The helmet is

not included. When worn with either a combat infantry helmet (p. TODO) or space helmet (p. TODO) the suit is sealed, with climate control (-140°F to 140°F) and radiation protection (PF 5).

A hardsuit isn't pressurized and can't operate in vacuum, but with air tanks and a mask or appropriate helmet, it can operate in areas with unbreathable or contaminated air.

Space Armor

This complete suit of articulated and pressurized plate armor enables its wearer to operate in almost any environment.

The suit includes biomedical sensors (p. TODO) and a climate-control system. It is sealed if worn with space helmet (below), providing climate control (-459°F to 250°F), pressure system (10 atm.), radiation protection (PF 10), and vacuum support. Each suit has a split DR; use its higher DR for attacks to the torso, and its lower DR for attacks to other areas.

Sealed Combat Armor Table

Type	Location	DR	Cost	Weight	LC
Combat Hardsuit	all	75/45	\$10,000	30	2
Space Armor	all	75/45	\$20,000	45	2

Sealed Helmets

These helmets protect the entire head. They take three seconds to attach or remove. Each helmet has a split DR: use its higher DR for attacks to the skull, and its lower DR for attacks to the face and the eyes.

Combat Infantry Helmet

This rigid full-face visored helmet is usually worn with either the combat hardsuit (p. 124) or a tacsuit (p. 122). It has built-in GPS (p. 46), hearing protection (p. 117), a small radio (p. 24), and an infrared visor (p. 36). Filter masks (p. 121) are built into the cheek pieces. With the visor locked into place, the helmet provides an airtight seal to hardsuit and tacsuits.

Space Helmet

These enclosed helmets are designed to be worn with suits that are sealed or provide vacuum support. There are four styles:

Bubble Helmet: A fishbowl helmet made of rigid transparent plastic. The user should wear her own vision and communication gear.

Space Combat Helmet: A heavily-armored combat helmet often worn in conjunction with space armor (p. 124). It has hearing protection (p. 117), a small radio (24), and an infrared visor (p. 36).

Visored Space Helmet: An enclosed helmet with a transparent faceplate. This incorporates a small radio (p. 24), an infrared visor (p. 36), and hearing protection (p. 117).

Flexible Space Helmet: Essentially a pressurized bag, this is made of light, flexible plastic, inflated by a puff of air from the suit. It can be rolled up and stored in a pocket; the user must wear their own communications and vision gear.

Sealed Helmet Table

Type	Location	DR	Cost	Weight	Power	LC
Bubble Helmet	head	9	\$2,000	5	B/36 hr.	4
Combat Infantry Helmet	head	27/18	\$2,000	5	B/18 hr.	2
Flexible Space Helmet	head	5*	\$500	0.5	-	4
Space Combat Helmet	head	60/45	\$3,000	7	B/36 hr.	2

* Flexible.

Chapter 28

Powered Suits

Powered suits enhance the wearer's strength and mobility. They come in two styles: open *exoskeletons* and enclosed *battlesuits*. Most powered suits provide a bonus to Lifting ST (p. B65) and Striking ST (p. B88).

Exoskeletons

A powered exoskeleton (or "exo") is an open framework of artificial "muscles." When the user moves, the sensors in the suit react to and match his movements. The wearer uses the physical attributes of the exoskeleton rather than his own.

Exoskeletons provide little protection, but unless noted, they may be worn over clothing or any flexible armor.

Full-Body Exoskeletons

These are attached to the body and limbs. They provide a bonus to Lifting ST and Striking ST. Battlesuit skill limits DX and DX-based skills; see p. B192. With the power on, a full-body exoskeleton's weight is *not* counted toward encumbrance.

Heavy Exoskeleton

A rugged, heavy-duty exoskeleton designed for cargo loading and construction work. It's often used as a substitute for a fork-lift truck or construction robot. It is very strong, but the oversized arms are not suited for fine work.

It stands eight feet tall (SM+1). The wearer gains Lifting ST+12 and Striking ST+8. In addition to any penalties for low skill, the wearer is Ham-Fisted (-3 DX).

The exoskeleton has a built-in laser torch (p. 51), a mini tool kit (p. 52) for Mechanic skill, and a fire extinguisher tube (p. 55).

Light Exoskeleton

This is a lower-powered but less bulky exoskeleton. It grants the wearer Lifting ST+10 and Striking ST+6.

Ranger Exoskeleton

Basically a battlesuit without the armor, this light but powerful exoskeleton is used for military or paramilitary operations. Its leg braces and motors boost the wearer's agility as well as his strength. It grants Lifting ST+12, Striking ST+12, and Super Jump 2.

Stealth Exoskeleton

This lightweight exoskeleton can be concealed under heavy clothing, such as a jacket or trousers. It can only be worn over skimpy clothing. The stealth exoskeleton gives Lifting ST+4 and Striking ST+4.

Lower-Body Exoskeleton

Lower-body exoskeletons are worn by porters, soldiers, and anyone else who needs to carry heavy loads without straining. They include an exo-supported backpack capable of carrying up to a 70-pound Payload; when the power is on, this load is *not* counted toward the encumbrance. Battlesuit skill only limits DX and skills for tasks that require lower-body agility, such as melee attacks or jumping.

Power Sleeve

A bulky "power glove" and arm brace that enhances gripping power. The glove can also be set on "auto-grip," which makes it "freeze" in any desired position; the user can then slip her hand out of the glove and leave it clamped onto something. It gives Arm ST+6 for crushing, gripping, and holding to the arm it is worn on (the user can wear one glove on each arm, if desired). It requires Battlesuit skill, but this only limits DX and skills for the power-sleeved arm.

Powered Exoskeleton Table

Armor	Location	DR	Cost	Weight	Power	LC
Heavy Exoskeleton	all	20/0	\$50,000	200	E/24 hr.	3
Light Exoskeleton	body, limbs	10/0	\$25,000	50	D/12 hr.	3
Lower Body Exoskeleton	groin, legs	8/0	\$12,000	30	2D/24 hr.	4
Power Sleeve	one arm and hand	8/0	\$2,000	2	C/12 hr.	4
Ranger Exoskeleton	body, limbs	20/0	\$50,000	50	D/12 hr.	3
Stealth Exoskeleton	body, limbs	12/0	\$10,000	10	2C/8 hr.	4

If an exoskeleton has a split DR, use the higher DR against any *swinging* melee attacks, falls, or collisions. Use the lower DR against *all other damage types*.

Battlesuits

A battlesuit is an armored exoskeleton. Its strength-amplifying feature lets a battlesuit trooper carry squad-support weapons like heavy machine guns or semi-portable blasters. Many battlesuits have built-in tactical systems such as sensors or weapon mounts, and are designed for hostile environments.

Battlesuits are much more expensive than ordinary combat armor, and require more training to use, but they greatly increase effectiveness. A single battlesuit trooper with heavy weapons can be as effective as an entire squad, and nearly as mobile as an armored vehicle.

Battlesuits do not run any faster, since the user's speed is limited by the length of their legs, but suits with strong leg muscles can move quickly by using a series of jumps, which may provide both the Super Jump advantage and an increase in Basic Move. Wearing a suit is not fatiguing; except for the helmet, the armor's weight does not count as encumbrance while powered up. If the suit loses power, the wearer can still move (unless they're in a combat walker), but they must use their own ST to carry the weight!

Unless otherwise noted, a battlesuit opens at the waist so that the user can easily step in or out. This takes three seconds, plus another three to screw on the separate helmet, if there is one. However, it takes 30 seconds to do this *and* perform all the subsystem checks, power everything up, and connect all features (such as the waste relief and biomedical telemetry). This time is halved on a successful Battlesuit skill roll. It's also possible to omit the check-out procedure and just start moving, but if so, the user risks internal systems failing at the worst times.

Battlesuits need to be fitted to the wearer. Refitting takes two hours and requires an Armoury (Body Armor)+2 roll. Failure means another attempt (and another 2 hours) is required. Critical failure damages the suit in some way, possibly requiring repairs before it is usable or it suffers a fault that will not be apparent until it is used in action. It is possible to use an unfitted suit, provided the user is the same size, shape, and body-type as the last wearer (height/weight should be no more than 2% off). However, the wearer will suffer a -1 penalty to DX and all DX-based skills.

Flying Battlesuits

Many battlesuits are used with flight systems, since the suit's strength amplification makes it easy to carry extra

gear. For maximum flexibility, these systems are not included in the suit designs, but are usually worn as extra gear. For maximum flexibility, these systems are not included in the suit designs, but are usually worn as external packs or belts. See *Flight Pack* (p. TODO) for various options. Flight systems interface with battlesuits, allowing the suit's own navigation displays to be used for flight control.

Underwater Battlesuits

Units operating underwater will need to use an aquatic propulsion pack (p. TODO) for submerged mobility. A few suits have integral aquatic propulsion.

Combat Walkers

These early designs have a barrel-shaped torso that blends into the head. There is no neck or waist articulation; the user must rely on sensors to see behind him and cannot twist his torso around. The suit's hands are also crude (but very strong) grippers. Combat walkers built for humans stand eight feet tall (SM+2).

A combat walker is more mobile than a tank, but its agility remains limited. The suit can sit or kneel, but the user cannot crawl, get up from a prone position, jump, or swim. On the other hand, the walker is covered with depleted uranium composite laminate over high hardness steel alloy, and can shrug off fire from light anti-tank weapons.

The suit's exoskeleton provides Lifting ST+20 and Striking ST+20. Due to its longer legs, it also adds +1 to Basic Move. While wearing the suit, the wearer suffers Bad Grip 2 (p. B123). The entire suit's weight is ignored for encumbrance. However, if the combat walker loses power, the wearer is effectively paralyzed until he leaves the suit.

The suit has several standard accessories: a GPS (p. 46), hearing protection (p. 117), biomedical sensors (p. TODO), and a waste relief system (p. TODO). Its helmet electronics include a hyperspectral visor (p. 36), a medium radio (p. 24), and a small laser comm (p. 24). The helmet has audio sensors so the user can hear outside the suit, but it lacks olfactory sensors; unless the hatch is opened, the user suffers from No Sense of Smell/Taste (p. B146) when dealing with the outside world. The suit's surface has a tactical ESM (p. 37), and incorporates infrared cloaking (p. 62) and radar stealth (p. 62).

A combat walker is slightly more roomy than most other battlesuits. This means that it is a "one size fits all" suit

that does not require special fitting to each user. It has a hatch at the back that the user must climb into; due to its height, the suit should be in a kneeling posture to enter, or it takes an extra second to clamber into it. Entry and exit are otherwise similar to most battlesuits.

Different variations of combat walkers are described below. These battlesuits have mostly become obsolete, having been replaced by heavy battlesuits (p. TODO), but vintage and refurbished walkers can still be found.

Infantry Combat Walker

This is the standard model, designed for operations in terrestrial conditions. It is sealed (p. 117), with a filter mask (p. 121), climate control (-20°F to 140°F) (p. 117), and radiation protection (PF 10) (p. 117). It can be equipped with air tanks (p. 121), but these add to its weight.

Marine Combat Walker

This model can swim underwater using ballast tanks and a waterjet propulsion system. It has Water Move 4, and a built-in small sonar (p. 40). It is sealed, and provides climate control (-20°F to 150°F), pressure support (10 atm.), and radiation protection (PF 10). It has a large air tank, giving it a 36-hour supply, though some notable old models only have a 24-hour air supply.

Space Combat Walker

This battlesuit is designed for operations on hostile planets. It can walk underwater, but cannot float or swim. It has vacuum support, and can operate underwater or in superdense atmospheres. It is sealed, and provides climate control (-459°F to 300°F), pressure support (30 atm.), radiation protection (PF 10), and vacuum support. It has two large air tanks, giving it a 72 hour air supply, though particularly old models only have a 48 hour air supply.

Powered Combat Armor

This is a standard medium-weight combat battlesuit. It is seven feet tall, made of articulated plates of metal-matrix composites with an inner layer of reflex armor. Powered combat armor is intended to resist rifles or light machine guns, but can't stand up to anti tank weapons. It is small enough to fit through ordinary doors, making it a superb tool for house-to-house fighting, urban warfare, and boarding actions.

Powered combat armor gives +10 to Lifting and Striking ST and Super Jump 1. Biomedical Sensors (p. TODO) and a waste relief system (p. TODO) are standard features. The suit's surface has a tactical ESM (p. 37).

The helmet comes with a filter mask (p. 121), a GPS (p. 46), hearing protection (p. 117), a small radio (p. 24), a small laser comms (p. 24). The helmet has olfactory and audio sensors so the user can hear and smell outside the suit.

With the helmet on, the suit is sealed. It provides climate control (-459°F to 250°F), pressure support (10 atm.), radiation protection (PF 10), and vacuum support. It has a

large air tank with 36 hours of air (very old models only have 24 hours). In a contaminated but breathable atmosphere, it can operate using the standard filter mask.

Powered combat armor incorporates infrared cloaking (p. 62). Chameleon surfaces (p. 61) are common but not standard.

Zero-G Worksuit

This suit is more like a miniature spaceship than a vacc suit. It is a rigid pressurized cylinder with a transparent helmet dome; the whole thing is slightly larger than a human. It has no legs, but is propelled by an integral thruster pack mounted in the base. The suit's thrusters accelerate or decelerate it at up to three yards/second², with enough fuel for 300 seconds of acceleration. A Piloting (Spacecraft) roll is required to quickly change direction.

In addition to its normal suit sleeves, it has three ST 15 waldoes – remote-controlled arms – for heavy duty work; they can be used as normal arms but at a -3 DX penalty. Any two waldoes may be used at once. One waldo also mounts as an integral laser torch (p. 51). A waldo's grip can be powered-locked onto a structure (e.g., a ship's hull) to hold the suit steady while the other limbs are used for work.

It is sealed, providing climate control (-459°F to 300°F), radiation protection (PF 10), and vacuum support. It has two weeks of air. A small (eight-inch diameter) airlock in its side is used to transfer small items (such as tools, food, or air) without breaking suit integrity. It has a built-in medium radio (p. 24). The suit is powered by an E cell, and has sockets for a second cell.

Like a combat walker (p. 126), a zero-G worksuit does not need to be specifically fitted to each user.

Commando Battlesuit

This is a lightweight, agile, form-fitting powered armor suit.

Its exoskeleton gives +15 to Lifting and Striking ST and Super Jump 2. Biomedical sensors (p. TODO) and a waste relief system (p. TODO) are standard features. The suit's surface has infrared cloaking (p. 62), radar stealth (p. 62), and a tactical ESM (p. 37).

The helmet comes with a filter mask (p. 121), an inertial compass (p. 46), hearing protection (p. 117), a small radio (p. 24), a small laser comm (p. 24), and a hyperspectral visor (p. 36). The helmet has olfactory and audio sensors so the user can hear and smell outside the suit.

With the helmet locked down the suit is sealed, providing climate control (absolute zero to 500°F), pressure support (20 atm.), radiation protection (PF 10), and vacuum support. It has a large air tank (p. 121) with 36 hours of air. In a contaminated but breathable atmosphere, it can operate using the filter mask.

Heavy Battlesuit

These highly-mobile suits can fight in almost any environment. They have enough life support to keep the user

alive for days in a contaminated war zone. They are smaller than combat walkers, but still stand seven feet tall and are bulky (SM+1).

The armor is a thick shell of laminated nanocomposites and ceramic armor over an inner layer of shock-absorbing liquid armor. This gives torso protection equal to at least three inches of steel plate. It also has integral superconductor-based electromagnetic armor, which doubles the suit's DR against shaped-charge warheads and plasma bolts. The electromagnetic armor operates off a separate D cell and is good for 10 uses.

A powered exoskeleton amplifies the user's muscles and grounds speed (see below). Except for the helmet, the armor's weight does not count as encumbrance while powered up. It is powered by an integral radiothermal generator which operates it for up to 10 years.

The suit's helmet includes a filter mask (p. 121), an inertial compass (p. 46), hearing protection (p. 117), a hyperspectral visor (p. 36), a small laser comm (p. 24), and a medium radio (p. 24). The suit's body incorporates biomedical sensors (p. TODO), trauma maintenance (p. TODO), a provisions dispenser (p. TODO) with a week's provisions, tactical ESM (p. 37), and a waste relief system (p. TODO). The suit also has infrared cloaking (p. 62) and radar stealth (p. 62).

With its helmet on, it is sealed, and has climate control (-459°F to 500°F), pressure support (10 atm.), radiation protection (PF 5), and vacuum support. It has two large air tanks with a 72-hour air supply.

The suit's exoskeleton grants Lifting and Striking ST+20. It has Basic Move +2 and Super Jump 1.

Command Battlesuit and Scout Battlesuit

These variations have almost identical statistics.

Command Battlesuit: A suit designed for officers, not

quite as strong as a heavy battlesuit, but with equivalent armor and greater mobility. It includes a medium laser comm (p. 24) and a large radio (p. 24). Its exoskeleton grants Lifting and Striking ST+18, Basic Move +3, and Super Jump 2.

Scout Battlesuit: A variation on the command battlesuit for reconnaissance and special ops units. It has a chemsniffer (p. 36), and a deceptive radar jammer (p. 61). The helmet has a small genius computer (p. 12). Its exoskeleton is less strong but faster: it grants Lifting and Striking ST+16, Basic Move +4, and Super Jump 3.

HEX Suit

The Hostile Environment eXosuit is a suit of powered space armor reinforced for operations in extremely dangerous environments.

The suit is eight feet tall (SM+1). Its bulbous, heavily-armored body is reinforced and shielded to resist extremes of pressure, temperature and radiation, and it has a heavy-duty life support. It is sealed, providing climate control (-459°F to 800°F), pressure support (50 atm.), radiation protection (PF 100), and vacuum support. It has 120 hours of air and water.

Its exoskeleton provides Lifting ST+8 and Striking ST+4, and cancels the weight of the suit for encumbrance. Unlike most other battlesuits, it does not otherwise increase the wearer's mobility. The suit requires 60 seconds to put on or take off.

Standard accessories include a waste relief system (p. TODO), a provisions dispenser (p. TODO) with a week's water and rations, and an automatic backscratcher. The helmet has hyperspectral goggles (p. 36), a small multimode radar (p. 39), and a medium radio (p. 24).

Battlesuit skill is used to operate the suit, and does limit DX and skill use (see p. B192).

Battlesuit Table

Armor	Location	DR	Cost	Weight	Power	LC
Combat Walker	all	200/120	\$300,000	800	E/24 hr.	1
Marine Combat Walker	all	200/120	\$320,000	900	E/24 hr.	1
Powered Combat Armor + Helmet	body	70/50	\$80,000	150	E/18 hr.	1
	head	70/50	+\$10,000	15	C/18 hr.	1
Space Combat Walker	all	200/120	\$330,000	950	2E/48 hr.	1
Zero-G Worksuit	all	40	\$60,000	150	E/48 hr.	3
Commando Battlesuit + Helmet	body	105/75	\$80,000	150	E/24 hr.	1
	head	10/75	+\$10,000	15	C/24 hr.	1
Heavy Battlesuit + Helmet	body	150/100	\$200,000	480	10 yr.	1
	head	150/100	+\$10,000	20	10 yr.	1
HEX Suit	all	140	\$200,000	2,000	2E/1 wk.	3

Battlesuits with split DR use the higher DR against attacks to the torso (and skull, for helmets or suits that cover all locations); the lower DR protects other locations.

* Flexible.

Chapter 29

Defense Systems

There is more to defense than just heavy armor. These are a variety of specialized systems, some designed to be integrated into suits, others for use on their own.

Miscellaneous Accessories

Magnetized Plates: These can be put on the sole of any boots. They let the wearer walk along metallic bulkheads and ship hulls in microgravity or zero-G. Move is normal with Vacc Suit skill and halved without. \$100, 0.5 lb. LC4.

Provisions Dispenser: A sealed helmet or suit that covers the head can be equipped with a concentrated food and water supply in a handy helmet-mounted dispenser. The provisions can be consumed "hands-free" without taking off the helmet. Built into many suits; if bought separately, \$50, 1 lb.

Waste-Relief System: The suit collects and packages the wearer's waste products in a hygienic manner. Built into many suits; if bought separately, \$1,000, 2 lb.

Other Defenses

These are miscellaneous protective systems, designed to deal with specific hazards rather than general damage. If the system is included in a suit as a standard feature, there is no extra cost or weight, and the system runs off the suit's power supply.

Ablative Foam

Ablative foam can be applied to skin or body armor. It is a half-inch-thick layer of sticky foam, available in a variety of camouflage colors. It gives DR 8 vs. burning damage only, and is treated as Hardened 1 (p. B47) against laser attacks. It ablates more rapidly than ablative body armor, losing 1 DR for every point of damage inflicted to a location.

A spray can covers one person or a square yard; a spray tank covers a car-sized vehicle or up to 10 square yards. Only one layer of foam can be used on a person, while up to three layers can be applied to vehicle armor. Application takes three seconds per square yard or person. The foam is also radar absorbent; -3 for radar to detect anything covered with it, not cumulative other modifiers for radar stealth systems. \$100, 2 lb. for a can; \$500, 10 lb. for a tank. LC4.

Armor Without Faceplates

Any helmet or armor that covers the entire head can be built with no faceplate. All the sensor information is presented on a display inside the helmet. It includes a 360-degree scan, so that the user has Peripheral Vision. The sensor suite costs \$1,000 and includes a basic HUD, audio microphones, and a simple (and unjammable) low-light optical-circuit TV camera.

Any critical hit to the "eyes" location by a beam weapon will burn out the TV scanner on a roll of 10 or less on 3d.

Biomedical Sensors

These embedded sensors monitor cardiopulmonary function, blood pressure, oxygen saturation, posture, and activity level. The sensors also note the location and size of any penetrations into the armor. This permits remote monitoring of physiological status over a communications system; the patient data can also be encrypted and stored in a built-in storage device. This data gives medics a +1 (quality) bonus to Diagnosis when examining the wearer in person, or allows Diagnosis skill to be attempted without the wearer being present at a -2 penalty. \$200, 0.2 lb., A/24 hr. LC4.

Electromagnetic Armor(EMA)

This armor upgrade is designed to dissipate the penetrator jet created when a shaped-charge warhead hits the exterior. When the round hits, embedded sensors trigger an electromagnetic pulse in the armor that disrupts the stream. Electromagnetic armor effectively doubles the armor DR vs. shaped-charge warheads and plasma bolts. Laminate armor with the EMA upgrade has triple the armor DR against shaped-charge warheads and plasma bolts.

EMA requires power and is limited in the number of times it may be used, a "use" being any penetration of the armor that is blocked only thanks to the doubling (or tripling) of DR. It draws on the suit or vehicle's power plant or energy banks; the number of uses is specified in the descriptions of vehicles equipped with it.

Vehicular EMA: This is integrated into layered armor in vehicles such as tanks (p. TODO).

Battlesuit EMA: This uses superconductor technology to integrate the armor into battlesuits. A minimum thickness of armor is required to insulate the suit, so EMA is only available for the heavy battlesuit (p. 127).

EMA is an integral feature rather than an add-on; its presence is noted in particular vehicle and armor designs.

IFF Comm

This software upgrade can be used with any directional communicator. It allows the user to send an "Identify Friend or Foe" signal and sets up an automatic response to any valid friendly IFF signal. IFF commas are compatible with the IFF interrogators (p. 98).

An IFF signal is an encrypted interrogation code. If the target has IFF comm software activated, and if it has the proper codes, its communicator will automatically reply with its own coded "friend" response. Once an IFF comm has identified a friendly target, it will pass this data to any navigational, sensor, or targeting displays it is linked to. If the target fails to respond, or any information does not match the IFF comm's database, it will be indicated as potentially hostile.

IFF comm software is Complexity 2, \$500. LC3.

Life Jacket

This small life jacket inflates automatically if totally submerged. Once activated, it reduces Swimming skill by 3, but the wearer won't sink even if he wants to. One jacket will support 600 pounds in water. \$20, 2 lb.

Nasal Filter Plugs

This pair of chemical-biological filter plugs fits in the wearer's nostrils. They do not provide full protection against gas, but as long as the wearer keeps her mouth closed and breathes only through her nose, the plugs add a +5 bonus to HT to protect against breathed gas (such as sleep gas), strong odors, or avoid infection from airborne microorganisms. They provide no protection against agents absorbed through skin.

Inserting the plugs takes three seconds if in hand. A DX roll can cut this to two seconds, but critical failure means the user drops one of the plugs instead of inserting it. In a surprise gas attack, the user must make an IQ roll to close her mouth and insert the plugs before breathing a whiff of gas. Combat Reflexes adds +6 to IQ for this purpose, and Hazardous Materials skill (p. B199) can substitute for IQ if it is higher.

The filters only work perfectly for about four hours of continuous use. The HT bonus then declines by -1 every two hours; after 10 hours the plugs offer no protection at all. \$100, neg. weight. LC4.

Near Miss Indicator

This miniature acoustic sensor can attach to any combat helmet. It only works in conjunction with a HUD (p. 13), and does not function in vacuum. The NMI's sensor detects

the flight path of projectiles (but not energy beams) as they pass across the user's field of vision, then displays them as visible traces. This gives a +2 to Vision rolls to locate the source of enemy fire. \$1,000, neg. weight, A/24 hr. LC4.

Personal Radar/Laser Detector

This alerts the user if they're in the path of a radar or ladar beam at up to twice that beam's range (1.5 times normal range for LPI radars, see p. 38). It cannot detect radars of a higher TL than its own. Soldiers often carry radar detectors built into combat helmets. \$50, 0.5 lb., A/10 days. LC4.

Psionic Mind Shield

This psychotronic device generates a telepathic mind shield that warns the user of mental attacks and defends against them. Add +4 to IQ or Will whenever the user resists an advantage with the Telepathic limitation. The shield also resists attempts to locate the user's mind using psionic abilities. Such abilities must win a Quick Contest against the wearer's Will+4 to find him.

These shields also work to defend against Raven abilities and Witchcraft that targets the mind.

Mind Shield Helmet: The shield circuits warn the wearer when a telepath fails to penetrate the shields, but provide no warning if the telepath succeeded. The warning can take the form of a beeper, a silent signal, or a message in the user's HUD. Lightweight caps (DR 1, cover only the skull) are \$1,000, 1 lb., 2B/100 hr. LC3.

Mind Shield Circuitry: This can be built into any type of helmet: \$1,000, 0.5 lb., 2B/100 hr. LC3.

Telepathic Barrier: This psionic stealth coating can be used to shield vehicle crews, building occupants, or even entire cities from telepathic detection and manipulation. It uses external power. \$1,000, 0.5 lb. per square foot. Sealing a 10' cube requires an area of 600 square feet; a typical civilian vehicle is about 300 square feet.

Mind Shield Headband: A more compact version of the standard telepathic mind shield, worn as a headband or tiara. \$2,000, 0.1 lb. B/100 hr. LC3.

Radiation Badge

This is a tiny device (often worn on the wrist) that detects the local radiation level; it includes a touch-sensitive display and micro-communicator. It can provide the actual radiation level or be set to trigger an alarm if the radiation exceeds a specified amount. The same unit may be built into a helmet visor or connected to a HUD. \$100, neg. weight, AA/1 month. LC4.

Riot Shield

Police on riot-control duty often use this large, rectangular shield of transparent armorplas. It has DB 3 and DR 30/HP 60. It does not impair the user's vision, but lasers ignore its DR. \$100, 4 lb., LC4.

Suit Patches

Environment suits and sealed battlesuits usually have a front pocket containing 10 sticky emergency patches. Damage that penetrates the suit can be patched manually. This requires three seconds and a Vacc Suit skill roll. If the first attempt fails, each further attempt is at a cumulative -1. Every three seconds of delay or failed attempt means a loss of 10 minutes' worth of air. Extra packets of suit patches are \$10, 0.1 lb.

Trauma Maintenance

This medical system is available for any battlesuit or flexible powered suit with biomedical sensors (p. 129). It includes an auto-injector and 10 doses of drugs. The user can manually trigger it, or it can be preset to inject a specific drug if vital signs warrant it; e.g., a painkiller if injured or a stimulant if fatigued. The injector might also be remotely controlled by a superior officer, or loaded with non-medical drugs; e.g., to trigger berserker rage. It has its own power supply to make it independent of suit power loss. \$2,000, neg. weight, A/1 year. LC4.

Desert Environment System

This recycling system can be added to any sealed suit, giving it the same water recycling capabilities as a desert environment suit (p. 177). \$1,000, 2 lb. LC4.

Microbot Arteries

These may be added to any armor. Microbot arteries contain room for one square yard of microbots inside the suit, allowing them to travel to any location covered by the armor. Suits with microbot arteries usually carry paramedical swarms (p. TODO) or repair swarms (p. 55) to heal the user or repair damage to the suit. A battlesuit may have two different sets of microbot arteries. \$500, neg. weight. LC4.

Reactive Armor Paste

This sensor-embedded directional-explosive paste comes in tubes and can be lathered onto armor or flesh. It explodes outward to disrupt impacts and beam-weapon strikes.

Reactive armor paste will only detonate if struck by a high-velocity attack such as a bullet, beam, or explosion. It reduces the damage from attacks *before* armor DR. It is especially effective against crushing damage from a direct hit by an explosive shaped charge, such as a HEMP or HEAT warhead. One detonation protects against all hits from a rapid-fire attack.

Each time the paste detonates, the wearer takes 1d crushing damage with the explosive modifier. Reactive armor paste is normally placed on armor, which will protect against this damage.

Reactive armor paste is only good for a limited number of uses. If it's already protected a location once, then roll 1d each time a successive attack strikes the same location.

Subtract 1 for every prior attack that resulted in a detonation. If the result is 0 or less, an unprotected area has been hit and the paste has no effect.

Reactive armor paste typically provides DR 20 (DR 200 vs. shaped charges). Enough paste to cover a full-body suit is 4 lb. and \$200. Use the tailored armor rules for partial coverage. LC2.

Smartsuit Options

These options are available for smart vacc suits (p. 123) and space biosuits (p. 123). They make full use of the mutable capabilities of smart matter materials. Some of the possible suit features are:

Interphase

This "smartsuit-built-for-two" feature allows two or more suits in physical contact to merge into a single, larger suit – like a big bioplastic sleeping bag – that contains all the original occupants. This takes 10 seconds and requires that all parties be cooperative, restrained, or unconscious. Once the suits are interphased, everyone within shares life support and can interact in ways that are difficult or impossible in separate suits; such skills as First Aid and Erotic Art are at only -1. A lone user can use First Aid on herself (still at -1) without opening her suit by activating interphase and causing her suit to balloon. It's impossible to walk while wearing a sack, but the occupants can hop or roll at Move 1. Separating the suits takes 10 seconds; any suit wearer can initiate her suit's separation. \$1,000 for a biosuit; \$5,000 for a smartsuit. LC4.

Rainbow

The suit can change its color on request, or even become transparent (though not invisible). This lets the suit mimic different kinds of clothing – for example, the user could make arms, head, and legs transparent to create the illusion of swimwear. The helmet's colors and transparency can also be adjusted.

The rainbow option is not as effective as a chameleon suit, but does allow the user to don a camouflage pattern (-2 to be spotted) if desired. It can also give the suit a chrome pattern, for the equivalent of a reflec armor surface (p. 119). \$400 for biosuit; \$2,000 for a smartsuit. LC4.

Morphwear

The suit can reconfigure itself to mimic normal clothing, with the hood retracting into the body and the legs, torso, and sleeves separating and billowing as necessary to duplicate anything from a formal suit to a cocktail dress. A large library of outfits can be programmed; in combination with the Rainbow setting, the suit can duplicate most types of full clothing, and create the illusion of skimpy outfits by becoming selectively transparent.

While it is activated, the morphwear function compromises the suit's ability to protect against hostile environments and halves DR. The suit can change back to its protective form in two seconds. \$1,000 for a biosuit, \$5,000 for a smartsuit.

Chapter 30

Force Fields

Part VIII

Medical and Biotech

Chapter 31

Biomedical Equipment

Medical Gear

These devices are useful for first aid, diagnosis, surgery, and long-term patient care. This section also describes static medical robots and microbots, which are treated as equipment. For mobile machines, see *Medical Robots* (p. 138).

Anti-Toxin Kit

This is an antidote for one specific non-nanotech toxin; 10 uses. \$25, 0.5 lb. LC4.

Automed

This is a coffin-sized trauma pod. A single patient enters it, and the lid is shut. The pod can treat the patient on its own, or be controlled remotely.

The automed is equipped with robot arms, surgical tools, and diagnostic sensors. Its dedicated computer can treat its patient with Diagnosis-14, Electronics Operation (Medical)-14, First Aid-15, Physician-13, and Surgery-15. It has no imagination, so new diseases or strange problems may stump it – in which case it does its best to sustain the patient and call for help.

An automed may also be used to diagnose or treat patients by manual or remote control. Used this way, it can function as a crash kit (p. TODO), as diagnostic probes (below), and as a portable surgery (p. TODO); however, do not add their equipment modifiers when the automed uses its own skills. It's common for automeds to be teleoperated by AIs rather than living doctors.

An automed can sustain patients on life support, as a transport ESU (p. TODO). It has 100 uses of bandage spray (below) and an internal pharmacy with room for 200 doses of drugs. The drugs are chosen and stocked by the automed's owners, and can be dispensed as needed. There is also a medium-range radio (p. 24) connected to the medical sensors, an internal camera, and a speaker. \$100,000, 250 lb., E/200 hr. LC4.

Bandage Spray

This spray-on antiseptic bandage seals and disinfects minor wounds while acting as an analgesic. It comes in flesh-

tone, colored, and transparent versions. First Aid using bandage spray receives a +2 (quality) bonus to skill.

One-Use Bandage Spray: One use. \$3, 0.1 lbs. LC4.

Bandage Spray Can: Six applications. \$15, 0.5 lbs. LC4.

The spray can stop bleeding and restore 1 HP in 5 seconds.

Biomonitor

A non-invasive monitor that records basic vital signs: pulse, heartbeat, blood pressure, etc. It has a small display, and stores its data internally on a standard disk so that a doctor can review the patient's medical history.

Biomonitor Bracelet: A doctor consulting or monitoring it receives a +1 (quality) bonus to Diagnosis skill for the wearer. \$50, 0.1 lb., A/100 hr. LC4.

Biomonitor Autoinjector: As above, but incorporates a hypo or patch with 10 doses of drugs. It injects a programmed drug when a specific physical or stress related psychological condition occurs, e.g., unconsciousness, heart attack, Bad Temper or Berserk disadvantage, transforming into a werewolf, etc. If an appropriate drug is available, the device can serve as a Mitigator (see p. B112) for such conditions. \$200 (plus drug dosage), 0.15 lb., A/100 hr. LC4.

Diagnostic Sensors: A “doc in a box” that connects to a set of sensors which must be attached over the body. It gives readouts on the patient's vital signs, including pulse, electrocardiogram, blood pressure, and respiratory rate. This provides a +2 (quality) bonus to Diagnosis. \$500, 0.5 lb., 2B/1,000 hr. LC4.

Diagnostic Bed

An examination table equipped with a full range of biological and medical scanners, including a CAT scan, a PET scan, T-rays, ultrasound, and X-rays. The patient lies on the table and scan results are projected onto an overhead screen.

Provides a +3 (quality) bonus to Diagnosis skill for most medical conditions, save those requiring detailed and non-invasive brain imaging (see HyMRI, p. TODO). If the imaging results from a diagnostic bed is combined with diagnostic

probes (below) or laboratory tests, the total bonus to skill is +5. \$25,000, 250 lbs., E/100 hr. LC4.

Diagnostic Probes

A solution of tiny medical biosensors which can be injected into a patient as part of a diagnostic procedure. Injecting them requires only a hypo, but retrieval requires an automed, diagnostic bed, chrysalis machine, or ESU. If they've had at least two hours to circulate, their data gives a +3 (quality) bonus to Diagnosis skill. If the data is combined with readings from an imaging scan performed by a diagnostic bed (above) or HyMRI (p. TODO), the total quality bonus to skill is +5.

A diagnostic bed can communicate with the probes without removal being required. If not removed, they'll work for a month and then degrade harmlessly. \$200 per dose. LC4.

Disposable Hypo

A tiny one-use syringe, no longer than a fingernail. It is preloaded with a dose of a drug, poison, or metabolic nanoagent in injectable form. If the drug costs \$5 or more, the hypo is included at no additional cost. Otherwise, \$0.50 plus the cost of the drug, 0.01 lb. LC4.

Disposable Test Kit

This tests for a specific disease, toxin, drug, or condition (e.g., pregnancy or malnutrition). No skill is required; the kit produces a color change to indicate a positive result. Available in versions that test urine or blood. \$5, 0.1 lb. LC4.

Emergency Support Unit

This is a life support system for patients who can no longer sustain their own bodily functions. See Mortal Wounds (p. B423) for the effect of trauma maintenance: the patient rolls to survive each day rather than each half-hour, and may use the higher of his Physician's skill or his HT.

Attaching a mortally-injured patient to an ESU requires an Electronics Operation (Medical) roll; each attempt takes 10 seconds. The system also includes diagnostic biosensors (p. 134). An ESU can function as a Mitigator (-60%, see p. B112) for any Terminal Illness disadvantage caused by organ failure or similar problems.

An ESU can maintain the biological functions of someone who is dead (unless they're at -5 x HP or worse), preserving the body intact for later use. It can also perform whole-blood transfusions. A "blood-wash" to remove toxins or nanomachines takes two hours.

Hospital ESU: A standard trauma maintenance unit, usually integrated into a hospital bed (the bed is not included). It provides a +2 (quality) bonus to Physician skill or HT rolls for trauma maintenance. \$15,000, 120 lbs., 4D/200 hr. LC4.

Transport ESU: A lightweight but shock-resistant and stabilized version of the hospital ESU, attached to a

stretcher or installed in a vehicle. It is used for safe transport of critically injured patients. It provides a +1 (quality) bonus to Physician skill or HT rolls for trauma maintenance. \$10,000, 60 lbs., 2D/100 hr. LC4.

Wearable Life Support Unit: Takes over the function of a specific failed organ, such as the heart or kidneys. It is only useful as a Mitigator for terminal illness caused by organ failure. \$2,000, 4 lbs., 4C/100 hr. LC4.

Suitcase ESU: A lightweight system that can be attached to a prone patient. It is often used by paramedics or built into robots. \$5,000, 12 lbs., D/50 hr. LC4

First Aid Kits

These kits contain basic medical instruments.

First Aid Kit: Contains a bandage spray can (p. 197), ointments, etc. It gives a +1 (quality) bonus to First Aid skill, or +2 when using the bandage spray to treat bleeding. \$50, 2 lbs. LC4.

Crash Kit: Contains a defibrillator, an oxygen mask, sutures, a bandage spray can, and no-shock drugs. It provides a +2 (quality) bonus to First Aid skill and counts as improvised equipment (-5) for Surgery skill. \$200, 10 lbs. LC4.

Hibernation Chamber

This chamber slows down a living subject's metabolic activity through chemical means. It reduces oxygen consumption, body temperature, food and water consumption.

It takes an hour to reduce the subject to a hibernation state, after which he is unconscious and his life support requirements drop by a factor of 10. He also "ages" at roughly one-tenth the usual rate. The subject may be kept unconscious indefinitely if the chamber is equipped to provide for life support. Once the chamber is opened, the subject will be at 0 FP (or his current total, if less). He can recover FP normally, although stimulants may also be used.

Hibernation is used to give critically ill patients awaiting organ transplants more time, to keep patients suffering severe blood loss alive long enough for surgery, and to reduce life support requirements during long voyages.

Hibernation Chamber: Houses a single person. It is equipped with life support systems to keep the patient alive at his low metabolic rate, stimulate muscles, etc. These must be connected to an external life support source, but the occupant uses up one-tenth the normal life support requirement. \$20,000, 200 lbs., external power. LC3.

Suspended Animation Tube: Has a self-contained regenerative life system that maintains all needs for as long as the power holds out. It will auto-revive if power is about to fail. \$50,000, 750 lbs., 5E/10 years (or indefinite with external power). LC3.

Hibernation Case: A compact unit that fits inside a trunk. Designed mostly for storing organs and pets, but a child, dwarf, or small teenager (SM-1) could fit inside. It will auto-revive if power is about to fail. \$10,000, 125 lbs., 5D/1 month. LC3.

Hibernation chambers are specific to classes of species (e.g., mammals) and may not work on some races.

HyMRI Scanner

A conventional magnetic resonance imaging (MRI) scanner uses powerful electromagnets to stimulate the protons in the patient's body into emitting radio energy, which is used to produce a non-invasive image. HyMRI augments this with an inhaled laser-polarized inert gas such as an isotope of xenon or helium. This increases the resolution, especially in the lungs and nearby heart and brain.

Use Diagnosis skill to operate the scanner. It is basic equipment for the noninvasive diagnosis of brain and spinal disorders, as well as for mind emulation (p. TODO), and provides a +5 (quality) bonus for diagnosing heart-lung problems.

An MRI is not safely usable on anyone with magnetic or ferrous material in their body, e.g., cybernetics or fragments. If in doubt, a diagnostic scan should precede its use.

Hospital HyMRI: A large device that the patient must lie inside. \$250,000, 500 lbs., 2E/10 hr (or external power). LC3.

Portable HyMRI: A helmet-sized device clamped over the patient. This is only usable for imaging the head. \$25,000, 50 lbs., 2D/1 hr. LC3.

Plasti-Skin

This antiseptic and hemostatic patch can serve as a pressure bandage or a tourniquet. When the flesh beneath it heals, the patch falls off. It reduces the time required for bandaging (p. B424) from 60 seconds to 20 seconds, and the hemostatic proteins incorporated into it stop bleeding immediately after successful application.

Plasti-skin is normally a different color than flesh (so the bandage can be easily identified). However, versions that assume the color of the underlying skin are available to cover tattoos and scars – these are useful as disguises. A field dressing pack with four applications is \$2, 1/8 lb. LC4.

Pneumohypo

This hypo injects drugs with a charge of compressed air. It must be touching the patient to inject its drug. If used as a weapon, it can penetrate DR 1, or normal clothing, has Reach C, cannot parry, and uses Knife skill (or DX-4). Its vial holds one dose of a drug.

These devices are about the size of a penlight, and are included in all medical kits at no extra cost. Air cartridges providing 100 charges of compressed air are \$10. It takes three seconds to remove an empty drug vial or air cartridge and replace a new one. \$20, 0.1 lb. LC4.

Physician's Equipment

Anyone under the care of a competent physician (Physician skill 12+) who has a stock of drugs and medical supplies gets +1 on all rolls for natural recovery. The healer may also make a Physician roll to cure the patient. Only one physician may roll per patient, but a single physician can care for many patients.

The exact number of patients a physician can attend to and the frequency with which he may roll to cure them depend on the TL of his Physician skill; see the Medical Help Table, below. On a success, the patient recovers 1 HP; on a critical success, he recovers 2 HP. This is in addition to natural healing. However, a critical failure costs the patient 1 HP!

Medical Supplies: Drugs and other disposable supplies sufficient for 50 patient-days of Physician treatment. Gives a +1 (quality) bonus. Without this gear, the doctor operates as if at the TL6 level. \$500, 5 lbs. LC4.

Medical Bed: A robotic nursing bed with built-in instruments, waste-relief systems, and an automated programmable drug dispensary for treating one patient. Adds +3 (quality) to Physician skill; allows three Medical Care rolls daily. \$10,000, 100 lbs., D/100 hr. LC4.

Biomonitor: If a patient has been wearing a biomonitor bracelet (p. 134) for at least a day, its accumulated data makes it easier to treat him. This gives +1 to Physician skill. \$50, 0.1 lb., A/100 hr. LC4.

Suit Doc: An array of intelligent diagnostic sensors and general-purpose medical drug injectors that can be built into any sealed suit. It can perform ongoing Medical Care (p. B424-425) on the wearer as if he were under the care of a doctor operating at its TL who has Physician-10. A suit doc's drug pack is good for five days. Extra suit doc drug packs are \$50 and 0.5 lbs. \$5,000, 5 lbs., C/100 hr. LC3.

Medical Help Table

Medical TL	Frequency of Rolls	Patients per Doctor
6	Daily	20
10	3 × daily	50

Diagnostic Smart Bandage

This is a sensor-equipped hemostatic plasti-skin bandage containing smart drug patches. A diagnostic smart bandage is manually applied; this takes 20 seconds, but otherwise use normal Bandaging rules (p. B424). It adds +2 (quality) bonus to skill when performing Bandaging, and its hemostatic proteins always stop bleeding.

After its application, the bandage will begin treating the patient for shock (p. B424), delivering a cocktail of drugs that help keep him calm, warm, and comfortable. After 10 minutes of this treatment, the bandage gets a First Aid-12 roll to determine its success. This is not quite as effective as a human medic: success restores only 1d HP rather than 1d+1, and there is no special result on a critical success. As usual, a critical failure results in a 2 HP loss.

Diagnostic Smart Bandage: Described above; four applications are \$20, 0.4 lbs. LC4.

Diagnostic Smart Bandage Spray: Takes only three seconds to apply; uses a smart aerosol. One application is \$5, 0.1 lb. LC4.

Surgical Equipment

A complete set of surgical equipment provides a +4 bonus to Surgery skill rolls in addition to the equipment quality

modifiers described below. See Surgery (p. B223 and p. B424).

Surgical Instruments: A complete set of surgical tools, including laser scalpels, forceps, bio-glue, sonic probe, and sutures. (This is also included in the crash kit, p. 135.) It is basic equipment for the Surgery skill. \$300, 15 lbs., 5B/20 hr. LC4.

Operating Theater: An entire room full of specialized equipment. Its instruments include manipulators that can be controlled via virtual reality gloves and an augmented reality interface; the surgeon still needs steady hands, but he's not putting them inside the patient. As a result, smaller incisions are needed and recovery times are halved. It provides a +2 (quality) bonus to Surgery skill. \$200,000, 1,000 lbs., 20C/40 hr. or external power. LC4.

Portable Surgery: A complete set of equipment that fits in the back of a utility vehicle, a trailer, or a hospital cart. This equipment is favored by "street docs" and military units. Its capabilities are the same as that of an operating theater, but it gives a +1 (quality) bonus to Surgery skill and +2 (quality) bonus to First Aid. A portable surgery takes five minutes to pack or unpack. \$50,000, 250 lbs., 5C/40 hr. (or external power). LC4.

Specialized Operating Theater: Dedicated to a particular Surgery specialization. It gives a +TL/2 (quality) Surgery bonus in that specialization, but is only basic equipment otherwise. \$1,000,000, 1,000 lbs., 20C/40 hr. or external power. LC4.

Specialized Portable Surgery: As above, but dedicated to a particular Surgery specialization, such as brain surgery or cybernetics. It provides a +2 (quality) bonus to Surgery skill in that specialization, but is only useful as basic equipment for other types of surgery. \$100,000, 250 lbs., 5C/40 hr. or external power. LC4.

Pocket Medic

This is a static robot the size of a paperback book. If clamped onto a wounded area, it will treat injuries. It has a hypo, anesthetic spray gun, and small surgical arms. It dispenses bandage spray (p. 197), then treats for shock with First Aid-12 (+1 per TL after TL9). After it is finished, it signals for removal. If its sensors indicate that first aid has failed, or that the patient is not responding to treatment, it calls for a physician. It has a built-in short-range radio (p. 44). \$1,200, 2 lbs., B/10 hr. LC4.

Medscanner

This multi-purpose medical scanner can detect internal injuries, genetic problems, diseases, implants, and more. It is a pocket-sized device with a one-yard range. It gives a +3 (quality) bonus to Diagnosis skill. \$1,000, 0.25 lbs., B/10 hr. LC4.

Nanostasis

This is a means of safely shutting down a person's metabolism, putting him into a state of permanent suspended animation, in which no special preservation tank

is needed. It uses nanomachines to install protective scaffolding and fixatives around and within every cell in the patient's body. Once placed in stasis, an organism does not require any oxygen or food, and cannot age or deteriorate, although it remains vulnerable to physical damage. Reversal of nanostasis requires similar bio-nanotech to remove the preservatives and restart bodily functions.

A living being placed into nanostasis is not dead. However, it is inanimate and unconscious, with IQ 0 and the Immunity to Metabolic Hazards, Injury Tolerance (Unliving), and Unaging advantages.

Nanostasis can also replace the need for anesthesia during surgery.

Nanostasis is safe, but the subject will be disoriented for hours (sometimes days) afterward. Upon revival, the process supervisor makes a Physician roll. Critical failure means the patient has the Confused (9) disadvantage for 20-HT hours, and Amnesia (Partial) for at least a week; roll vs. HT weekly to recover. Failure produces the same effects, but roll vs. HT daily to regain memory. On a success, Confused lasts only (20-HT)/2 hours and there is no memory loss. Critical success means immediate recovery.

Nanostasis Tank: A growth tank (p. TODO) modified to place someone into nanostasis, or to revive him. It takes five hours for the process to slow and then completely stop the patient's metabolism. Afterward, he can be safely removed. Reviving a patient takes eight hours. The tank uses up one package of nanomachines (\$5,000, 0.1 lbs.) per patient. \$300,000, 250 lbs., E/200 hours. LC3.

Nanostasis Pod: An armored and radiation-shielded (DR 50, PF 100) pod that contains a nanostasis tank and automatic suspension and revival equipment (Physician-14 for this purpose only). It powers down when not in use; it is designed to keep someone preserved for centuries. It can revive its occupant at a pre-set date. \$500,000, 500 lbs., E/200 hours (when not powered down). LC3.

Neural Inhibitor

A two-inch-wide disk with adhesive bonding material on one side. When applied to the bare skin of a living being with an approximately terrestrial vertebrate nervous system, it cuts off nerve impulses.

Its effects depend on where it is placed. If a neural inhibitor were attached to a person's forearm, his hand would be paralyzed, but he'd feel no pain from a hand or forearm injury, and surgery could be performed without anesthesia. If it were placed near the neck over the spinal cord, he would be paralyzed from the neck down. Use on the skull induces unconsciousness until removed. If the subject is not cooperating, treat these effects as a HT-6 affliction attack; the victim may roll to resist each second in contact.

A neural inhibitor gives a +1 (quality) bonus to First Aid to treat shock (p. B424). \$200, 0.1 lb., A/10 hr. LC 3.

Paramedical Swarm

This swarm of microbots is designed for autonomous patient care. It is made up of teams of specialized microbots. Some taste blood and perform diagnosis, some cut away

damaged tissue, clean wounds, sew up cuts, and inject drugs, and some enter the body to perform internal repairs or diagnosis.

The swarm may perform First Aid, cleaning and repairing damaged tissue and injecting no-shock drugs. Each square yard of swarm can treat one person at a time. A paramedical swarm has Diagnosis-10 and First Aid-10. It provides its own basic equipment for both skills, but it cannot benefit from other types of medical equipment. Paramedical swarms can't treat somebody in a sealed suit, but a swarm can be housed in microbot arteries (p. 131). \$6,000/square yard; see Swarmbots (pp. 35-37) for additional microbot swarm rules and options. LC3.

Regeneration Tank

A regeneration tank is a biofab (p. TODO) optimized for rapid whole-body cell repair. The tank contains mechanisms for controlling nanomachines as they permeate the user's body, instructing and assisting every viable cell in what repairs to make. Nonviable cells are programmed to self-destruct, or are removed and replaced with clones of healthy cells.

A Physician roll is required to supervise the procedure. Success means it works normally; failure takes twice as long as usual. It can heal everything up to permanent crippling injuries, at 1 HP per 12 hours, or radiation at 10 rads per day. Missing limbs and organs regrow in six weeks. \$500,000, 600 lbs., 2E/200 hr. LC3. A regeneration tank requires nanomachines and feedstock: a week's supply is \$1,000, 1 lb.

Rejuvenation Tank

This specialized regeneration tank reverses the aging process. Its nanomachines reset cellular clocks, killing senescent or dying cells and replacing them with healthy ones.

Rejuvenation requires three months of treatment, after which the subject's body is restored to young adulthood and full health. All age-related disadvantages and attribute losses are removed, as are any crippling injuries.

Rejuvenation is a risky procedure. The process supervisor must make a Physician roll. On a critical success, the patient is rejuvenated and fully recovered. Success means that the patient is rejuvenated but suffers Confused (9) (p. B129) for 1d days as he adjusts to his rejuvenated body. Failure means the structures of his memory were permanently disrupted: he has Partial Amnesia (p. B123). A critical failure results in either a messy death (such as being turned into a mass of cancer cells) or revival with no mind at all. An unfortunate side effect of *all* rejuvenations is the sterilization of the patient. Furthermore, each additional rejuvenation a patient undergoes adds a cumulative -1 penalty to the physician roll to use the tank.

A rejuvenation tank can also function as a regeneration tank. \$1,000,000, 600 lbs., 2E/200 hr. LC2.

Suitcase Doc

This device must be placed atop a patient's torso or other injured part (this takes a Ready maneuver). After that, it is autonomous. It unfolds, extruding surgical manipulators, anesthesia and life support tubes, and diagnostic sensors as necessary. It uses its manipulators to cut away clothing and treats the patient using Diagnosis-10, First Aid-12, Physician-10, and Surgery-10. It incorporates diagnostic probes (p. 135), suitcase ESU (p. 135), and a crash kit (p. 135).

If the doc encounters a problem it can't handle, it calls for help on its short-range radio. It also carries 10 uses of bandage spray and an internal pharmacy with up to 20 doses of drugs. \$10,000, 20 lbs., 2C/10 hr. LC3.

Medical Robots

Most medical robots are static equipment or tiny microbots.

Nursebot

209 points

This man-shaped robot caregiver can assist the elderly and disabled, both at home and in clinics and hospitals. Its long, dexterous fingers have retractable surgical instruments, which can function as claws if used in combat. Its oversized head contains infrared and sonar systems for patient imaging.

Some nursebots can pass as human, although a sculpted humanoid version is more common.

Attribute Modifiers: ST+3 [30]; HT+2 [20].

Secondary Characteristic Modifiers: HP+7 [14].

Advantages: Absolute Direction [5]; Ambidexterity [5]; Discriminatory Taste (Profiling, +50%) [15]; Doesn't Breathe [20]; DR 2 [10]; High Manual Dexterity 2 [10]; Infravision [10]; Machine [25]; Microscopic Vision 2 [10]; Penetrating Vision 1 (Blockable, Dense Substances, -30%) [7]; Radio (Burst, +30%, Secure, +20%, Video, +40%) [19]; Sealed [15]; Sensitive Touch [10]; Sharp Claws (Switchable, +10%) [6]; Vacuum Support [5].

Perks: Accessories (Personal computer; surgical instruments) [2]; Sanitized Metabolism [1].

Disadvantages: Electrical [-20]; Restricted Diet (Very Common, power cells) [-10].

Lenses

Select one of these model lenses, then combine it with a machine intelligence lens (p. TODO) and a biomorphic lens (p. TODO).

Vintage Model (-5 points): Add Maintenance (one person, weekly) [-5]. \$150,000, 150 lbs., 2D/8 hr. LC4.

Modern Model (+1 point): Add Maintenance (one person, bi-weekly) [-3], Reduced Consumption 2 [4]. \$100,000, 150 lbs., 2D/24 hr. LC4.

Psychiatric Equipment

This equipment is for monitoring and manipulating the mind.

Brainscanner

A brainscanner observes the human brain by the mind's electrical activity. A high-resolution 3D structural scan of the subject's brain is assembled using a HyMRI or similar system. Other real-time electrical recording technologies such as magnetoencephalography (MEG) or electroencephalography (EEG) are used to record the firing of individual brain cells and map those impulses to the scan.

Brainscanners can also be used to create a "persona map," a model of the way a person thinks. The subject must be conscious, but cooperation is not required. Roll against Electronics Operation (Medical); one roll is allowed each day. Updates are performed at +1 and generally take a few hours.

Careful study of a recent persona map can reveal a person's main mental advantages, disadvantages, and quirks. It requires two hours and a successful Psychology skill roll, which provides a +2 bonus to Psychology and +1 to other social skills when dealing with that individual.

Scanning Net: This is a network of electrodes, superconducting quantum-interference devices (SQUID), and other sensors that must be attached to the subject's head. It must be used in conjunction with a prior HyMRI scan. \$6,000, 4 lbs. LC4.

Implant Net: A neural interface (p. 26) or biomonitor implant (p. TODO) allows brain scans without the use of a scanning net. This provides +1 to all tasks that require a brainscan.

Deep Brainscanning

This is an *interactive* brainscan. The person running the scan must fit the subject with a neural interface (p. 26), then stimulate the parts of the brain associated with memory recall. The subject is conscious but in a dreamlike state through most of the process. Roll every week rather than daily. Success provides data that gives triple the bonus of a brainscan, and which is sufficient to design a shadow mind emulation (p. TODO).

Biotech Equipment

Equipment for growing life forms and for biotechnology research. Portable labs (p. 41) for Biology skill are also useful.

Growth Tank

An artificial womb that can be used to grow a life form to infancy or adulthood. It's no faster than natural growth. An organism developing in a growth tank has the same awareness as a baby in its womb. If kept past the fetal stage, it will not develop mentally beyond infancy unless additional stimulation (such as an educational dreamgame) is provided.

Incubator Growth Tank: Can carry a human infant to term. \$10,000, 10 lbs., external power. LC3.

Adult Growth Tank: Big enough to allow a human to grow to adulthood inside it. \$200,000, 200 lbs., external power. LC3.

Larger and smaller tanks are \$1,000 and 1 lb. for each pound of body weight they can support.

Biofab

This is a specialized wet nanofactory that can assemble organs or even a complete life form. A biofabricator can assemble living things rapidly (about a year of growth every week). It can grow an adult human in about 18-20 weeks.

Incubator Biofab: Can carry a human infant to term. \$200,000, 50 lbs., D/20 hr. (but usually runs on external power). LC2.

Adult Biofab: Big enough to allow a human to grow to adulthood inside it. \$4,000,000, 1,000 lbs., E/20 hr. (but usually runs on building power). LC2.

Larger and smaller tanks are \$20,000 and 5 lb. for each pound of body weight they can support.

Drugs and Nano

A drug may be a pill, injection, aerosol, contact agent, or aerosol contact agent. Many drugs are available in multiple forms. Most pills require 30 minutes or more to take effect, but can be dissolved in drinks. Contact agents such as patches take at least five minutes, while aerosols and injections take effect almost immediately. Double cost for aerosols or contact agents, or multiply by 10 for aerosol contact agents.

Each doubling of dosage gives an extra -1 to the roll to resist.

Analgine-Beta

This drug masks pain for a period equal to half the user's HT in hours. Unfortunately, the user is also Numb for the same period. \$50 per dose. LC3.

Antirad

One dose halves the effective amount of rads from a new exposure; two doses will halve exposure again, and so on. Antirad is preventative; it does not heal radiation damage. It comes as an injection or pill for \$150 per dose.

Hyperstim

This drug *instantly* awakens an unconscious person, regardless of his HP or FP. Someone using this drug cannot fail a HT roll to avoid unconsciousness. After the drug wears off, roll vs. HT. Failure causes 1 HP damage, while critical failure also results in a heart attack. \$100 per dose. LC2.

Morphazine

This drug puts the patient into a deep, dreamless sleep. The user gets a HT-3 roll to resist; failure results in the user falling asleep for eight hours times the margin of failure. It is a reliable, powerful sleeping pill, often available only through prescription. If injected, it works in one second. \$10 per dose. LC3.

Soothe

Places the user in a dreamy state of euphoria. Roll HT-3; if the roll is failed, the drug causes the Euphoria irritating condition and High Pain Threshold advantage for five minutes times the margin of failure. The user has no memory of events that occur while under the drug's influence. \$15 per dose. LC4.

Crediline

A psychoactive drug designed for interrogations and drug-assisted psychotherapy. It is often abused by criminals. The subject becomes trusting and talkative. He must roll HT-3 or suffer the Gullibility (9) disadvantage for (25-HT) minutes. \$240 per dose. LC2.

Ascepaline

Accelerates cellular regeneration: anyone using it regenerates 1 HP every 4 hours. Each dose lasts a day, and a week should elapse before another dose is taken. If not,

roll vs. HT+2 for the second dose, HT+1 for the third, etc. Failure means the user's natural ability to heal without the drug is permanently damaged: the user gains Unhealing (Partial) (p. B160). He may still use Ascepaline, however. \$20 per dose. LC3.

Purge

This cleanses the user's system of foreign biochemicals. If the user makes a HT roll, it neutralizes any active drugs (including recreational drugs and alcohol) within 2d minutes. Failure means that the dose had no effect; critical failure also nauseates the user (-3 DX for 1 hour). Purge will not counteract drug addiction or cure side effects that remain after the drug that caused them wears off. Purge has no effect on TL11+ drugs or most deadly poisons, but it will counteract sleep gas. \$20 per dose. LC4.

Memory-Beta

Stimulates the user's memory. After taking a dose of the drug, he can remember nearly anything that has happened to him that he concentrates on recalling. An IQ roll is required to focus on something specific, and some stimulus is required to recall buried memories. If the IQ roll fails, the user gets lost in his own memories, reliving bits and pieces of his life. A critical failure results in the user being captured by some especially strong memory, whether of joy, tragedy, terror or even birth. This may trigger buried phobias or other psychological traumas. \$250 per dose. LC3.

Chapter 32

Cybernetics and Uploading

While Cybernetics began as prosthetic limbs and organs, modern biotechnology that allows for the growth of new limbs and organs has eclipsed the need for purely cybernetic replacements. Instead, cybernetic technology has turned towards those which *enhance* the body.

Social Effects of Cybernetics

While there are certainly those who shun cybernetics, especially among the radical anti-android movement, they are exceedingly rare. Among most people, cybernetics are as normal as eye-glasses (in fact, eye glasses might be rarer given the state of the ease of replacement or bionic eyes).

Statistics

Cybernetic modifications usually provide advantages or mitigate disadvantages; these traits are listed under Statistics along with the total point cost. The Body Modification (p. B294) rules apply, with the exception that the more detailed Operations rules below supersede the Surgical Modifications rules on p. B295.

Cybernetic advantages often have the limitation Temporary Disadvantage (Electrical, -20%), which means the advantage is vulnerable to electrical surges, power draining, etc. See Electrical, p. B134.

Cybernetic replacement parts for specific body locations are bought as a crippling disadvantage with the Mitigator (-70%) limitation. This limitation is assumed to include the effects of the Electrical, Maintenance (1 person, monthly) (p. B143), and Unhealing (p. B160) disadvantages for that body part.

Cybernetic implants generally supercede (or mitigate) existing natural or biological traits. Thus, if someone with Night Vision 1 gains a bionic eye that provides Night Vision 2, the levels don't stack together. Modify the character's

point total accordingly; if paying character points for the advantage, base the cost on the net change (if positive).

Availability

Each modification specifies the type of procedure, the cost of the cybernetics, and the LC. Procedures are classified as simple, minor, complex, or radical – see below.

Procedure

Installing cybernetic modifications requires, except for simple procedures, involved neuro-surgery. For players or NPCs performing this surgery, use the Surgery (Cybernetics) skill (Defaults: Surgery-2). When receiving this surgery at a reputable hospital, no skill rolls are generally required.

The Surgical Procedures Table shows the difficulty modifiers (parenthetical modifier is for brain or eye surgery), time per attempt, and the injury caused by a failed roll (which is applied to the body part being operated on). Success installs the modification, but it won't work until after the specified recovery period. The fee is the surgical fee charged at a clinic or hospital – ignore it when doing your own work.

These times assume the surgeon is using precise, robotic instruments; without them, double the recovery time and damage. (Increase the damage from a failed Simple procedure to 1d/2 HP.)

A modification is not functional until the recovery time has passed. If a disadvantage is mitigated by the modification – e.g., One Hand for Bionic Hand – the patient will suffer the disadvantage until the recovery time is completed.

On a critical success, halve the recovery time. A critical failure means that the cybernetic is defective in some way. This may mean it will break down at some point or it might cause an inconvenient disadvantage.

Surgical Procedure Tables

Procedure	Modifiers	Time	Injury	Recovery Period	Fee
Simple	+4 (+2)	15 min.	1 HP	1 hour	\$100
Minor	+2 (+0)	1 hour	1d/2 HP	1 day	\$1,000
Major	+0 (-2)	2 hours	1d HP	1 week	\$10,000
Radical	-3 (-5)	4 hours	3d HP	4 weeks	\$100,000

Biofabrication

Some surface implants – notably skin coatings and dermal armor – can be grown by immersing the patient in a biofab, which assembles the implant similarly to a 3D printer.

This process requires a Physician roll (modified by the quality of the tank) and takes the specified time on the Surgical Procedures Table. During this time, the patient is unconscious. On a failed Physician roll, the process must be repeated. On a critical failure, something goes gruesomely wrong, resulting in 1d corrosion damage for every 2 hours the process took.

Detecting and Removing Cybernetics

A diagnostic bed (p. 134), medscanner (p. 137), or X-ray scanner (p. 66) can detect concealed implants on a successful Electronics Operation (Medical) or Diagnosis roll.

Cybernetics can be safely removed in the same fashion they are installed, but the operation is easier: add +1 to Surgery rolls. If the parts don't need to be removed intact, add +2 and halve the time required.

Cybernetics may be rigged to cause unpleasant effects (e.g. see Bomb Implant, p. 144) if removal is attempted. A successful Traps-4 roll is required to notice a cyber-trap before it goes off; roll at no penalty if specifically looking for it. Disarming a booby trap requires an appropriate Traps roll prior to the surgery.

Second-Hand Cybernetics

Second-hand parts may be available, usually at 20-70% the normal cost. This may or may not be a bargain, and there may be damage that is not immediately evident.

Looting cybernetics from bodies results in salvaged cybernetics worth 10-35% of the original value. The process of salvaging them follows the removal rules above if the victim is living. Salvaging from a corpse is much faster. It takes only one-third the procedure time and, if paying someone, costs 1/10th as much. A Mechanic (Robotics) skill roll can be substituted for surgery. Failing the roll means the parts require major repairs; critical failure destroys them.

Repairing Cybernetics

Use Mechanic (Robotics) skill to repair physical damage or malfunctioning cybernetics, or to diagnose second-hand parts to see if they have any hidden flaws. Minor damage to bionic body parts can be repaired from the outside, without surgery. For implants and major damage, the part must be completely removed before repairs can take place.

Powering Cybernetics

Cybernetic devices are generally powered by body heat and motion, though there are some exceptions. Bionic limbs require cell replacement or recharging on a monthly basis (this is part of the maintenance requirement subsumed in their Mitigator limitation)

Acquiring Cybernetics

At character creation, cybernetics are paid for with Character Points but during play, cybernetics are bought using money and you do not pay the Character Point cost.

You cannot acquire Cybernetics without paying for them, even if you have the Character Points.

Body Modifications

These include modifications to the body's limbs and organs, as well as implanted devices.

Biomonitor Implant

This implant monitors vital signs: pulse, heartbeat, blood pressure, respiration, brainwaves, blood sugar, and alcohol levels, as well as the overall condition of the user's other cybernetics. It includes a small wrist display, and can connect to a neural interface (p. 26) or computer implant (p. 147). It gives a +2 bonus to any First Aid, Diagnosis or Physician rolls on the cyborg, as long as the medic can see the display. Halve the bonus if the user can see it but has to describe it to the medic. If the medic has a neural interface or a computer, he can jack it into a port beside the visual readout and monitor the cyborg directly.

Statistics: Accessory (Biomonitor) [1]. *1 point.*

Availability: Simple procedure. \$100. LC4.

Bionic Arm or Hand

This is slightly stronger than the original, but constrained by the limits of the flesh-and-bone shoulder it is attached to.

One Bionic Arm

Statistics: Arm ST+2 (One arm; Temporary Disadvantages, Electrical, -20%, and Maintenance, 1 person, weekly, -5%) [5]; DR 2 (One arm, -40%) [6]; One Arm (Mitigator, -70%) [-6]. *5 points.*

Availability: Major procedure. \$12,000. LC4.

Two Bionic Arms

Statistics: Arm ST+2 (Both arms; Temporary Disadvantages, Electrical, -20%, and Maintenance, 1 person, weekly, -5%) [8]; DR 2 (Arms, -20%) [8]; No Fine Manipulators (Mitigator, -70%) [-9]. *7 points.*

AVAILABILITY: Two major procedures. \$24,000. LC4.

If the recipient already has one existing bionic arm, use the Availability entry for one bionic arm.

Bionic Hand

A cybernetic hand and wrist.

Statistics: Arm ST+1 (One arm, Temporary Disadvantage, Electrical, -20%) [3]; DR 2 (One hand, -80%) [2]; One Hand (Mitigator, -70%) [-4]. *1 point.*

Availability: Major procedure. \$8,000. LC4.

Bionic Ears

Crude cybernetic implants to repair damaged or lost hearing were available even in ancient history; these are much more advanced, providing some benefits over natural ears.

Bionic Ear

Statistics: Hard of Hearing (Mitigator, -70%) [-3]. -3 points.

Availability: Minor procedure. \$500. LC4.

Bionic Ears

Statistics: Protected Hearing [5]; Deafness (Mitigator, -70%) [-6]. -1 point.

Availability: Two minor procedures. \$1,000. LC4.

Advanced Bionic Ears

These ears are connected to a computerized sound-profiling database.

Statistics: Discriminatory Hearing (Temporary Disadvantage, Electrical, -20%) [12]; Protected Hearing [5]; Deafness (Mitigator, -70%) [-6]. 11 points.

Availability: Two minor procedures. \$5,000. LC4.

Bionic Eyes

The eye is a complex organ, but modern cybernetics are able to replace it with something that works just as well or better than the original. Standard features are roughly equivalent to night vision contact lenses, including a video display option and low-light and telescopic (2x) optics.

One Bionic Eye

Statistics: Accessory (Video Display) [1]; Nictitating Membrane 2 (One eye, -50%) [1]; Night Vision 2 (Temporary Disadvantages, Electrical and No Depth Perception, -35%) [2]; Telescopic Vision 1 (Temporary Disadvantages, Electrical and No Depth Perception, -35%) [4]; One Eye (Mitigator, -70%) [-4]. 4 points.

Availability: Major eye procedure. \$5,000. LC4.

Two Bionic Eyes

Statistics: Accessory (Video Display) [1]; Nictitating Membrane 2 [2]; Night Vision 2 (Temporary Disadvantage, Electrical, -20%) [2]; Protected Vision [5]; Telescopic Vision 1 (Temporary Disadvantage, Electrical, -20%) [4]; Blindness (Mitigator, -70%) [-15]. -1 points.

Availability: Two major eye procedures. \$10,000. LC4.

Bionic Leg

A single cybernetic leg is limited by the capabilities of the remaining original leg. A pair of legs are more useful.

One Bionic Leg

Statistics: DR 3 (One leg, -40%) [9]; Missing Legs (Mitigator, -70%) [-6]. 3 points.

Availability: Major procedure. \$8,000. LC4.

Two Bionic Legs

Statistics: Basic Move +1 (Temporary Disadvantages, Electrical, -20%, and Maintenance, 1 person, weekly, -5%) [4]; Super Jump 1 (Temporary Disadvantages, Electrical, -20%, and Maintenance, 1 person, weekly, -5%) [8]; DR 3 (Legs, -20%) [12]; Legless (Mitigator, -70%) [-9]. 15 points.

Availability: Two major procedures. \$16,000. LC4.

Bionic Vital Organs

Complete cybernetic replacement of the heart, lungs, or other vital organs is usually performed only to save a life. This may be combined with additional implants that improve on the original organ.

Bionic Organ Transplants

One of the most common operations, this extends older medicine with better pacemakers, artificial lungs, etc. The procedure is common, and therefore cheaper than most cybernetics.

Statistics: Hard to Kill (Temporary Disadvantage, Electrical, -20%) +2 [4]; Terminally Ill (Up to one month; Mitigator, -70%) [-30]. -26 points.

Availability: Major procedure. \$7,000. LC4.

Boosted Heart

This combination of a cybernetic heart upgrade and arterial reinforcement allows the recipient to temporarily boost his metabolism beyond human norms. It can be added to either a healthy or a bionic heart.

Statistics: Basic Speed +1 (Costs Fatigue 1, -5%; Temporary Disadvantage, Electrical, -20%) [15]; Immunity to Heart Attack (Temporary Disadvantage, Electrical, -20%) [4]. 19 points.

Availability: Major procedure. \$10,000. LC4.

Bionic Voicebox

This implant replaces the recipient's voicebox, and may include an artificial tongue if the original was damaged. Someone with a damaged or recovering voicebox can croak or gurgle, but cannot actually speak. These implants can also be used to give animals the power of speech, although at IQ 5 or less, they can only parrot words.

Cybervoder

Statistics: Cannot Speak (Mitigator, -70%) [-4]. -4 points.

Availability: Minor procedure. \$1,000. LC4.

Silvertongue Implant

Statistics: Cannot Speak (Mitigator, -70%) [-4]; Voice (Temporary Disadvantage, Electrical, -20%) [8]. *4 points.*

Availability: Minor procedure. \$5,000. LC4.

Bomb Implant

This explosive charge is attached to a timed or radio-triggered detonator and placed in the subject's head or torso. Implanted bombs could be suicide devices under the control of the implantee, or used to insure the loyalty of untrustworthy subordinates. Implanted bombs are often wired into other implants to prevent tampering – see *Detecting and Removing Cybernetics* (p. 142).

An ounce of explosive will inflict 6d+1 crushing damage with the explosive modifier; wounding to the victim is tripled (as per a vital hit) for a torso charge in the vitals, or quadrupled (as per a skull injury) for one buried in the head. An exploding skull inflicts 1d-3 cutting fragmentation damage to anyone nearby.

A nasty variation on the implanted bomb is to place it under the control of a computer implant (p. 147) which shares the victim's consciousness. Such a system is much harder to fool than a guard with a radio trigger!

Statistics: An implanted bomb may qualify as an Involuntary Duty.

Availability: Simple procedure. Use the cost and LC of a smart grenade (p. 95); a 25mm or 40mm can fit in the torso, a 15mm in a limb, 10mm elsewhere in the body.

Boosted Reflexes

These implanted glands release chemicals on mental command, triggering a controlled adrenaline-like response.

Statistics: Basic Speed +1 (Costs Fatigue, 2 FP, -10%) [18]. *18 points.*

Availability: Minor procedure. \$9,000. LC3.

Cyber Claws

The recipient's hands or feet are equipped with ceramic or metal claws. The claws are retractable, triggered by muscle contractions.

Statistics: Sharp Claws (Switchable, +10%) [6].

Availability: Minor procedure. \$6,000. LC3.

Halve the cost and treat as a simple procedure if adding these to a bionic hand or arm.

Filter Implant

A self-regenerating particle-filtration system integrated into the recipient's lungs.

Statistics: Filter Lungs [5].

Availability: Minor procedure. \$2,500. LC4.

Flesh Pocket

This is a surgically implanted pocket or pouch, sealed by a flap of skin. It can be used to smuggle small objects. A flesh pocket is normally installed in the torso; up to five

levels are possible. Each level allows the pocket to hold up to Basic Lift/10 lbs. If placed elsewhere, a maximum of one level can be installed, and the amount of weight that can be carried is divided by 4 (leg), 8 (arm), or 16 (head or neck).

Statistics: Payload 1-5 [1/Level]. *1-5 points.*

Availability: Simple procedure. \$200 per level. LC3.

Gyrobalance

This is a miniature electronic gyroscope implanted in the inner ears (both ears – but treat as a single operation), and interfaced to improve the recipient's sense of balance.

Statistics: Klutz (Mitigator, -70%) [-2]; Perfect Balance (Temporary Disadvantage, Electrical, -20%) [12]. *10 points.*

Availability: Minor procedure. \$7,000. LC4.

Hidden Compartments

A cybernetic arm or leg may have a compartment large enough for any small object of up to Basic Lift/10 lbs. weight.

Statistics: Payload 1 [1].

Availability: Simple procedure. \$500. No operation required if purchased with the limb. LC4.

Implant Radio

This "implant communicator" is a radio (p. 24) with a range of one mile. It is spliced into the recipient's auditory nerve; the user may speak normally or subvocalize. A character with an implant radio can use it to subscribe to a cell phone or net service provider.

Statistics: Radio (Reduced Range, 1/10, -30%; Secure, +20%; Temporary Disadvantage, Electrical, -20%) [7]. *7 points.*

Availability: Simple procedure. \$100. LC4.

Implant Video Comm

This implanted radio communicator (p. 24) is spliced into the recipient's optic nerves to provide a video display. It has a range of one mile, and can be used to subscribe to a cell phone or net service provider.

Statistics: Radio (Reduced Range, ×1/10, -30%; Temporary Disadvantage, Electrical, -20%; Video, +40%) [9]. *9 points.*

Availability: Simple procedure. \$200. LC4.

Memory Flesh

These synthetic flesh implants allow the recipient to shift between two different sets of facial and bodily features: his own and another set specified when it is installed.

Statistics: Alternate Form (Cosmetic, -50%, Temporary Disadvantage, Electrical, -20%) [5]. *5 points.*

Availability: Major procedure. \$20,000. LC3.

If the subject already has bioplastic skin (p. 145), this is a minor procedure.

Subdermal Armor

This flexible armor is implanted under the skin. The operation uses nanotechnology to grow the armor under the skin. A careful tactile examination, a diagnostic bed, or a medscanner can detect the armor, but it is invisible to the naked eye and does not appear on metal detectors. It provides DR 12 vs. piercing and cutting damage and DR 4 vs. other damage.

Statistics: DR 8 (Limited, Piercing and Cutting, -20%; Tough Skin, -40%) [16]; DR 4 (Tough Skin, -40%) [12]. 28 points.

Availability: Major procedure. \$2,000. LC2.

Smart Tattoos

These tattoos are made with video ink. They can follow preprogrammed scripts, or even act in response to changes their sensors detect in the skin (sweat, temperature, etc.). A tiger tattoo might roar when it detects anger, or purr when the wearer is aroused.

Statistics: Distinctive Features 1 (Switchable, -10%) [0]. 0 points.

Availability: Simple procedure. \$200. LC4.

Stinger

This concealed implant houses a single disposable hypo (p. 135) sheathed under a fingernail or in a body cavity. The recipient has no ability to manufacture drugs or toxins; he must buy hypos loaded with injectable drugs, poisons, or metabolic weapons. It takes 10 seconds to remove and replace a hypo in the mount.

A fingernail-mounted stinger attacks just like a jab with a disposable hypo. It has reach C, does 1 HP damage for penetration purposes, but with no wounding, and delivers a follow-up attack based on whatever agent was loaded into it. If the user has claws rather than normal fingernails, the injection can be a follow-up attack to the claw's damage. A body-cavity stinger is mostly useful to deliver a surprise attack during an intimate moment; a Touch-8 sense roll can notice the tiny mount before it can be used. A stinger in the mouth can also be a follow-up attack to a bite.

Statistics: Extra Arm (Switchable, +10%; Takes Recharge, -10%; Weapon Mount, -80%) [2]. 2 points.

Availability: Minor procedure. \$500 (hypos not included). LC3.

Weapons Mounts

These are modular weapons installations attached to a cyborg's body. Each can mount a single weapon that weighs no more than the recipient's Basic Lift. Mounted weapons cost cash – not points – and their weight counts as encumbrance.

A mounted weapon is plugged-in, not built-in. The user can swap it for another weapon with a suitable interface. It takes five seconds to mount or remove a weapon.

Concealing a weapon mount is similar to hiding a firearm of similar bulk. A Bulk -5 rifle built into one's arm will have

a protruding muzzle, while a Bulk -1 holdout pistol may have only a tiny gun-port built into the user's palm.

All mounted weapons can be detected by searches. Enemies or the authorities can unplug and confiscate them, just like carried weapons.

Bionic Arm or Hand Mount

This is a weapon mount built into an existing bionic arm or hand (p. 142). It may be mounted above or below the arm, or fire out through the palm. The weapon's weight may not exceed Basic Lift if in an arm, or half of Basic Lift if in a hand.

Statistics: Extra Arm (Weapon Mount, -80%) [2].

Availability: Minor procedure. \$100/lb. of weapon weight. LC of weapon.

Heavy Weapon Arm

This weapon mount replaces the user's arm with a socket joint and a hardpoint for attaching a weapon, usually rifle-sized. The mounted weapon must weigh equal to or less than the user's Basic Lift.

Statistics: To replace one arm with a weapon mount, take Extra Arm (Weapon Mount, -80%) [2] and One Arm [-20]. -18 points.

Availability: Minor procedure. \$100/lb. of weapon weight. LC of weapon.

Accelerated Reflexes

A system of electronic nerves and computer hardware that replaces large sections of the nervous system.

Statistics: Extra Attack 1 (Temporary Disadvantage, Electrical, -20%) [20]. 20 points.

Availability: Radical procedure. \$50,000. LC2.

Bioplastic Skin

This modification covers the recipient's body with a sheath of living smart bioplastic (p. 117). It is thin and sensitive enough that it looks and behaves like normal skin, and even heals itself. It is invisible armor covering the entire body. It has DR 15 vs. burning or piercing damage, DR 5 vs. other types of damage.

Statistics: DR 10 (Limited, Burning and Piercing damage, -20%; Tough Skin, -40%) [20]; DR 5 (Tough Skin, -40%) [15]. 35 points.

Availability: Major procedure. \$20,000. LC3.

If installed first, bioplastic skin reduces the cost and difficulty of certain other cybernetic skin modifications.

Cyberhair

This implant replaces sections of ordinary hair with thin cybernetic tendrils attached to a reinforced scalp. Cyberhair does not grow and cannot be cut by ordinary razors or scissors, but it can coil close to the scalp when the recipient needs a "haircut."

Cyberhair can be used as a simple manipulator, which may be useful if the user is grappled or tied up. It must be at least shoulder-length to be effective.

Shoulder-Length Cyberhair

Statistics: Extra Arm 1 (Extra-Flexible, +50%; Short, -50%; Temporary Disadvantages, Electrical, -20%, and Maintenance, 1 person, weekly, -5%; Weak, 1/4 body ST, -50%) [3]. *3 points.*

Availability: Major procedure. \$3,000. LC4.

Waist-Length Cyberhair

Statistics: Extra Arm 1 (Extra-Flexible, +50%; Temporary Disadvantages, Electrical, -20%, and Maintenance, 1 person, weekly, -5%; Weak, 1/4 body ST, -50%) [8]. *8 points.*

Availability: Major procedure. \$4,000. LC3.

Knee-Length Cyberhair

Longer and tougher, with a reinforced scalp to support the hair's capabilities.

Statistics: Extra Arm 1 (Extra-Flexible, +50%; Long, +100%; Temporary Disadvantages, Electrical, -20%, and Maintenance, 1 person, weekly, -5%; Weak, 1/2 body ST, -25%) [20]. *20 points.*

Availability: Major procedure. \$10,000. LC3.

Variskin

The recipient's skin is replaced or coated with smart film. He can change its color and texture to blend in with the surroundings. If nude, he gets +2 to Stealth skill when perfectly still, or +1 if moving. Clothing reduces this to +1 when perfectly still. It takes one second to alter skin pigment, and unnatural colors such as green or chrome are possible. The skin can also function as a video display terminal for data run through neural interface or computer implant.

Statistics: Accessory (Video terminal) [1]; Chameleon 1 (Controllable, +20%) [6]. *7 points.*

Availability: Minor procedure. \$1,000. LC2.

If the patient has bioplastic skin (p. 145) the procedure is simple.

Gill Implant

This implant allows the recipient to breathe underwater, using a device that extracts oxygen from water (it's not a true set of fish gills). It uses two C cells per day of operation. Maintenance involves opening an access panel in his chest or back, cleaning filters, and installing new power cells.

Statistics: Doesn't Breathe (Gills, -50%; Temporary Disadvantages, Maintenance, 1 hour, daily, -10%, and Electrical, -20%) [4]. *4 points.*

Availability: Major procedure. \$8,000. LC4.

Hive Implant

This implanted swarmbot hive (p. TODO) can carry a single swarm measuring one square yard. It includes recharging ports hidden by a skin flap, allowing the swarm to recharge from a power system or the included C cell. The swarm and a control system (such as an implant computer and advanced com implant) must be acquired separately.

Statistics: Accessory (Swarmbot Hive) [1]; Payload 1 [1]. *2 points.*

Availability: Minor procedure. \$1,000. LC4.

Intestinal Recycler

The human digestive system is imperfect, so waste matter always contains useful chemicals that could have been metabolized and used by the body. This implant collects waste matter and reprocesses it.

Statistics: Reduced Consumption 2 [4]. *4 points.*

Availability: Major procedure. \$4,000. LC4.

Nanoweave Subdermal Armor

Advanced flexible armor implanted under the patient's skin. It has DR 18 vs. piercing and cutting damage and DR 6 vs. other damage.

Statistics: DR 12 (Limited, Piercing and Cutting, -20%; Tough Skin, -40%) [24]; DR 6 (Tough Skin, -40%) [18]. *42 points.*

Availability: Major procedure. \$5,000. LC2.

Polyskin

A combination of micromachines, smart bioplastic implants, and artificial glands that allow the recipient to alter his appearance. He can adjust apparent weight, skin color and tone, and facial structure.

The system can be purchased for the face or for the entire body. It can also be combined with sexmorph (p. 147).

If the recipient already has bioplastic skin (p. 145) divide the dollar cost of the implant and the recovery time by 2.

Polyskin Body

Statistics: Elastic Skin (Temporary Disadvantage, Electrical, -20%) [16]. *16 points.*

Availability: Radical procedure. \$36,000. LC2.

This is only a major procedure if the recipient already has bioplastic or living metal skin.

Polyskin Face

Statistics: Elastic Skin (Face only, -25%; Temporary Disadvantage, Electrical, -20%) [11]. *11 points.*

Availability: Major procedure. \$15,000. LC2.

Reinforced Skeleton

Micro- or nanomachines can reinforce a patient's skeleton with carbon fibers, transforming his bones into structures with the strength of metal. Implants take over the function of bone marrow and produce blood cells. Weight does not increase. While the reinforced bones do not show up on metal detectors, they can be identified with X-rays, diagnostic beds, and other advanced sensors.

Statistics: HP+5 [10]; DR 20 (Skull only, -70%) [30]; DR 10 (Limited, Crushing, -40%; Tough Skin, -40%) [10]. *50 points.*

Availability: Radical procedure. \$50,000. LC3.

Ripsnake

This cybernetic assassin's weapon is a concealed bionic limb linked to the user's nervous system. It uncoils from a natural body opening (usually the mouth) when deployed, and can attack semi-autonomously.

In certain situations, a ripsnake can deliver an automatically successful attack to the vital organs. For example, if a would-be assassin with a ripsnake concealed in his mouth kisses someone, it can coil out and down his victim's throat.

Statistics: Extra Attack 1 (Ripsnake Only, -20%) [20]; Impaling Striker (Cannot Parry, -40%; Long, +1 SM, +100%; Temporary Disadvantage, Electrical, -20%) [12]. *32 points.*

Availability: Major procedure. \$26,000. LC2.

Sexmorph

This suite of sphincter valves, synthetic hormone glands and memory or bioplastic implants allows the recipient to switch gender in 10 seconds. If desired, a user can also adopt a neuter phase (no obvious genitalia or breasts) or mixed phase (male genitalia, female breasts, or vice versa) with voice and features as desired.

Statistics: Hermaphromorph (Temporary Disadvantage, Electrical, -20%; transsexual form also, +20%) [5]. *5 points.*

Availability: Major procedure. \$10,000, LC3.

Slickskin

The recipient's skin is covered with a switchable smart matter nanofilm. When activated, most of his skin becomes virtually frictionless. The palms of the hands and the soles of the feet are not affected.

Statistics: Slippery 3 [6]. *6 points.*

Availability: Major procedure. \$12,000. LC3.

Thermal Imaging Eyes

This is a pair of bionic eyes with tiny infrared imaging cameras, day/night telescopic optics, and a HUD (p. 13) chipped into the optic nerves.

Statistics: Accessory (HUD) [1]; Infravision (Temporary Disadvantage, Electrical, -20%) [8]; Nictitating Membrane 2 [2]; Telescopic Vision 1 (Temporary Disadvantage, Electrical, -20%) [4]; Blindness (Mitigator, -70%) [-15]. *0 points.*

Availability: Two major procedures (minor if replacing existing bionic eyes). \$8,000. LC4.

Brain Implants

Brain implants are inserted into the recipient's skull and linked to his central nervous system. Some societies may see brain implants as sinister. Others may consider altering the mind to be more socially acceptable than modifying the body.

Brain implants are riskier than other implants. Critical failure on major or radical procedures may cause brain injury, resulting in a loss of one point of IQ, or a disadvantage like Epilepsy or Phantom Voices.

Braintap

A braintap is an advanced form of implant communicator that lets the recipient transmit his experiences as sensies (p. 32). Others can use the receiver to experience or record the sensory information experienced by the braintapped character.

Braintaps are used by sensie stars, journalists, or anyone else who wants to record his personal experiences. A normal braintap can be turned on or off by the user, but remote-controlled braintaps are also possible. It is possible to implant a braintap in an animal. If well-trained, such animals make very useful scouts or familiars. A braintap can also be implanted without someone's knowledge, during other surgery – a favorite trick of intelligence agencies.

Braintap Jack

This incorporates a plug-in cable jack (p. 23) plus a sensie transmission module. If the user has a computer implant (below), he can store data in it.

Statistics: Cable Jack (Send Only, -50%; Sensie, +80%) [7].

Availability: Minor procedure. \$3,000. LC4.

Wireless Braintap

This incorporates a radio transmitter with a one-mile range and a sensie-transmission module. If the user has a computer implant, he can store data in it.

Statistics: Radio (Secure, +20%; Reduced Range, $\times 1/10$, -30%; Send Only, -50%; Sensie, +80%) [12].

Availability: Minor procedure. \$12,000. LC3.

Computer Implant

This is a computer implanted in the recipient's head and controlled through its own direct neural interface. It takes only a thought to call up a file or access a database. Data scrolls across the periphery of the user's vision, and he hears the computer as a voice in his head.

The implant includes an optical-recognition feature using the user's eyes and ears as sensors. It can speed-read documents, for example, and store them in its database. (It

takes normal time to read them later, though one could ask the computer to provide a synopsis).

The interface can also run "virtual tutor" (p. 32) augmented reality programs that not only talk but show how to do things by overlaying instructions on the user's visual field. Although several programs could theoretically be run at once, the user can only focus on one at a time. A computer implant is most useful with an implanted communicator.

The recovery time represents the amount of time needed to master the computer's functions.

Computer Implant

The user should also have a neural jack (p. 148) or implant radio (p. 144).

Statistics: Accessory (Tiny computer) [1]; Photographic Memory (Temporary Disadvantage, Electrical, -20%; Recorded data only, -20%) [6]. *7 points.*

Availability: Minor procedure. \$4,000 + the cost of a tiny computer (p. 12) with the compact option. LC4.

Chip Slots

A chip slot is a sterile dime-sized skull socket, covered with a cap, into which modular brain implants ("chips") can be inserted. Each chip interfaces directly with the recipient's brain and nervous system, providing knowledge and ability. Chips containing individual skills, techniques, or mental advantages can be manufactured and purchased.

Chips: Chips themselves are tiny plugs that weigh 0.05 lbs. (just under an ounce). Skill chips cost \$500 per point. Most are LC3.

Statistics: Variable. Buy the Cip Slots advantage (p. B71) with the limitation (Temporary Disadvantage, Electrical, -20%). The maximum number of slots is 3, and each chip can be worth no more than 15 points.

Availability: Minor procedure. Cost is \$5,000 per slot plus \$3,000 per point of abilities that a chip can hold. LC3.

Skip Slot

This is a general-purpose chip slot optimized for skills. Running a chip with 4-points in skills, it can give someone an easy skill at attribute+2, an average skill at attribute+1, a hard skill at attribute+0, or a very hard skill at attribute-1. It can also add +1 to any existing skill level.

Statistics: Chip Slots 1 (4) (Temporary Disadvantage, Electrical, -20%) [14].

Availability: Minor procedure. \$17,000. LC3.

Computer Implant Template

-17 Points

An implanted computer can be a PC or associated NPC! This is a built-in computer implant with a mind of its own. The template's Mindlink is with the person it is implanted into. If it's a PC, the person it is implanted into is usually an Ally or Dependent.

Combine this with any AI template (p. TODO) or the Mind Emulation template (p. 151).

Attribute Modifiers: ST 0 [-100]; HT +4 [40].

Secondary Characteristic Modifiers: HP +2 [4]; Basic Move -6 [-30].

Advantages: Absolute Direction (Requires signal, -20%) [4]; AI [32]; Doesn't Breathe [20]; Doesn't Eat or Drink [10]; DR 5 (Can't Wear Armor, -40%) [15]; Injury Tolerance (No Eyes, No Head, No Neck) [17]; Machine [25]; Mindlink [5]; Mind Reading (Mindlink Required, -40%*; Sensory Only, -20%; Touch-Based, -20%) [6]; Sealed [15]; Radio (Burst, +30%; Secure, +20%; Video, +40%) [19].

Perks: Accessories (Tiny computer) [1].

Disadvantages: Electrical [-20]; Quadriplegic [-80].

Features: Taboo Trait (Fixed ST, DX, HT, HP).

Availability: Minor procedure. \$4,000 plus the cost of a tiny computer (p. 12) and AI software (p. 14) or a mind emulation (p. TODO) program. LC4.

* Works the same way as the identical limitation for Possession (p. B76).

Lenses

Puppeteer (+100 points). The computer can use biopresence software to possess the body of its host. This can also be combined with any of the above sub-race options. Add Possession (Mindlink Required, -40%; No Memory Access, -10%; Telecontrol, +50%) [100]. If the host has a biopresence implant so that possession is automatic, add Puppet [5], increasing the cost to +105 points. Add the cost of biopresence software (p. 71).

Mind Interface (+6 points). The computer implant can sense the surface thoughts of its host. Remove the Sensory Only limitation on Mind Reading. This can be combined with Puppeteer. +\$10,000. LC3.

Neural Interface Implant

A neural interface (p. 26) permits the user to control electronic devices using his mind. It picks up electronic impulses and translates them into electrochemical signals in his brain. There are two models in common use, and some people may implant both:

Neural Jack

This is a socket implanted in the body (usually the back of the neck, base of the spine, or skull) with a communications interface. The user can plug an optical cable (p. 23) into it and connect to a phone line, modem, etc.

Statistics: Cable Jack (Sensie, +80%) [9]. *9 points.*

Accessibility: Minor procedure. \$4,000. LC3.

Wireless Neural Interface

This is a wireless neural interface radio with a one-mile range. It can also function as a radio communicator.

Statistics: Radio (Reduced Range, $\times 1/10$, -30%; Secure, +20%; Sensie, +80%) [17]. *17 points.*

Accessibility: Minor procedure. \$5,000. LC3.

Neurotherapy Implant

Computer chips may be surgically implanted into the brain to restore misbehaving or damaged functions, or to act as a bridge between injured and healthy areas.

A neurotherapy implant can be implanted to neutralize mental or physical disadvantages that impair brain or neurological function, such as Dyslexia, Epilepsy, Killjoy, Non-Iconographic, Neurological Disorder, and Short Attention Span.

If brain damage such as a stroke or bungled brain surgery causes DX or IQ loss or other disadvantages (e.g., Blindness or Mute, or partial paralysis resulting in a disadvantage such as One Arm), the GM may also allow the implant to fix it.

Statistics: Add the Mitigator (-70%) limitation for the disadvantage.

Availability: A persona map of the patient is required before a neurotherapy implant can be installed; see *Brain-scanner* (p. 139). This data is used to program the implant. Minor procedure. \$500 per -1 point of disadvantage. LC3.

Psych Implant

This implant stimulates areas of the brain to produce psychological reactions. Moderate regimes use them as an alternative to prison or psychiatric treatment – repressive ones rely on them for mind control.

A psych implant gives the subject an additional mental disadvantage. Common implants induce Combat Paralysis, Gullibility, Pacifism, or Slave Mentality, and are used to restrain violent individuals or render the subject easily controllable. Illegal implants are available that compel Berserk, Dyslexia, Paranoia, or a Phobia. An implant can not create self-imposed mental disadvantages such as Code of Honor.

The disadvantage is not active until after the recovery period, although the subject will feel a growing urge to act in the fashion indicated. Any implant-induced disadvantage ends when the implant is removed. However, anyone who has worn a psych implant for three or more months may acquire the disadvantage permanently. After the implant is removed, the implanter should make a Will roll at +4 to avoid the disadvantage continuing, with a penalty of -1 for each doubling of time, e.g., Will+3 at six months, Will+2 after a year, Will+1 after two years, etc.

Therapeutic implants also exist which negate mental disadvantages, such as Bad Temper or Phobias; use the rules for Neurotherapy Implants. After several months the effect may become permanent. Roll vs. Will as above when the implant is removed – if the roll fails, the disadvantage is gone. The GM may require it to be bought off with character points.

Statistics: A disadvantage granted by a psych implant will have the (Temporary Disadvantage, Electrical, -20%) limitation. A disadvantage that is negated by a psych implant will have the (Mitigator, -70%) limitation.

Availability: A persona map of the patient is required; see *Brainscanner* (p. 139). This data is used to program the implant. Minor procedure. \$1,000 per -1 point of disadvantage added or mitigated. LC3.

Biological Operating System (BOS) Implant

This implant controls biofeedback systems and diagnostic monitors, as well as nanomachine drug factories that help the user manage his body's physiological state.

Statistics: Alcohol Tolerance [1], Deep Sleeper [1], Metabolism Control 1 [5], No Hangover [1]. *8 points.*

Availability: Major procedure. \$10,000. LC3.

Sensie Transceiver Implant

These brain implants enable a person to transmit or receive live or recorded sensory impressions from another person. They are essentially two-way braintaps.

Sensie Transceiver Jack

This incorporates a plug-in cable jack (p. 23) plus a sensie transceiver module. If the user has a computer implant (p. 147), he can store data in it.

Statistics: Cable Jack (Sensie Only, +0%) [5].

Availability: Minor procedure. \$2,500. LC4.

Wireless Sensie Transceiver

This incorporates a radio transmitter with a one-mile range and a sensie-transmission module. If the user has a computer implant, he can store data in it.

Statistics: Radio (Secure, +20%; Reduced Range, $\times 1/10$, -30%; Sensie Only, +0%) [9].

Availability: Minor procedure. \$4,500. A/1 year. LC3.

Cognitive Enhancement

This implant establishes new connections between itself and different parts of the brain. Normal neurons are replaced with cybernetic duplicates. The benefits provided are capabilities at which electronic computers exceed the capabilities of human brainpower, such as spatial awareness, memory and processing speed.

Statistics: Choose from IQ+1 to IQ+3 [20/level], 3D Spatial Sense [10], Eidetic Memory [5], Enhanced Time Sense [45], Intuition [15], Language Talent [10], Lightning Calculator [2 or 5], Oracle [15], Mathematical Ability [10/level], Musical Ability [10/level], Single-Minded [5], Visualization [10]. The maximum points available per operation are 15. Then add Temporary Disadvantage (Electrical, -20%).

Availability: Major procedure. \$5,000 \times point cost (before applying Temporary Disadvantage). LC3.

Puppet Implant

A puppet implant allows someone else to remotely control a cyborg's body. The teleoperator must have appropriate software, hardware, and access – see *Biopresence Software*, p. 71. A puppet implant requires a communications implant or sensie implant.

Statistics: This may count as the Involuntary form of Duty (p. B133) if someone else holds the access codes.

Availability: Major procedure. \$45,000. LC2.

Personality Implant

The combination of a puppet implant and a computer implant (p. 147) housing a digital mind is also called a personality implant. It can take possession of the cyborg. Personality implants might be used for coercive purposes – for example, a cult leader might implant them in his followers. They could also be voluntary, with people owning and accessing personalities that are programmed to obey them, or storing the personas of deceased friends, lovers, or ancestors in their heads.

Cybernetic Uplift

These modifications are normally added to pets or working animals in order to give them additional capabilities.

Enhanced Voicebox

This implant gives an animal that can't speak the ability to form human words, much like a parrot can. It can be added to any mouse-sized or larger animal.

The animal's Cannot Speak disadvantage is nullified as long as the implant is functional. Giving a non-sapient (IQ 5 or less) animal a voicebox does not mean that it can actually learn a language, but it can be taught to speak a few words.

Finger Paws

Finger paws can be added to a bionic or organic leg on an animal with walking paws, such as a rat, dog, cat, or tiger. The paws are replaced with crude hands that can be used both for walking and grasping objects. Neural implants help the animal become comfortable with its new digits.

Statistics: Basic Move -1 [-5]; Bad Grip 1 [-5], Foot Manipulators (2 arms) [-6]; No Fine Manipulators (Mitigator, -70%) [-9]. -25 points. This replaces No Fine Manipulators [-30].

Availability: Two major operations. \$10,000. LC3.

Neural Uplift

This procedure improves the intelligence of a non-sapient animal by implanting computer components that emulate higher neural and brain functions. It may not be added to an animal with IQ 6+.

Statistics: IQ+1 (Temporary Disadvantage, Electrical, -20%) [16]; Wild Animal or Domestic Animal (Mitigator, -70%) [-9]; Stress Atavism (Mild, 12) [-10]. -3 points. This replaces Wild Animal or Domestic Animal [-30].

Availability: Major procedure. Reduce difficulty of the procedure by one step (e.g., major to minor) if performed on an animal with a racial IQ 1-3. \$5,000 × average racial IQ before the cybernetic uplift operation. LC3.

Total Cyborg Brain Transplants

A total cyborg is someone whose entire body has been replaced with artificial parts. Only his brain, parts of the

spinal cord, and a few other nerves remain human.

Robot bodies large enough to house human brain cases have a total cyborg mentality lens. The most common are androids, but other types are possible. Robot templates with No Brain, Diffuse, or Homogenous are precluded.

Generally, due to advances in modern technology, a robot body need only have been built for at least a personal computer (p. 12) to have room for a human-sized brain. Non-human brains may require a larger or smaller volume.

Total cyborgs may not have other cybernetics, with the exception of brain implants.

Statistics: The character takes on the robot body's racial template with the Cyborg lens; his brain is the same. See Mind Transfer (p. B296).

Availability: Major operation. \$40,000 for the brain case, plus the cost of robot body. The cyborg's body is functional after the operation.

Uploading

Memories are encoded within the physical structure of the brain. Uploading is the process of copying this into a digital form. Uploads can create a mind emulation – a computer program that emulates the workings of the original person's mind. A mind emulation is not just a recording, but a working model of the way a particular brain functions.

Destructive Uploading

This technology involves the preservation and destructive analysis of the subject's brain so that chemically stored memories can be recorded as digital media. For example, the subject's brain may be placed into stasis, then sliced by robotic surgeons into tiny segments, each of which is scanned at very high resolution.

This procedure is fatal and may be controversial: Is it suicide or transcendence? Individuals may choose destructive uploading to obtain a form of immortality, often out of a desire to live as a posthuman entity in a superhuman robot body. They may also have no choice; with destructive uploading, the dead can be revived and interrogated. (See *Uploading the Dead*, below).

Destructive uploading requires the patient (or his preserved brain). The surgery is performed using a modern surgical facility, chrysalis machine, or automed. Make a Physician roll at -5, and an Electronics Operation (Medical) roll at -5.

Success means the data was gained. If either roll fails by 1, it means only enough data for a low-res copy (p. TODO) was gained; if either roll fails by 2, it means only enough data for a very-low-res copy is gained. If either roll fails by 3+, or is a critical failure, the upload fails. Only one try is possible; success or failure destroys the brain.

Non-Destructing Uploading

This process uses advanced scanning systems to record the mind without destroying the brain. This makes it far easier to make copies which exist at the same time as the

original person. It might use an advanced form of magnetic resonance imaging (HyMRI) or other non-invasive scanner. It may also require physical probes. These might be a development of the scanning, tunneling microscope (STM), or use sensors placed in the brain to assist in mapping it.

Since the original is not destroyed, it is practical for people to store “backup” copies of themselves. This is very useful if mind downloading (p. TODO) is possible, allowing the original mind to be replicated in a new body.

A typical upload-resolution scan takes an hour per attempt and a successful Electronics Operation (Medical) roll. Multiple tries are possible. This roll is made secretly by the GM.

Modern Imaging: This can only make low-res scans (p. 220). On a critical failure, the user has made a very-low-res scan without realizing it.

Uploading the Dead

As long as the brain is intact, it is possible to upload a dead person’s mind and retrieve a mind emulation. Either invasive or noninvasive methods can be used. Uploading is impossible when the brain suffers total destruction (-10 x HP), exposure to 5,000+ rads, or death from a failed HT roll that resulted from damage to the skull or eye.

Deep structures containing long-term memories may survive for hours after death, but not indefinitely. Use the usual success rolls, but apply a -2 penalty for working with a corpse, as well as an additional -1 penalty per hour past death unless the brain is preserved or in nanostasis. Uploading a corpse preserved via freezing is at an extra -3 due to cell damage from freezing. Memories from the last 1d x 20 minutes before the person died will usually be lost in the uploading process. This means someone revived via uploading might have no memory of how he died.

Mind Emulation

A successful upload provides the necessary “braintape” of the subject. Bringing it to life requires coding that into a mind emulation – a model of the living brain.

Ghost Compiler: Required to allow someone with Computer Programming skill to create a ghost mind emulation (below). Complexity 10, normal cost. LC2.

Ghost-Editor Program: This allows someone to use Brain-washing skill on a mind emulation. Complexity 11, normal cost. LC1.

Where does a mind emulation go after it’s been uploaded? There are several possibilities.

Backup Storage

A mind emulation can simply be stored, unconscious, as data; if non-destructive uploading is possible, old backups may be regularly deleted and replaced by newer updates. A mind emulation requires about 100 TB. The location and security of one’s backups may be a paramount concern, with specialized facilities that are devoted to protecting them. Insurance agencies, organizations, or governments might

maintain “memory vaults” that store backup copies of members or citizens. Backups could be awakened, interrogated, enslaved, or worse if they fell into the wrong hands, and entire adventures could revolve around recovering one.

Treat an accessible backup as the Extra Life (Copy) advantage.

Low- and Very-Low-Res Copies

Sometimes an uploading or downloading procedure doesn’t work out right – or shortcuts are taken. The result is a low- or very-low-res copy.

Low-Res: This is an imperfect copy. It can be deliberately made at +2 to skill and 50% of the normal time and cost, or it may be the result of an accident. A low-res mind-emulation (above) or mind download (below) will have only half as many points in skills. The subject may also suffer from Partial Amnesia [-10]. If so, the subject has a 50% chance of having the Flashbacks (Mild) [-5] disadvantage, representing partial memories.

Very-Low-Res: This is a badly degraded copy. If a mind emulation or download is made from it, the copy has -1 IQ [-20] and Total Amnesia [-25]. It has a personality, but only one-quarter its normal points in skills (round down). Advantages based on emotional sensitivity – e.g., Charisma, Empathy, Fashion Sense, Rapier Wit – are lost. The subject has a 50% chance of gaining Flashbacks (Mild) [-5] as above.

Robot Bodies

A mind emulation can be run in a computer brain in a robot body. A person might want to return to a body that resembled his original form, a younger and healthier version, or a completely new shape.

Ghost Comps and Communities

A mind emulation might reside in a computer rather than a robot. Mind emulations may travel by copying themselves, or move through expansive virtual realities. Entire communities of emulations and AIs may exist on a computer network, or a single gigantic computer system.

Computers in Biological Shells

A computer brain running a mind emulation may be implanted in a biological body – perhaps even the original body, or a clone of it, depending on its condition after the emulation was created. Use the rules for living flesh androids (p. TODO). The body may wear out, but the computer can always be removed or the data copied to a brain in a new body.

Multiple Bodies, Multiple Personalities

It's possible to copy a mind emulation many times over. Mind emulations may take advantage of this by existing in many different forms at the same time!

Downloading Mind

Superscience may allow an uploaded mind to be imprinted on a living brain. See *Downloading Minds* (below).

Mind Emulation Templates

Any computer with sufficient Complexity (see below) can run a sapient mind emulation. A mind emulation differs from an AI in lacking the Automaton meta-trait and possessing other metatraits. This creates a sub-race (p. B454) version of the template.

Mind Emulation (“Ghost”) Programs

A mind emulation's Complexity depends on the average racial IQ of the being that was uploaded: Complexity $4 + (\text{IQ}/2)$, rounded up. Thus, a race with IQ 10 requires a Complexity 9 program. Lower Complexity by 1 for beings with the “Fixed IQ” taboo trait (as in the Domestic and Wild animal meta-trait); e.g., a dog with IQ 5 requires only a Complexity 6 emulation.

A mind emulation has the advantage Digital Mind [5] and the taboo trait “Complexity-Limited IQ,” and optionally one or more of the lenses under *Optional Intelligence Lenses* (p. TODO). For a nonhuman, also apply the race's IQ, Perception, and Will modifiers, and all racial mental traits.

Downloading Minds

This is the transfer of an uploaded mind into a living brain. It may use nanomachine or replicator technology to replicate every neural connection in the original brain, rebuilding the new brain into a copy of the desired mind. It could also be a highly sophisticated form of regeneration ray (p. TODO) technology.

For ethical (and possibly technical) reasons, downloading is normally performed on a “blank mind” – for example, a clone that was developed in a coma, with no memories or personality of its own. However, downloading into another person's brain may also be possible.

Downloading requires an Electronics Operation (Medical) roll. Success means the mind emulation replaces the original's memories and personality (if it had any). Failure means that the transfer process fails and destroys the brain of the body that was going to receive the download. Critical failure, or any failure by 5 or more, means the transfer seems to work, but there's a hidden flaw. The subject may suffer Partial Amnesia or a Split Personality, or the wrong emulation may have been transferred!

The difficulty of downloading depends on how different the new body's brain structure is from the mind emulation's original body. This allows someone to become a person of a different sex, age, or species. Such downloads are useful for spies or students of alien cultures, or as punishment or torture (“work off your bad karma as a dog”). However, the GM is free to rule that two species are too dissimilar for a transformation to be possible.

If downloading to the brain of another person of the same species, roll at -1 to skill. For transfer to a different species, apply physiology modifiers (p. B181).

The effects of successful downloading are covered under Mind Transfer (p. B296). That is, the old racial template is replaced by that of the new body. The Mind vs. Brain (p. B296) rule should apply except in science-fantasy settings; downloading an emulated human mind into a cat's brain would result in a drop in IQ, for example.

A failed download will result in a low-res copy (p. 151). A critical failure results in a very-low-res copy. It may take some time to realize this, however; the GM rolls this secretly.

Clinical Mind Transference Equipment: The host body must be placed inside this coffin-sized unit. \$500,000, 250 lbs., E/200 hr. LC3.

Personality Overlays

“Overdubbing” a conscious mind may either overwrite that mind (destroying it and creating the new person), or result in an unstable blend of both minds. If the latter, the effect is a Split Personality (p. B156) with -10 to -30 additional points of different mental disadvantages for each personality. Flashbacks, Manic-Depressive, On the Edge, and Paranoia are all appropriate.

Incarnation

If a mind emulation of a formerly biological entity can be downloaded into flesh, why not a digital mind? A former AI struggling to live as a biological entity could be a very interesting character!

Part IX

Psi-Tech

Chapter 33

Mundane Technology and Lab Equipment

In this case, *mundane technology* refers to items that aren't psychotronic superscience but that are useful to psis or those researching psionics.

Psi Testing Equipment

The portable labs outlined on p. 41 can also be specialized for the study of psionics, specifically the Expert Skill (Psionics). Possible equipment included in these labs include tools such as Zener cards (flash cards with symbols that those with Telepathy can guess), electronic number generators (for testing ESP and Probability Alteration), biological tests for Psychic Healing, and so on.

The costs the same and provides the same bonuses.

One way this equipment can be used is to test a subject's psionic abilities. For each test session, roll against the researcher's Expert Skill (Psionics) at +4 or unmodified Psychology. Failure means the subject comes up negative. Otherwise, *if the subject is cooperating*, he may then roll against IQ, plus any Talent for the power question. (*Exception:* the ability being tested for normally requires a Per or Will roll, use that score instead.) On a success by 10+ or a critical success, he demonstrates his latent gift in a measurable way. If he isn't cooperating, then the experiment fails – although it may be possible to trick him into revealing powers.

Sensory Deprivation

Sensory deprivation techniques isolate the subject from external stimuli, serving to focus his mind inward. Intended for psychiatric testing or therapy, they can also be used as a meditation aid and a focusing tool by psis prior to operations where a high level of skill is necessary – or to make a subject (sometimes a prisoner) especially receptive to mental intrusion.

After an hour of sensory deprivation, the user must roll against the higher of Will or Meditation. Success indicates that the isolation has successfully focused his mind; he gets +1 to use psi skills while the sensory deprivation endures, plus an additional bonus equal to 1/3 of his margin of success (rounded down), to a maximum of +5. Failure means that he gains no benefit. If he remains in isolation, he may

roll again once per hour, but further rolls are at a cumulative -1 (although never worse than -5).

There's also some danger. If the subject fails this roll by 5+, or critically fails, then the prolonged sensory deprivation hasn't merely failed to increase his concentration – the isolation and loss of sensation have worked to unhinge his mind! Treat this as a failed Fright Check. Roll 3d on the Fright Check Table (p. B360) and add his margin of failure. Quirks or Phobias (p. B149) acquired this way are liable to relate to the sensory deprivation; Autophobia, Claustrophobia, and Scotophobia are especially appropriate.

Regardless of his roll, the subject is also more open to any form of telepathic contact. He has no physical sensations to distract him! Every hour spent in sensory deprivation gives +1 to all skill rolls for Telepathy abilities (friendly or hostile) used on him, to a maximum of +5 after five or more hours.

Various types of sensory deprivation equipment, most notably a sensory deprivation tank (p. 71). When using a tank, additional psi-tech may be used, but it must be designed to be waterproof (1.2× cost, or included in rugged, p. 7). Total VR (p. 31) can also be used with a properly designed virtual environment, though the virtual nature makes it difficult to use any additional psi-boosting tech, any bonuses are halved without software to incorporate them into the VR (generally at least Complexity 6, depending on specific needs).

Electroencephalography (EEG)

Electroencephalography is the recording of spontaneous electrical activity ("brainwaves") produced by the firing of neurons within the brain. Its primary clinical use is to diagnose neurological abnormalities such as epilepsy. However, EEG is also used for cognitive research and brain-computer interfaces.

An EEG machine has several components: sensing electrodes, amplifiers, a computer control system, and a display device. T

Old EEG machines had several components: sensing electrodes, amplifiers, a computer control system, and a display device. Modern EEGs are much more compact, even built into diagnostic beds (134), medscanners (137), and HyMRI scanners (p. 136).

Modern scientific understanding of psionics has allowed for the identification of esper abilities simply by analyzing EEG readings. Databases of such information are standard with most diagnostic beds, but will need to be acquired separately for medscanners. If the scanner has access to such a database, a successful Electronics Operation (Medical or Scientific) roll determines what power is involved (e.g., Telepathy). Success by 5+ identifies the specific ability (e.g., Telesend). Furthermore, most databases also are able to detect when a subject is being *affected* by a

psi power that induces mental effects: Psychic Vamprisom, Telepathy, Dream Control, etc.

Psis and HyMRIs

HyMRI scanners (p. 136) can also function as EEGs (above) and can also map the exact areas of the brain that are active during psi use. They can also be useful for locating brain-tissue grafts (p. TODO), other psi implants, or where to target an electro-psionic neutralizer (p. TODO).

Chapter 34

Psychotronic Equipment

Psi-Interface Technology

Psi-interface or “psiberface” technology is used to link complex psionic equipment with an operator’s mind. Unless noted otherwise, all psychotronic equipment requires a psiberface connection. It is related to neural interface (p. 26) technology. All psi-interface gear may also interface with anything that a neural interface can.

Psiberface Port

This is a cable socket in a psychotronic device that facilitates the attachment of a psiberface unit. Plugging a psiberface unit into the port takes two seconds. Many devices come with psiberface ports, but extras can be added: \$500, 0.25 lb. apiece. Wireless versions (with a range of about 100 yards) are double cost. LC4.

Psiberface Helmet

A psiberface version of a neural induction helmet (p. 26), this lightweight helmet is lined with psi-sensitive electrodes and neural-induction probes. Its 6'-long cable can plug into any psychotronic device with a compatible port. Donning a psiberface helmet takes two seconds. This functionality can be built into the helmet of armor or a vacc suit (1.25× cost). \$7,000, 2 lb. B/100 hr. LC4.

Psiberface Implant

A psiberface version of a neural interface implant (p. 148). There are two models available:

Psiberface Jack

This is a socket implanted into the body with a psiberface port. This allows the user to connect with any psychotronic tech with a compatible port. Additionally, works as a neural jack (p. 148).

Statistics: Accessory (Psiberface Port) [1]; Cable Jack (Sensie, +80%) [9]; 10 points.

Accessibility: Minor procedure. \$8,000. LC3.

A neural jack can be upgraded to a psiberface jack as a Simple procedure for \$4,000.

Wireless Psiberface

This is a wireless psiberface implant that uses a radio with a 100 yd range. It also functions as a wireless neural interface (p. 148), when used this way, it has a one-mile range.

Statistics: Accessory (Wireless Psiberface Port) [1]; Radio (reduced Range, ×1/10 -30%; Secure, +20%; Sensie, +80%) [17]. 18 points

Accessibility: Minor procedure. \$13,000. LC3.

A wireless neural interface can be upgraded to a wireless psiberface as a Simple procedure for \$8,000.

Psiberface Field

This works like a psiberface helmet but covers an area. Anyone entering the field is connected to the systems it controls. Chair-sized field: \$50,000, 25 lb. Larger field (usually built into a floor): a basic \$200,000 and 100 lb., plus \$10,000 and 100 lb. per square yard covered. External power. LC2.

Brainlock

A psiberface device may include a brainlock (p. 26) at no extra cost.

Psi-Amplifiers

“Psi-amps” are psychotronic devices that use targeted neural stimulation to boost one or more psionic talents. Most benefit a single power; e.g., Telepath or Psychokinesis. Some designs amplify *several* powers; switching between powers takes a second. A psi amplifier is capable of increasing a psi’s Talent beyond the standard four-level limit. The extra skill can be and often is used to facilitate extra effort (**GURPS Psionic Powers**, p. 7). When using a psi-amp for extra effort, halve the FP cost: 1 FP instead of the usual 2 FP.

A psi-amp should be attuned to the user, and can only be attuned to one psi at a time. This takes an hour and requires a successful Electronics Operation (Psychotronics) roll. Failure wastes time but allows further attempts; critical

failure damages the device. It is possible to use an amplifier that isn't properly attuned or that's attuned to someone else, but any roll of 15+ while doing so counts as a critical failure.

The power surge a psi experiences when using an amplifier can be dangerous. If he ever rolls a critical failure while using an enhanced ability, he suffers amplified psychotronic feedback in addition to the usual critical failure effects. This burns out the machine, which will require minor repairs (p. B484). Moreover, the user must make a HT roll at a basic +3 but with a penalty equal to the machine's psi Talent boost. Failure means he suffers a seizure (p. B429) for seconds equal to the margin, with the usual 1d FP loss afterward; failure by 5+ indicates a coma (p. B429). Critical failure further inflicts 2d burning damage per second on him, bypassing all DR (it's his brain being fried!), until someone else pulls him free; if he survives, he must also roll vs. Will at -3 or suffer "brain-burn." A brain-burn victim is effectively reduced to a mindless state, though recovery is possible given proper care and treatment.

Psi-Amplifier Headband

This compact device gives +2 to Talent for a single psi power. \$6,000, 1 lb., 2B/1 month. Per additional power it can boost: +\$3,000, +0.25 lb. LC3.

Psi-Amplifier Helmet

This medium-powered psionic amplifier gives +4 to Talent for a single power: \$25,000, 4 lb., 2C/1 month. Per additional power it can boost: +\$10,000, +2 lb. LC3.

Backpack Psi-Amplifier

A portable psi-boosting device that consists of a backpack-sized power pack connected to a helmet. It gives +6 to a single power: \$40,000, 25 lb., 2D/1 month. Per additional power it can boost: +\$20,000, +10 lb. LC3.

Psi-Amplifier Throne

This is a throne-like chair with a helmet and computerized biofeedback monitors. The user sits in the chair and power floods through him, to be channeled into psionic energy. Unless the user is very powerful, machines that amplify Teleportation will move the user but not the amplifier! It gives +8 to the user's Talent for a single power. \$200,000, 1,000 lb., external power. Thrones that can amplify more than one power at once are available: +\$100,000, +500 lb. per extra power. LC3.

Psi-Amplifier Citadel

The ultimate psi-amplifier system! The user's body is protected within a life-support system, cryogenically cooled and placed in suspended animation. His *brain*, however, is kept conscious, its functions amplified to an unheard-of degree and supercharged with a tidal wave of psychotronic energy: +10 to his Talent for a single power. Preparing the

user (attaching him and synchronizing the cybernetic systems) or disconnecting from the device takes 10 minutes, halved on a successful Electronics Operation (Psychotronics) roll. No psiberface system is needed; it's integral to the citadel. \$1,000,000, 4,000 lb., external power. Citadels that can amplify more than one power at once are available: +\$500,000, +2,000 lb. per extra power. LC2.

Universal Psi-Amplifier

It is possible to create amplifiers that can divide their talent boost among more than one power, as desired. Adjusting bonuses requires a Concentrate maneuver. *Triple* the price of a single-powered model.

Dedicated Psi-Amplifier

Highly focused psi-amplifiers can benefit specific *abilities* instead of entire powers, boosting one particular psi skill rather than a Talent. This makes them significantly more potent: increase the bonus by +2. Other stats are unchanged. This is incompatible with the universal option.

Psychotronic Generators

Psychotronic generators constitute an entire category of gadgets. Each duplicates the effect of one psi ability; it collects and focuses psionic energy for that specific purpose only. Such a device might exist for any psionic ability that has an associated psi skill. In all cases, the operator must be integrated into the machine in some way – touching it, strapped into it, wielding it, etc.

Psychotronic generators come in endless shapes and sizes, but typical examples have metal or plastic cases that house electronic circuits, crystalline components, and perhaps organic elements. Devices that emulate abilities that affect the user are commonly built as helmets, backpacks, or belts. Machines that enhance or add senses often incorporate goggles, cameras, or visors – or boxes or consoles with some form of audio or visual output. Contrivances that radiate a field over an area are typically stationary boxes or wearable modules, often sporting antennas. Gadgets that affect distant targets tend to resemble weapons or ray projectors. And those that must touch their subject incorporate prods, gauntlets, or electrodes.

Any such device works exactly as if the operator had the specified psi ability, with these exceptions:

1. All rolls for the ability use Electronics Operation (Psychotronics) in place of the ability's psi skill, and psi techniques default to Electronics Operation at their usual penalties. This makes a psychotronic generator relatively easy to use: the operator needs to learn a single Average skill instead of several Hard ones. However, different types of generators are mutually unfamiliar (see *Familiarity*, p. B169), and the GM should enforce any penalties rigorously. Users with psionic capabilities may add their psi Talent to rolls for suitable abilities, but their psi skills are of no value here.

2. When using a psychotronic generator, a critical failure doesn't require a Will roll to avoid crippling the ability. Instead, roll against the generator's HT (usually 10). Failure indicates a breakdown. Getting it working again calls for minor repairs (p. B484) using Electronics Repair (Psychotronics).
3. Psychotronic generators can be nursed toward extra effort, but are more fragile than living psis. Use a standard IQ-based Electronics Operation roll instead of a Will-based roll, and double the usual penalty. Any critical failure while using extra effort causes a malfunction and breakdown, in addition to whatever other critical failure effects the GM assesses.
4. Psychotronic generators aren't cumulative with natural psi abilities. Similarly, they cannot be used in a gestalt with other generators (or other psis).

Design

Use the Psychotronic Generators Table to determine a psychotronic generator's cost, weight, and other stats. Dollar cost increases with the point cost of the ability emulated. Compact designs cost more per point to build, so powerful generators tend to be larger.

Psychotronic generators that resemble beam weapons or the like often function as if their ability had the Weaponized limitation (**GURPS Psionic Powers**, p. 21). To simplify calculations, it's easiest to pair Weaponized (-50% or -80%) with Accurate 10 (+50%) or 16 (+80%) to offset it, thereby keeping point cost – and dollar cost – the same, and ensuring that the newly Weaponized ability has a decent chance to hit.

Generators are normally electrically powered, but can be self-powered for $1.5 \times$ cost. Either way, abilities that cost FP to use still cost FP, in addition to any electrical power the generator requires. The FP can be drained from the user or provided by an attached psychotronic battery (p. TODO).

Psychotronic Generators Table

Size: A descriptive term for the device; SM appears in parentheses. A semi-portable or large generator is too big to wield manually (at least for a human!); thus, any "touch" effect involves a platform, electrode helmet, bed, chair, etc. into or onto which the subject must be strapped or placed in order to be affected by the ability.

Cost: The cost of a powered generator, figured from the point cost of the ability it emulates. Multiply this by 1.5 for a self-powered model that has no electrical power requirement.

Weight: The weight of a standalone generator. Optionally, it might be integrated into a mundane device (gun, TV, goggles, etc.) that retain its normal functions, provided that the generator weighs no more than 1/3 of that item's original weight.

Power: The electrical power requirement for a powered generator, giving six hours of operation on batteries or a day on power cells. Ignore this for self-powered gadgets!

LC: The Legality Class if the effect is ostensibly benign – weather control, healing, communication, etc. Halve this and round down if the most likely uses are criminal, military, or espionage activities (GM's decision). Generators that can harm or control individuals are LC2 or worse.

Size	Cost	Weight	Power	LC
Mini (SM -6)	$\$3,000 \times$ point cost	0.3 lb.	2A/1 day	4
Small (SM -4)	$\$2,500 \times$ point cost	3 lb.	2B/1 day	4
Portable (SM -2)	$\$2,000 \times$ point cost	30 lb.	2C/1 day	4
Semi Portable (SM 0)	$\$1,500 \times$ point cost	300 lb.	2D/1 day or external power	3
Large (SM +2)	$\$1,000 \times$ point cost	3,000 lb.	E/1 day or external power	3

Examples of Psychotronic Generators

Akashic Terminal: A humming, hissing, liquid-cooled electromechanical device the size of a room, within which the subject is suspended, bathed in scanning rays, his possible futures flashing on a bank of monitors above him. Gives Prognostication 4. Large, \$33,000, 3,000 lbs., external power. LC3.

Astral Blade: A large knife, covered with exotic patterns, whose hilt conceals a solid-state crystalline psychotronic generator that mirrors the knife in the astral plane. Gives Astral Sword 1 (and also works as a large knife). Mini, \$36,000, 1 lb. (including knife), self-powered. LC2.

Psiberdeck: Small electronic device resembling a 1980s game console, with attached head electrodes. Gives Netrunning 1. Small, \$50,000, 3 lbs., 2B/1 day. LC4.

Psycho-Surgery: Sinister dentist chair-like device with a blank-faced helmet. The subject is strapped in; the operator uses an attached interface helmet and virtual-reality console. Gives Mental Surgery 1, Mindwipe 1, and Telereceive 1. Semi-portable, \$76,500, 300 lbs., external power. LC1.

Radionic Healing Crystal: A small, geometrical crystal-and-metal device, resembling a futuristic salt shaker, that's passed over the subject's body to activate it. Gives Cure Disease 1. Mini, \$27,000, 0.3 lbs., self-powered. LC4.

Teleport Belt: A thick metallic belt composed of linked platinum ovals and psi-charged quartz crystals, with a built-in power pack. Mentally controlled; allows the operator to teleport up to two miles. Gives Autoteleport 8. Mini, \$210,000, 0.3 lbs., 2A/1 day. LC4.

Other Augmentation Devices

These technologies offer alternative means of intensifying psionic power. They can be used in conjunction with psi-amplifiers (p. 156).

Gestalt Web

A gestalt web machine is a large psychotronic device attached to two or more nearby psiberface units (p. 156). It automatically links all psis using those psiberface units into a gestalt (**Psionic Powers**, p. 9). This requires no skill roll – the effect is identical to the Gestalt Familiarity perk (**Psionic Powers**, p. 19). A gestalt web capable of linking two minds is \$1,000,000, 400 lbs. Add \$20,000 and 10 lbs. per additional mind it can accommodate. The psiberface systems are extra. External power. LC3.

Psychotronic Battery

This is a means of storing and draining psionic energy. It typically resembles a small metal or crystal object, usually a geometric solid, although it might be built into another device. It responds to the mental control of any psi who touches it, and can be set to “positive” or “negative.”

On its negative setting, it drains psychic energy from the nearest sapient being within two yards. He loses 1 FP every 10 minutes and cannot recover his own lost FP. Draining continues until the battery has absorbed 10 FP, after which it is full and no longer drains energy. Left unused, energy in the battery bleeds off at the rate of 1 FP every 12 hours.

On its positive setting, any psi who's touching the battery may tap it. He can draw up to 1 FP per second from it, using this energy instead of or as well as his own FP to power psionic abilities. The battery cannot be used to energize anything *but* psi; it's effectively a psionic Energy Reserve (p. TODO).

A baseline psychotronic battery like the one above is \$10,000, 0.1 lbs. Ones that hold more than 10 FP are possible; every doubling of FP capacity multiplies cost and weight by 10. LC3.

Dedicated Psychotronic Battery

Some psychotronic batteries supply energy useful only for one specific power (e.g., Telepathy) or ability (e.g., Telesend). Power-specific versions hold 1.5× the FP; ability-specific ones store 2× the FP. In either case, the user can draw 2 FP/second. Treat these as standard batteries in all other respects.

Symbiotic Crystal

This is a “living” psychotronic crystal, typically the size and shape of a silver dollar. These are impossible to manufacture and are only found on a handful of planets, location of most of which are closely guarded secrets of the Witch-hunters.

A symbiotic crystal acts as a focus to refine a psi's gifts, allowing greater precision. By touching the crystal and staring into its depths, the owner can focus one psi ability at a time through its pseudo-mind, increasing his effective skill level by 1/3 (round down). For instance, a telepath focusing Mental Stab-13 through a symbiotic crystal would have an effective Mental Stab skill of 17. Using the crystal as a focus always calls for an extra Concentrate maneuver; add this to the usual time required to invoke the psi ability.

After using a crystal once, the psi becomes mentally bonded to it. He is not required to use it to enhance his skills, but no other being can ever do so. He's also able to sense the crystal's location over a distance. To determine sensing range, consult the *Psionic Range Table* (**GURPS Psionic Powers**, p. 22); the psi's effective level for this purpose is his Will + his highest psi talent, rounded down.

While the crystal is within range of its owner, he experiences anybody else touching it as a violation of his mind. He must make an immediate Will roll to resist ill effects.

Modifiers: -4 if the person touching it is a psi; +2 if the person touching it loves the owner, -2 if he hates him, no modifier otherwise.

Success means the psi experiences moderate pain (p. B428) while the crystal is being touched. On a fail, he suffers agony (p. B428) the entire time, and then for seconds afterward equal to his margin of failure. Critical failure causes a heart attack (p. B429).

A symbiotic crystal has SM -10, DR 8, and HP 1. If it's destroyed within the bonded psi's sensing range, the owner must roll against Will at -10 to avoid shock. On a success, he's merely stunned. Failure indicates a heart attack – and if he survives, he lapses into a coma (p. B429) for weeks equal to his margin of failure. Critical failure means death!

A symbiotic crystal costs \$1,000,000 and has negligible weight. LC3.

Anti-Psi Technology

These devices restrain, disrupt, or protect against psionic powers. They're related to the Anti-Psi power (**GURPS Psionic Powers**, pp. 23-26) – and psi-amps and psychotronic generators for that power fall into this category, too.

Electro-Psionic Neutralizer

This device is a means of removing psionic powers from a subject – likely a prisoner. It resembles an electroconvulsive therapy ("electroshock") machine: a laptop-sized control and power unit connected by a cable to a headphones-like set of electrodes. When attached to a psi's head and properly adjusted, a brief treatment can cripple his psi abilities.

Once the electrodes are in place, each neutralization session starts with an Electronics Operation (Psychotronics) roll by the operator, to calibrate the unit and synchronize it to the subject's brain. This takes 30 seconds. Then the neutralizer is activated, whereupon it delivers a two-second electrical pulse.

The subject gets a HT-6 roll to resist. Success means he merely loses 1 FP from the stress. Failure indicates he suffers an immediate seizure (p. B429, including loss of 1d FP) followed by moderate pain (p. B428) in the form of a headache that lasts until he has recovered all FP lost to the seizure. In addition, all of his psionic powers are crippled indefinitely. A month after neutralization and every month thereafter, he may try a HT-4 roll to reach power, with success meaning he regains it. This restores one level of any ability that comes in levels, with the remainder returning at the rate of one level/week.

Crippling a psi power or ability with an electro-psionic neutralizer normally renders it completely unusable. If the HT roll to resist fails by only 1, thought, the effects are

partial and unpredictable – roll instead on the table under *Optional Crippling Rules* (**GURPS Psionic Powers**, p. 7).

Psionic science has also been able to identify which parts of the brain are associated with what gifts, meaning that a neutralizer can be tuned to affect only *certain* powers or abilities. This requires both a scan of the brain (obtain with an EEG, p. 154 from a diagnostic bed, medscanner, HyMRI, etc.) and a database with esper brain diagrams (generally included with the Electro-Psionic Neutralizer). The Electronics Operation (Psychotronics) roll is at -2 to calibrate it to cripple one specific power or -4 for a particular ability. Attempting either increases calibration time to 10 minutes per attempt.

Complete suitcase-sized device: \$10,000, 10 lb. 4C/4,000 uses. LC2.

Null-Field Generator

Also see 70 for a related, weaker tool.

A null-field generator projects anti-psionic interference patterns that disrupt or absorb all natural uses of psi within the area covered. This works identically to the Psi Static advantage (p. B78). The null field's disruption applies both to psis inside the field attempting to use their abilities and to those outside the field trying to affect anything within it (e.g., a psi couldn't teleport into a null field from outside it). Psis who attempt to use their powers from within a null field or project their powers into it perceive it as a cold, oppressive "dead zone." Size varies, but these examples are typical:

Pocket Null Field: This device is about the size of a paperback book and often worn on a belt. It covers a two-yard radius around the user. \$2,000, 0.4 lb., 4B/1 month. LC3.

Portable Null Field: This suitcase-sized generator projects a null field over a 10-yard radius. It may be set to affect a smaller radius, if desired. People who fear psieavesdropping often use portable nulls as anti-surveillance devices. \$50,000, 10 lb., 2C/1 month. LC3.

Semi-Portable Null Field: This generator fits in a truck bed and projects a null field over a 20-yard radius. It may be set to affect a smaller radius, if desired. \$200,000, 250 lb., E/1 month. LC3.

Null-Field Tower: This large generator, mounted in a tower 30' high, projects a powerful null field that blankets a 100-yard radius – enough to protect a large installation or neighborhood. A series of such towers could nullify psi powers over an entire region! \$50,000,000, 1,000 lb., external power. LC2.

Null-Neutralizer Node

This device creates a synchronized counter-field within a null field (above). In effect, it creates a "hole" in the null – a circle where psi works normally – by countering it with precisely matched anti-psionic signals. Use the stats for null-field generators, but double cost and halve the radius affected; e.g., a pocket null-neutralizer costs \$4,000 and has a one-yard radius.

Note: These have *no effect* on the power dampers mentioned on p. 70.

Overload-Field Generator

This system generates an anti-psi interference field pulsing at a frequency that makes psi abilities in the area of effect fluctuate uncontrollably. The field is invisible and can pass through solid objects. All psi abilities within it behave exactly as if they had the Uncontrollable limitation (p. B116), triggering spontaneously in stressful situations. (*Exception:* The diagnostic overload projector is more powerful; see below.) Any ability that's already Uncontrollable goes out of control at once and stays that way while the psi remains in the field. These effects end immediately upon leaving the field.

Pocket Overload Field: While this cigarette pack-sized device can be worn on a belt, it's small enough to be deployed covertly; e.g., hidden in a psi's desk or (with a Pick-pocket roll) slipped into his pocket without him noticing. It may be activated by a timer or remotely via a receiver. It affects a two-yard radius. \$2,000, 0.4 lb., 4B/1 month. LC2.

Portable Overload Field: This suitcase-sized generator projects a field over a 10-yard radius (or a smaller radius, if desired). \$50,000, 10 lb., 2C/1 month. LC2.

Semi-Portable Overload Field: This generator fits in a truck bed and projects a field over a 20-yard radius (or a smaller radius, if desired). \$200,000, 250 lb., E/1 month. LC2.

Overload-Field Tower: This large generator, mounted in a 30'-tall tower, emits a field that covers a 100-yard radius. \$5,000,000, 1,000 lb., external power. LC1.

Diagnostic Overload Projector: This unit generates a two-yard-long overload-field ray. It affects any psi in its path, but only if it irradiates the psi's head for at least 10 full seconds, and only while he remains in the beam. However, the field is more powerful than the others described here: the subject must make a Will roll every 10 seconds, with failure indicating that his powers aren't merely Uncontrollable but start to manifest regardless of stress. If he's subject to other emotional stress at the same time, the GM may impose a Will penalty; e.g., -3 for a captive who fears for his life if he doesn't escape. The diagnostic overload projector is often installed in a clinical setting, such as over an examination table or next to a prisoner strapped to a rack. Its usual purpose is to reveal psi ability (the ray is focused on the subject in the hope that he'll be forced to reveal his powers), but it can be used more subtly (e.g., disguised as a sun lamp, hair dryer, etc., perhaps as a trap to expose a secretive psi's abilities). \$200,000, 40 lb., external power. LC2.

Overload Grenade: This is a rugged, baseball-sized overload-field generator designed to be thrown like a grenade. It doesn't explode, but its integral power supply burns out after use. It creates an overload field that blankets a five-yard radius for one minute. It can't be turned off once activated, although the grenade can be destroyed (SM -8, DR 10, HP 4). Some versions also release tear gas or emit a loud siren howl to trigger stress! \$500, 1 lb. LC2.

Psi-Impeder

While this headgear is worn and undamaged, it projects a continuous psi-damping field that completely prevents the wearer from using any psionic abilities.

Psi-Impeder Band: This simple electrode headband can be buckled tightly onto a psi's head. As it's fairly easy to remove, it's most useful if the subject is also physically restrained. One way to deal with a psi-impeder band if one's hands are restrained is to bang it against a solid object repeatedly – it has only DR 2, HP 2. However, any damage affects the skull as well . . . the impeder's DR doesn't protect the wearer (although he gets his usual skull DR, normally DR 2). \$1,000, 0.25 lb., A/1 month. LC3.

Psi-Impeder Helmet: This is a psi-impeder integrated into an open, armored skullcap that can be strapped and locked onto the subject's head, preventing easy damage or removal. The helmet protects its circuitry (and the user's skull!) with DR 8. \$1,250, 3 lb., 4A/1 month. LC3.

Dedicated Psi-Impeder

Impeders may be available that block only one specific power (e.g., Telepathy). Cost is halved; other stats are unchanged.

Psycho-Optic Filter

Through a combination of special lenses and electronic stimulation of the optic nerve, this technology modifies the user's incoming visual perceptions to filter out anomalous psionic sensory impressions. This enables him to see through any psionic illusion, obscuration, or invisibility that affects normal vision.

The filter has a drawback, though: While it's on, the optic stimuli it uses subliminally leak into the user's normal perceptions, resulting in the periodic sensation that "someone is watching" out of the corner of his eye. This distorts his visual situational awareness (-2 to Perception rolls), prevents him from using the Danger Sense advantage (psionic or otherwise), and is mentally stressful (he can't regain lost FP). Switching the filter on or off takes a second.

Like many psychotronic devices, a psycho-optic filter only works if a living person is "in the loop." It's useless to robots or automatic cameras, unless controlled by a psionic computer (p. TODO).

Psycho-Optic Filter Goggles: These resemble bulky night-vision goggles with attached electrodes. The wearer suffers from No Peripheral Vision (p. B151) – that is, his vision is limited to a 120°arc. \$10,000, 2 lb., 4B/1 month. LC3.

Psycho-Optic Filter Mode: A psycho-optic filter can be integrated into standard helmet-mounted passive visual goggles or any head-up display (suit, vehicle, etc.). This adds \$10,000 to cost and 1 lb. to weight. LC3.

Psychotronic Para-Stealth

Psionic research has identified the ways that certain shapes (such as pyramids) focus psi ability, while more-esimal diagrams, glyphs, shapes, and materials can disrupt

it. Psychotronic para-stealth is a passive surface configuration that exploits this interference to afford buildings, vehicles, robots, and body armor partial invisibility to psi. Any attempt to use a psionic sense (such as Clairvoyance, Danger Sense, or Telescan) to notice or detect an object that has such an exterior always requires a skill roll, at a penalty that depends on the para-stealth system's quality.

A minimal or basic para-stealth surface isn't especially remarkable to normal eyes – perhaps a specialized paint job or an odd texture. Improved, radical, or total para-stealth inevitably means a weird appearance, though: bizarre angles, unusual colors, geometries that seem to be almost non-Euclidian, and/or strange patterns embossed on the object's exterior. Para-stealth systems can't be disguised or hidden "below the skin" without disrupting their special qualities. A Vision roll can notice something unusual about them. Psis who succeed at noticing items protected by para-stealth often describe them as blurred, "wrong," or headache-inducing.

The following table lists the various grades of para-stealth. "Psi" applies to all rolls for psionic senses. "Vision" applies to *normal* Vision rolls to notice something odd!

Para-Stealth	Psi	Vision	Cost*	LC
Minimal	-2	-8	\$1,000	4
Basic	-4	-4	\$4,000	4
Improved	-6	0	\$20,000	3
Radical	-8	+4	\$100,000	3
Total	-10	+8	\$500,000	2

* Adjust for SM (8).

Astral Technology

Astral psychotronics are related to the Astral Projection power (**GURPS Psionic Powers** pp. 26-30). Psi-amplifiers and psychotronic generators for that power are also available.

Astral Barrier-Field Generator

This machine generates an astral zone around itself that's impervious to outer-plane astral travel. The barrier is invisible except to the Astral Sight ability or to someone on the outer astral plane, where it manifests as a mirror-surfaced bubble that – if gazed upon for too long – begins to reflect frightening imagery drawn from the observer's subconscious. Staring at it can lead to hallucinations and insanity! Roll a Fright Check for every half hour spent contemplating the barrier, at a cumulative -1 per continuous hour.

The only way to pass an astral barrier is to face one's fear and discover a "back door" through it via the inner astral plane, which involves Astral Crossing (**GURPS Psionic Powers**, p. 29). This often requires a lengthy trip through a psychological maze, and a confrontation with inner demons or subconscious fears. Successfully navigating this gauntlet brings the traveler to the other side of the barrier, but typically takes an hour or more of subjective time.

The generator is semi-portable device that can cover up to a 50-yard radius. \$500,000, 100 lb., 4C/2 weeks (or external power). LC3.

Astral Duplicator

This device somewhat resembles a bizarre hybrid of photocopier and X-ray machine. It's designed to translate articles of equipment – and even people – into the astral plane by creating synthetic astral bodies for them.

In operation, an object placed on the duplicator's plate is irradiated with psionic energy. A flickering aura manifests around the item, gradually intensifying over several minutes as its artificial astral form is created. The article's astral copy appears in the outer astral plane, coincident with its location on the machine. It now exists on both planes; e.g., an astrally projecting psi could pick up an astral copy of a piece of gear and use it normally in the astral plane.

Forming an object's astral copy is a tricky procedure that requires 10 minutes and an Electronics Operation (Psychotronics) roll per attempt. Once duplication is successful, the copy can remain in the astral plane... but only while the original remains untouched on the duplicator's translation plate. A "silver cord" connects the duplicate to its material form. Removing the original item from the plate or even touching it, or turning off the machine, dissolves the astral body.

Living things can be placed on the plate and "copied," too – the device simply creates their astral projection for them. Their Move on the astral plane is IQ/2. However, such an astral body is dependent on the machine, as explained above for objects. This isn't a safe process! The duplicator's radiation drains 1d-2 FP (minimum 1 FP) per copying attempt, successful or not, and for every 10 minutes spent in astral form. In addition, when the synthetic astral body is dissolved, the sudden shock requires a HT-2 roll, with failure meaning unconsciousness for minutes equal to the margin, and failure by 5+ or critical failure resulting in a coma (p. B429).

This is a large, bulky device: \$2,000,000 and 400 lb. per pound of object (minimum 0.5 lb.) it can sustain in astral form. External power. LC3.

Kirlian Sensor Field

This is a psychotronic security system intended to detect astral intruders. Its low-powered electrostatic field causes any astral body moving through it (in the outer astral plane) to fluoresce visibly, appearing as a silhouette surrounded by a colorful flickering aura. To psis using Astral Sight, the field itself is visible as a sparkling mist: -1 to skill rolls to see through it.

The sensor field is generated by a pair of opposed plates that must be within three yards of each other. In buildings, these are often hidden in or otherwise attached to the floor and ceiling, or parallel walls. Once the system renders an astral body visible, other security devices installed can detect and react to it as they would any sighting; e.g., standard cameras can register the intruder.

A side effect of the field is that a person traversing it in the material world (rather than in the astral plane) may experience a slight buildup of static electricity. His hair might stand on end, or he may create a small sparks when he touches objects or people. The field might also disrupt sensitive electronics – particularly computers – unless they've been hardened.

A Kirlan sensor field installation in a building or a vehicle is \$180 and 9 lb. per square yard of ground coverage; e.g., a system protecting a corridor 10 yards long and 2 yards wide would cost $\$180 \times 10 \times 2 = \$3,600$ and weigh $9 \text{ lb.} \times 10 \times 2 = 180 \text{ lb.}$ The control console – wired into the building or vehicle's electronics, and used to switch the field on or off – is \$2,500, 20 lb. External power. LC4.

OOBE Machine

An out-of-body excursion (OOBE) machine psychotronically stimulates certain areas of the brain to induce astral travel. It typically consists of a bedlike platform to which the subject is strapped, plus attached electrodes (or a psiberface unit) and control modules. Once the user is connected to the device, the induction process takes 20 minutes as he's gradually reduced to unconsciousness and then awakens on the astral plane.

The user must either rely on an operator or set the duration of the "trip" beforehand; he has no control over the apparatus from the astral plane. Manual operation is safest, as the technician can monitor the subject's status, but the device *can* be preprogrammed to let someone use it unassisted. Either way, make an Electronics Operation (Psychotronics) roll. Multiple travelers can be connected to the same machine; if so, roll separately for each, applying -1 per person past the first to *all* rolls.

Success means the process works smoothly. The subject falls asleep partway through the process and then awakens in the outer astral plane, his astral body emerging from his sleeping form. All rules under *The Astral Plane* (**GURPS Psionic Powers**, p. 27) apply. The visitor's Move is IQ/2. If he possesses Astral Projection abilities (other than Astral Travel) of his own – e.g., Astral Sword – then he can use these normally.

Failure means the subject doesn't form a proper astral body. He may have *some* kind of "out-of-body experience" (e.g., feel as if he's floating, and then look down and see himself). However, the entire incident is completely subjective, and he has no control over his movement. In effect, he's sleeping – and possibly dreaming an uncontrolled OOBE – until the machine is switched off or a programmed trip ends.

Critical failure is more bizarre: The subject is inadvertently projected into the strange inner astral plane (**GURPS Psionic Powers**, p. 28). He's trapped there for the duration, unable to return – and possibly experiencing the odd events and psychological terrors and revelations that are common in that realm. An OOBE machine can keep the subject in the astral plane for as long as it's powered up. There is some physiological stress, though: The user loses 1 FP per hour spent in the machine.

When a traveler's time is up – or if the operator recalls

him – he's drawn back to his body by "reeling in" his silver cord. However, if the machine is turned off suddenly (or destroyed!) before the subject can return, he experiences a traumatic shock to his system. He must roll vs. HT-4 to avoid suffering a seizure (p. B429) for seconds equal to margin of failure. Critical failure means a heart attack (p. B429) instead.

Complete system: \$400,000, 200 lb., external power. LC3.

Ergokinetic and Information Technology

Ergokinetic psychotronics are related to the Ergokinesis power (**GURPS Psionic Powers**, pp. 30-37).

P-Web Shield

A very simple device, the P-web is a fine mesh of platinum-group metal alloy. Worn on the head – built into a hat or a helmet to protect the webbing – it grants total immunity to the Confuse ability of Ergokinesis. It also prevents the wearer from using Ergokinetic abilities (but affects no other type of psi). Add to any head: +\$1,200, +0.5 lb. LC4.

Extrasensory Perception Technology

These psychotronics are related to the ESP power (**GURPS Psionic Powers**, pp. 37-43).

Deathscanner

A deathscanner is a form of trauma-enhanced Retrocognition. It consists of two psiberface units (p. 156) connected through a psychotronic scanning module. The operator plugs into one psiberface; the other is for a *corpse*. The scanner enables the user to examine the dead person's memories in the hour or so prior to death! It picks up both physical sensory impressions and what the subject was actually thinking.

The device can only "read" a relatively fresh corpse – the subject must have died within the past 72 hours. As well, the brain must be more-or-less intact. Scanning is *impossible* if the brain suffers total destruction (-10×HP), the victim was exposed to 5,000+ rads, or death resulted from a failed HT roll brought about by eye or skull injury.

Each attempt to reach the subject and sort through his memories requires 10 minutes and a roll against Electronics Operation (Psychotronics). The operator is at -1 per hour that the corpse has been dead. Success gives a general impression of the circumstances surrounding the person's death: what was going on in the last few minutes, what the victim saw and heard, etc. Further attempts may be made to learn more details.

Failure by 1-4 means the user picks up only a confusing mishmash of pain and fear, perhaps a constant repetition of frightening images from the last few seconds before

death. This *might* be useful if the cause of death is totally unknown, but it provides no clear information. Repeated attempts after a failure suffer a cumulative -1 to skill.

Failure by 5+ or critical failure means the user has been trapped in the dark whirlpool of the victim's death experience! Make a Fright Check at -5, with all usual effects. Any further attempts by that operator to probe the corpse are at -2.

Portable Deathscanner: This is a semi-portable scanning helmet and terminal, capable of fitting in the trunk of a car. It provides no skill bonus. \$200,000, 40 lb., M/6 hrs. or 4×C/1 day. LC3.

Laboratory Deathscanner: This is a large scanning device, similar in size to a hospital MRI system. It provides +2 to skill when using the deathscanner. Instead of or as well as displaying images via psiberface, it can translate them into digital media and project them as a movie. \$1,000,000, 1,000 lb., external power. LC3.

Event Recorder: This addition to the deathscanner allows the creation of a sensie (p. 32) from the subject's dying memories. This only works if the brain has been dead for less than a day. The unit records backward from the moment of death until the scan quality deteriorates beyond recovery; total length rarely exceeds a few minutes. The recording could be used evidence at a trial, or even serve as a form of entertainment with the depraved! Added to deathscanner: +\$3,000. LC3.

Psychometer

This is a handheld sensor the size of a paperback book. It allows an Electronics Operation (Psychotronics) roll to detect the active use of psionic powers. It cannot determine whether someone is a psi unless he's currently using psi abilities.

A psychometer can be set to sweep a 60° arc at 1,000 yards or to perform a 360° degree scan at 200 yards. Each use requires 10 seconds of scanning to gather data. A failed skill roll means the user didn't focus the gadget properly – it detects nothing, and repeated attempts suffer a cumulative -2 to skill until the operator takes 30 minutes to recalibrate the device.

When used to detect the general use of psi abilities, there's no special skill modifier. Success means the user detects all such psi phenomena within range. If set to search for a specific power (e.g., Telepathy and Telepathy-related psychotronics), the skill roll is at -2. After achieving a general fix, the operator can try to learn more specific information – the kind of psi ability being used, approximately how powerful it is, etc. – at 10% of range. This requires 10 seconds of additional scanning and another skill roll, this one at -2. If there are multiple psi sources, the user can only focus on one of them at a time.

Sleek, high-tech unit: \$10,000, 2 lb., 4B/1 day. LC4.

For a larger-scale, psi-detector, see *Psi Scanner* (p. 38). These can be upgraded to incorporate the psychometer tech, add either +\$10,000 or +0.5 CF, whichever is more.

Psychic Healing, Vampiric, and Biokinetic Devices

These psychotronic devices detect, emulate, and manipulate life-energy auras and bio-energy fields. They're related several powers: Psychic Healing (**GURPS Psionic Powers**, pp. 46-49), Psychic Vampirism (**Psionic Powers**, pp. 49-52), and Biokinesis (**Psionic Powers**, pp. 72-73).

Life-Transference Machine

This bed-sized psychotronic device transfers bio-energy between two living people, draining one to heal or invigorate the other. Both individuals must be strapped down on the platform and connected to the machine via a psiberface system. Make an Electronics Operation (Psychotronics) roll to set things up properly; each attempt takes one minute. Critical failure may mean that donor and recipient are reversed – or that both parties are drained!

Once the machine is set up, it sucks life force from the donor at the rate of 1d+1 HP per minute. For every full 2 HP drained, 1 HP is transferred to the recipient, provided that he isn't already at maximum HP. At full HP, each HP transferred to him restores 1 FP instead. If he's at full HP and FP, he gains no benefit.

The draining process isn't painful but the donor will feel steadily weaker and sicker, exhibiting signs of shock: clammy skin, weak and rapid pulse, lethargy, and so on. No obvious external injuries appear as he loses HP, but the victim gradually suffers cellular damage and internal hemorrhage (which may be visible as bleeding from the nose, etc.). The machine's effect on an injured or ill recipient is far more dramatic: preternaturally accelerated healing.

A life-transference machine can't affect nonliving entities (such as machines) or the dead, with one exception: It can transfer life force to someone who has recently died of injuries (HP loss), provided that he has been dead for less than three minutes and isn't at or below -5×HP. If the machine raises his HP above -HP, then make a HT roll for him. Success means he comes back to life!

Complete system: \$2,000,000, 200 lb., external power. LC2.

Psychospectral Imaging System

A psychospectral imaging system is an electronic camera capable of detecting the psionic auras surrounding living things, superimposing them over the observer's visual field. Resolution is lower than that of the Aura Reading psi ability, so diagnosis isn't possible (although obviously, someone who's dead won't possess an aural!). However, living things – plants, animals, people, and other life forms larger than microorganisms – are visible even in total darkness, through smoke and fog, and regardless of electronic countermeasures.

The system can't detect nonliving targets, see through solid objects (living or not), or sense life completely enclosed in non-living material (e.g., a car's occupants). However, a personal aura extends a short distance from the body – about 0.25" for a human – so it's possible to detect that

of someone clad in ordinary clothing or wearing body armor less bulky than a heavy battlesuit. Only a suit with an SM greater than its wearer's will mask his aura.

Psychospectral Goggles or Visor: Wearable, hands-free aura-imaging optics with a wide field of view. These can be added to a suit helmet as an integral feature or bought as separate strap-on goggles. Either limits the user's vision to a 120° arc; he suffers from No Peripheral Vision (p. B151). \$2,000, 0.8 lb., B/1 day. LC4.

Psychospectral Camera: Aura-imaging electronic video camera for surveillance or recording. No display is included; operation requires a separate terminal, such as a computer system. It limits the user's vision to a 60° arc (treat as Tunnel Vision, p. B151) but incorporates a 4x zoom lens (Telescopic Vision 2). It's often installed in a rotating mount, tripod, etc., and may be mounted on a vehicle. It can also function as a standard digital camera. \$2,000, 2 lb., 4B/1 day. LC4.

Thanatos-Field Generator

Also called a *vampire field* or a *death field*, a Thanatos field kills by psionic means, draining the life force from living things. As it harms people without damaging electronics or machinery, it's a very useful – if somewhat slow-acting – weapon system. It has no effect on life forms with IQ 0: bacteria, plants, etc.

A Thanatos field is unaffected by solid objects, armor, or force fields. Anyone caught in it must make a Will-4 roll each second, with failure reducing HT by one and costing 1 FP. Sufficient FP drain leads to HP loss (p. B426)... which the HT reduction makes deadly! Victims cannot heal FP or HP naturally while inside the field. Outside it, they recover normally, and HT returns at the rate of one point every 10 minutes. While the field is invisible, people within it experience a sense of fatigue and malaise – although they usually blame this on general tiredness.

The field generator is a heavy, backpack-sized device. It has a spherical area of effect, the radius of which can be set anywhere between 10 and 100 yards (its maximum), changing the radius takes two seconds. \$200,000, 40 lb., 4C/1 day. LC1.

Selective Thanatos-Field Generator

This variant design gives the operator the option to tune the field to affect only nonsapient (IQ 1-5) or sapient (IQ 6+) victims. It can also be adjusted to affect only psis or non-psis. Double the price of a regular, non-selective field generator. LC2.

Exterminator Field Generator

This field generator has safety interlocks that limit it to function only vs. *nonsapient* (IQ 1-5) life forms. Roll against Electronics Repair (Psychotronics) at -4 to remove this limitation, turning it into a regular, non-selective field. Any failure destroys the device. LC3.

Psychokinetic Technology

Psychokinetic devices work on similar principles to the Psychokinesis (PK) power (**GURPS Psionic Powers**, pp. 53-57).

PK-Sensitive Materials

Certain exotic compounds are unusually responsive to PK and to Telekinesis (TK) in particular. These "telekinesis-sensitive" (TKS) molecules have several applications.

Kinetic Bubble

This is a spherical container made of plastic that's impregnated with TKS molecules. Materials and shape combine to resonate with and amplify TK, making the bubble and its contents easier to lift telekinetically. Treat the container and anything placed within it as having 1/10 of their normal mass for the sole purpose of determining how much a psi can lift with the TK Grab ability (or optional Telekinetic Control ability). Actual weight and mass are unchanged.

A typical kinetic bubble is SM 0 and capable of holding up to 1 cubic yard: \$20,000, 0.25 lb. Larger bubbles are available; apply Adjusting for SM (p. 8) to cost and weight. LC4.

TKS Structure

Almost any structure can be made from a metal, concrete, or plastic composite that is impregnated with TKS molecules. Divide its effective mass by 10 for the sole purpose of lifting or moving it with TK. Cost is \$100 per pound of object weight. LC4.

Psiberweave

Psiberweave is the generic name for any synthetic fabric impregnated with psi-interactive biomolecules that are sensitive to psychokinetic impulses. Anyone who has the TK Grab (or Telekinetic Control) ability can "tweak" the molecules of his psiberweave garment to make instant changes to color and texture, up to and including turning it transparent. Within limits, he can even adjust cut. Texture changes and complex patterns require a skill roll; failure means unintended results that require repeated attempts to fix, at the usual penalties. Finally, treat the article as having 1/10 of its actual weight for the sole purpose of lifting or moving it with TK.

Any clothing or flexible body armor can be psiberweave at 4x its usual cost.

Telepathic Technology

Telepathic psychotronics are related to the Telepathy power (**GURPS Psionic Powers**, pp. 57-67).

Empathic Mirror

This headgear amplifies all physical sensations felt by the wearer and broadcasts them around him. While an empathic mirror has its peacetime uses (primarily in the bedroom; used appropriately, it can grant +2 to Erotic Art), it's intended mainly as a *defensive weapon*: Everyone within a five-yard radius of the user suffers the same shock, stun, and knockdown effects as he does, as well as any irritating or incapacitating conditions that afflict him! People affected by the device make their own recovery rolls, using their scores (most often HT or Will) rather than the wearer's. For example, if the user takes 4 HP of injury from a bullet, everybody within five yards is at -4 due to his pain – and if he's physically stunned, everyone within that radius is stunned and must make HT rolls to recover.

An empathic mirror affects friend and foe alike. Thus, it's most practical in combat where the wearer faces several nearby opponents alone. Any form of the Mind Shield advantage (e.g., the Psionic Shield ability or equivalent psychotronic device) blocks its effects completely – as does another empathic mirror.

Available as a lightweight headband or built into a helmet (add cost and weight to that of the armor): \$20,000, 1 lb., 6B/1 day. LC3.

Memory Crystal

This is a cubic crystal within which a psi with the Telesend ability can permanently imprint a single mental image, along with all associated emotional resonances. If the memory is particularly strong and violent, those who touch the crystal must resist the psi's Telesend skill or be mentally stunned.

A typical memory crystal costs \$2,000 and has negligible weight. It is possible, but uncommon, for larger objects to be built from memory crystal: the cost will vary wildly but are generally \$10,000 per lb.. Regardless of size, there is no power requirement. LC4

Mental Translator

This device beams telepathic signals directly into another person's brain. In effect, this is mechanical telepathy. A mental translator requires a psiberface unit to function, and the user can only transmit. No special hardware is needed on the receiving end, however. Any sentient (IQ 1+) living brain, including that of a total cyborg, can receive the transmissions; entities with IQ 0 (like most plants and microbes), and purely digital intelligences, cannot.

The signal is directional, much like that of a laser communicator, but not blocked by material objects. It must be focused on a particular target in line of sight, or at a known location within range. Transmissions can propagate beyond the listed "effective" range, but these are more difficult to pick up. To extend range, the operator may roll against Electronics Operation (Communications or Psychotronics), at -1 per +10% to range, to a maximum extension of +100%.

Humans and similar races perceive mental-translator signals as "voices in the head," at the volume of a loud whis-

per. Other species perceive them as analogs to their primary communication sense (sound, smell, or whatever). Regardless, the message is "universal" and transcends language – any IQ 1+ being can understand it, although nonsapient ones (IQ 1-5) are limited to simple concepts.

Tiny: 20-yard range. \$20,000, 0.06 lb., 4A/8 hrs. LC4.

Small: 200-yard range. \$100,000, 0.6 lb., 4B/1 day. LC4.

Medium: 1-mile range. \$400,000, 6 lb., M/6 hrs. or 4¥C/1 day. LC3.

Large: 10-mile range. \$2,000,000, 60 lb., 4D/1 day (or external power). LC3.

Mind-Transfer Machine

This psychotronic device enables two people to switch minds. The new inhabitant of each body has all of his old memories and none of the former occupant's; for guidelines, see *Mind Transfer* (p. B296). The individuals involved need not be members of the same species, but both must have IQ 2+.

The machine's operator must roll against Electronics Operation (Psychotronics) for the transfer. Neither party can resist! Success means the process takes five minutes; this includes time to adjust to the new body and become functional. Critical success permits rapid adjustment, halving this time; failure indicates disorientation, doubling it. Critical failure burns out the machine and causes exotic effects (e.g., both minds in both bodies, resulting in two cases of Split Personality)... or simply brain damage, ranging from Epilepsy or Neurological Disorder to both minds being reduced to IQ 1 vegetables (best inflicted upon NPCs). All effects are permanent, and while the machine can restore a mind to its former body, critical failure results may be irreversible.

A mind-transfer machine is \$100,000,000, 200 lb., external power. LC1.

Mindscanner

The mindscanner is a passive psychic detector – typically an early development in settings with telepathic psychotronics. It detects thoughts but isn't sensitive enough to interpret them. Its screen simply reads out the location of all sapient (IQ 6+) beings in range who are currently thinking about something; anyone who stops thinking vanishes from the display. The device cannot identify individuals. However, it works through walls and other solid cover, making it useful despite its limitations.

Roll against Electronics Operation (Psychotronics) locate anyone within range who are currently thinking. It comes with a built-in screen, but can be connected to any terminal (p. 13) to display signals on a map.

The greater the number of thinking people in the area, the harder it is to keep track of their locations. All skill rolls are at -1 for 10-19 people in range, -2 for 20-39, and so on. Each doubling gives another -1.

A mindscanner won't detect sleeping beings unless they're dreaming. It cannot sense nonsapient (animal) thoughts or raw emotions, either. And individuals protected by any form of Mind Shield (e.g., the Psionic Shield ability), or within a

null field or an area of Psi Static, are completely invisible to it.

A conscious person who lacks shielding can only hide from a mindscanner if he avoids thinking. He must roll against Mind Block (p. B210), at an extra -2 because Mind Block normally involves conscious efforts to "jam" thoughts through such ploys as doing math in your head – not trying not to think! Moreover, he can't use mental (IQ-, Will-, or Per-based) skills besides Mind Block. He can only perform physical actions or skills that can be done instantly and with planning. In particular, a fighter can attack, defend, and move, as his training will have taught him to do these things almost reflexively, but he can't take Aim, Evaluate, or Feint maneuvers, which always require a certain degree of planning.

Handheld Mindscanner: 30-yard range, \$6,000, 1 lb., 4B/1 day. LC3.

Large Mindscanner: Usually vehicle- or tripod-mounted. 150-yard range. \$300,000, 25 lb., 2C/1 day. LC3.

Mindseeker

A mindseeker can replace the normal guidance of any homing missile or torpedo, enabling it to lock onto sapient (IQ 6+) minds within 500 yards in a 60° cone in front of it. Unless the weapon has other systems (e.g., inertial guidance) that allow it to follow a preprogrammed route, it will move directly forward until a sapient mind comes into range, at which point the seeker will steer it toward that target. If the sensor detects several such minds before it strikes, it will home in on the nearest. Use the rules under *Homing Weapons* (p. B413). The weapon has a penalty to hit targets with Mind Shield (e.g., the Psionic Shield ability) equal to their level of that trait.

Mindseekers can be species-specific; a mindseeker programmed to hunt one species won't be useful against another. A mindseeker can even be programmed to go after one particular individual. This necessitates transmitting the target's psychic signature to the seeker's memory; a psi who has previously encountered that person's mind can do so using Telesend. A weapon with such guidance will move until it finds its prey – it won't home in on other targets – and if it runs out of fuel or crashes first, its warhead won't detonate.

A psi who notices a mindseeker missile or torpedo may try to divert it telepathically – assuming he has time before it hits! This involves using Telesend to transmit bogus signals to its "brain." Roll against Telesend at -5. Success means the weapon turns aside and crashes harmlessly. Critical success lets the psi give it an alternative target signature, if he wishes.

Mindseeker-equipped weapons cost five times as much as ordinary homing missiles or torpedoes. Other stats are unchanged.

Psionic Mind Shield

See *Psionic Mind Shield*, p. 130.

Telepathic Switches

Telepathic switches (or *teleswitches*) are psi-sensitive circuits that respond to mental control via Telepathy ability.

Basic Telswitch

The simplest teleswitches allow telepaths to turn on but not *control* electronic devices, from TVs to computers. They most often replace manual on/off switches in systems such as lights, vehicle ignitions, and electronic doors. More interesting uses include activating and deactivating detonators and timers for explosives; turning homing beacons on and off; and activating and deactivating security systems. \$200, negligible weight. LC4

Secure Teleswitch

A teleswitch can be sensitized to a single set of mental signatures – only those minds can operate it. Such are switches useful as electronic locks on doors and safes, and for limiting access to computers and the like. \$1,000, negligible weight. LC4.

Telepathic Control Panel

This is an array of exceptionally sensitive, miniaturized telepathic switches built into a single device; e.g., a computer keyboard where each teleswitch corresponds to a single key. The increased sensitivity enables the psi to control several switches per second. A telepathic control panel fitted to a computer, calculator, sensor, gunnery console, etc. lets a psi use his mind to operate the device at a distance, visualizing each key or button and so activating the switch. While doing so, he uses his normal skill for operating the device or the average of that skill and his Telesend skill, whichever is *lower*. One Telesend skill roll per minute is required to maintain mental communication with the controls. Added to a normal control panel: +\$10,000, or +\$50,000 if secure. LC4.

Thought Globe

A sphere a few inches in diameter, the thought globe is highly sensitive to psychic impressions. Anyone – psionic or not – who touches it and concentrates on a specific image will cause the globe to show that thought-image as a picture or a hologram inside it. This is not a mental projection, but a physical display that can be photographed. \$5,000, 0.5 lb, 4A/8 hr. LC4.

Teleportation Technology

These devices are related to the Teleportation power (*GURPS Psionic Powers*, pp. 66-71).

Actuality Shield

An actuality shield is an exotic matter built into an object's surface making it easier to transport with Teleportation. Treat the shielded item as having only 10% of its

actual weight when determining how much weight can be teleported. This applies when calculating encumbrance limits for the Autoteleport and Combat Teleport abilities, and when figuring out whether Exoteleport can affect the thing.

This shielding has a drawback: objects “protected” by actuality shields are *more* vulnerable to attack by Innerportation, as more mass can be teleported away! This ability inflicts *double* (that is, 2d-4 impaling damage per level) on shielded items.

An actuality shield for any object costs \$10,000 per pound of weight. LC3.

Jump Beacon

A jump beacon physically stresses space-time, creating a node that is “weaker” than the surrounding area. This makes it easier for a psi to teleport himself or an object to its vicinity. The device has a simple on/off switch. While it is active, teleportation by any means (Autoteleport, Exoteleport, etc.) to a location within its radius is at +4 to skill.

The side effect of this is that teleportation attempts within 1% of the radius of an active jump beacon is at -2 to skill if they would teleport the subject *farther* away from the beacon.

Portable Jump Beacon: A suitcase-sized unit that generates a node that covers a 500-yard radius. \$40,000, 30 lb., 2D/2 days. LC4.

Local Jump Beacon: A bulky, cabinet-sized installation with a node that covers 10,000-yard radius. \$1,000,000, 300 lb., external power. LC4.

Jump-Vortex Generator

This variation on jump beacon technology is used as a psionic trap for teleporters. The jump vortex attempts to intercept anyone using psionics to teleport to or from any destination within its radius, drawing him to it instead. It has a similar effect on objects teleported with Exoteleport. People or items successfully diverted by the vortex appear adjacent to the generator.

A jump vortex’s area of effect depends on the device’s power; two examples appear below. The vortex can “catch” people and things teleporting out of or into that area – any

trip with an origin or a destination within the vortex’s radius risks being diverted. If two or more vortices are within range, the teleport is drawn to the nearest one.

A psionic teleporter may be able to resist the vortex’s influence. If the skill roll for his Teleportation ability succeeds by a sufficiently large margin, the teleport isn’t diverted. The psi senses a mysterious “pull” attempting to drag him or the object he’s teleporting off course. If he resists *and* gets a critical success, he senses the vortex’s location.

Jump vortices are typically used as traps to snare intruding teleporters, and often built into secure areas such as prisons. But they can also be helpful! A porter deliberately trying to go to or send something to a vortex receives the same bonus that a jump beacon (above) would give.

Portable Jump Vortex: A suitcase-sized unit with a 200-yard range. It can fit in a backpack and is easily installed in a room (often under the floor or furniture). To resist its pull, a teleporter must succeed by 3+. \$200,000, 40 lb., 2D/4 hr. (or external power). LC3.

Local Jump Vortex: A heavy installation with a 2,000-yard range. To resist its pull, a teleporter must succeed by 5+. \$5,000,000, 500 lb., external power. LC3.

Teleport Jammer

A teleport jammer exerts a “tightening” effect on the local space-time, making it difficult to teleport into or out of the area it covers. Within its field, skill rolls for all Teleportation abilities other than Portersense are at -10. This penalty diminishes by -2 per full 10 yards of distance from the device; e.g., a psi who’s 40 yards from a teleport jammer has only -2 to his Autoteleport, Exoteleport, and Innerportation skills.

When someone with Teleportation abilities first comes into contact with the edge of the field, the GM should make a Per-based roll against the porter’s *best* Teleportation psi skill at -3 (ignore this penalty if he has Portersense). Success gives him a hint that something is “not right” in the area; success by 3+ or critical success tells him that he’s near a teleport jammer.

The generator is a semi-portable device that can affect up to a 50-yard radius. \$500,000, 100 lbs., 4C/2 weeks (or external power). LC3.

Chapter 35

Psi-Drugs and Nanodrugs

Chapter 36

Psibernetics

Part X

Vehicles

Chapter 37

General Vehicles

Planetary Travel

Self-Driving Vehicles

On the more high-tech planets, such as Eurydice or Armitage, automated vehicles have become the norm, making use of inertial guidance systems, GPS, anti-collision radar, and computer autopilots. Generally speaking these services vary from planet to planet, but fare is generally in the range of \$2 to \$5 a mile.

In some particularly dense and/or tightly controlled regions, such as Riveria, Armitage, it is actually illegal for a non-AI or AI-assisted human to drive.

Mag-Lev Trains

Subway and commuter trains may use magnetic levitation (mag-lev) for propulsion, eliminating rail friction and allowing speeds of up to 300 mph. Mag-lev lines are most efficient when constructed in evacuated tunnels, removing all air resistance and enabling the trains to reach supersonic speeds. If intercontinental tunnels are built, 1,000-mph mag-lev trains replace aircraft and surface shipping. The capital investment for an evacuated mag-lev system is enormous; only very wealthy societies can afford one. Operating costs are comparatively low, however, so a railway with the capital investment paid off can have cheap fares. Government subsidies may help pay for the infrastructure.

Some planets and cities use magnetic levitation (mag-lev) trains as a primary form of transit both for people and goods. Before its annihilation, the subterranean settlements on Awei in the Milky Way were known for their immense planetary train system.

Mag-lev is also cheap on worlds with no atmosphere. Under these circumstances, fares average \$20 per person (or \$100 per ton of cargo) per 1,000 miles.

Super Airships

In atmosphere, cargo and passenger airships may be the most economical long-distance transport. Airships are cheap and reliable, though limited to worlds with dense or standard atmospheres and reasonably placid weather. Airships average 50 mph over long hauls, and streamlined vessels using airfoils and aerostats may fly faster than 100 mph.

Fares are usually \$10 per 100 miles, per person or per half ton of cargo. Airships need only minimal facilities, and can get by with no more than a mast to tie up to, so they are an attractive option for undeveloped planets.

The floating cities of Criaphus are a prime example of this infrastructure. The Large airships shuttle people from one floating city to the next atop the planet's dense atmosphere.

Ballistic Liners

Hypersonic suborbital space planes can carry 100 or more passengers to anywhere on an Earth-sized planet in less than three hours. The cost is \$500 to \$1,000 per person or ton of cargo. Suborbital vehicles require extensive takeoff and landing facilities, and are unlikely to make stops at small towns, frontier outposts, or lonely archaeological sites.

Transcontinental Tunnels

Robots and advanced boring machines can dig tunnels between continents for about \$10 million per mile. (In contrast, the Channel Tunnel between France and the United Kingdom is 31 miles long and cost about \$20 billion.) These are generally used for supersonic mag-lev rail lines.

Fusion-Powered Watercraft

Surface ships are one of the most economical ways to move massive cargoes over intercontinental distances. Vehicle-sized fusion reactors are likely to be used in both spacecraft and ocean-going vessels.

Contragravity

Gwhel generators have had a significant impact on transportation, across sectors. While they are primarily employed in gwhel-drive engines to propel spaceships, recent advances have seen smaller gwhel-generators entering the market, allowing for much smaller vehicles and structures to make use of their contragravity technology.

Space Travel

Space travel is covered in detail in the *Spaceships* chapter, p. TODO. That said, for space travel between the largest, most populated of worlds, spaceships land and depart from space ports, many of which reside out in the planets' orbits, rather than on their surfaces. The primary method of getting between these space ports and the surface is through space elevators.

Space Elevator

A space elevator, or beanstalk, is a super-strong cable running from the equator on a planetary surface into geostationary orbit (about 21,700 miles up for Earth). The beanstalk is built using carbon nanotube cables, thickest at the base, narrower at the top. A counterweight – either an extension of the cable (useful for snagging and hurling spacecraft) or an asteroid or space station – is attached to the other end. Elevator cars run up and down the cable, taking anywhere from a day to a week to reach the top. After the construction cost has been paid, it might cost as little as \$3/lb. to reach orbit.

Beanstalks may range from satellite-sized systems with hair-thin cables to giant mega-structures with bus-sized elevator cars for passengers and cargo. The cost of construction is \$40 billion per ton/day of cargo capacity (assume that passengers require about a ton each due to safety and life support requirements). Multiply cost by the square of local gravity, e.g., a lunar beanstalk (1/6 G) is 1/36 as expensive. The cost of construction may increase if space junk, satellites, or low-orbiting moons must be cleared away first! LC2.

Riding a beanstalk elevator to or from orbit costs \$500 and takes from six hours to a week, depending on elevator speed. The best elevator cabins resemble those of trains, with food service, entertainment, and a spectacular view.

Vehicle Systems

Crashweb: An “smart” airbag that provides 10 ablative DR for seated vehicle occupants involved in a crash or collision. An activated crashweb will prevent the user from doing anything until he gets free (DX-2 roll to do so each turn).

If a collision is expected and the occupant is not worried about surviving it, he can turn off the crashweb. This feature is common in military designs or libertarian societies, but civilian passenger vehicles sold in CR3+ societies may require the crashweb to be operational. To disable a crashweb in such a civilian vehicle, make an Electronics Repair (Security) roll; each attempt takes one minute.

Full Life Support: A vehicle with full life support is completely sealed (p. 117). It recycles air and water supply for its occupants as long as it has power. It can function normally in vacuum or other hostile environments. Its climate control system provides a comfort zone extending from absolute zero to 500°F. Some vehicles can moderate even higher temperatures.

Limited Life Support: This functions like full life support as long as it has power, but does not recycle air or water; it only has enough for a limited duration, specified in man-days. Six man-days of support can provide air and water for one adult for six days, two for three days, and so on. The vehicle can replenish this supply if it has a source of breathable air or drinkable water.

NBC (Nuclear-Biological-Chemical) Kit: This is an environmental control system equipped with sensors to detect contaminants, filters, and an overpressure system (the interior is kept at a higher pressure than outside) to keep impure air out. Much like a filter mask (p. 121), it defends against nuclear fallout, germs, and chemicals such as pollution or poison gas. Only people entirely inside the vehicle may benefit from an NBC kit.

ATVs

These ground vehicles are designed for off-road travel in trackless wilderness. Modern ATVs aren't just designed for Earth – they're built for hostile environments on alien worlds as well.

Wheeled ATV

This is an eight-wheeled all-terrain vehicle used by survey teams and prospectors. The wheels have oversized self-inflating tires and independent electric motors. The vehicle is powered by a pair of F cells, giving it a range of 500 miles. Its tough composite hull can survive up to 30 atmospheres of pressure. It has full life support (p. 173) and radiation PF 2.

Standard equipment includes headlights, a one-man airlock, an inertial navigation system (p. 46), a large radio (p. 24), a personal computer (p. 12), and three workstation terminals (p. 13). An auxiliary solar panel can operate all onboard systems except the motors indefinitely, allowing the vehicle to be used as a base camp.

Use Driving (Heavy Wheeled) skill to operate it. It has a watertight hull and auxiliary hydrojet propulsion system, and can swim at Move 1/4.

Exo-Spider

This is a car-sized eight-legged vehicle designed for the roughest terrain, such as icy mountains or craters. It is powered by a closed-cycle turbine engine with a range of 360 miles. Its hull can withstand 30 atmospheres of pressure, and it has limited life support (10 man-days) and radiation PF 10.

It has the same equipment as the wheeled ATV (above), except that it is equipped with a holographic crew station (p. 13). Use Driving (Mecha) skill to operate it.

Personal Vehicles

These are standard commuter vehicles.

Smart Car

This is an electric car with a motor in each wheel, a light alloy and composite body, and a fuel cell power plant. It runs for six hours with a cruising range of 400 miles.

It is equipped with a computerized crew station (p. 13), an inertial compass (p. 46), an infrared surveillance camera (p. 36), a rugged personal computer (p. 12), small ladar (p. 39), a small cellular radio (p. 24), and an entertainment console (p. 28). Each occupant has a crashweb (p. 173). The car has a biometric lock (p. 66) on its doors, and the vehicle is also equipped with headlights and tail lights.

The driver uses Driving (Automobile) skill to operate it, although the vehicle is often driven under computer control.

Dynamic Car

This four-wheeled electric vehicle is powered by superconductor cells. It can operate for 12 hours with a cruising range of 1,000 miles. The vehicle's reconfigurable smart skin subtly adjusts the shapes of the body and the wheels for optimum aerodynamics and ground traction.

The car has the same systems as the smartcar described above, but its body has programmable camouflage (p. 62) allowing it to change color and pattern on command. The interior features self-adjusting memswear (p. 20) seats. If empty, it can fold into a SM+2 box for ease of parking. A \$100, LC3 hack lets it do this on command, doing thrusting crushing damage to occupants based on its ST.

Flying Cars

Modern advances in composites, flight-control software, and miniaturized power plants make the old dream of flying automobiles possible.

All flying cars have these standard systems: computerized controls, headlights, an inertial compass (p. 46), a personal computer (p. 12), and a small multi-mode radar (p. 39). Other details depend on the model, as described below.

Air Car

This is a streamlined automobile with a bubble canopy. It flies using thrust from four pod-mounted ducted fans, but it also has an ordinary wheeled suspension and electric drivetrain that lets it operate like an ordinary car. It can hover in mid-air, or take off and land vertically, or fly as fast as a light airplane with a range of 900 miles. The quoted performance statistics are for ducted-fan flight; as a ground vehicle, the air car has Handling/SR +1/3 and Move 3/45* on the ground, with an 1,800 mile range.

The vehicle has two doors and four seats. It is operated with Piloting (Vertol) and Electronics Operation (Sensors); Navigation (Air) is also useful!

It can fly with only two engines, but if a total systems failure occurs or it runs out of fuel while airborne, it deploys a landing parachute that will usually bring it down safely (assume Parachuting-11). All occupants are also provided with crashwebs (p. 173).

Grav Jeep

Part of Grav-Tech's latest line of products, the Grav Jeep, also known as a Gwhel Jeep, uses mini-gwhel-drives (p. TODO). It is an open-topped and resembles a streamlined automobile with no wheels. It has a personal computer (p. 12) and a small inertial compass (p. 46). A pair of F cells give it a 2,000-mile range. The pilot uses Piloting (Contra-gravity) skill.

Ground Vehicle Table

Vehicle	ST/H	Rnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Cost	Locations
Smart Car	46	+1/5	12	3/60*	1.4	0.6	+3	1+4	5	\$20K	G4W
Wheeled ATV	100	-1/4	12	2/40	10	2	+5	1+9PVS	40	\$200K	g8W
Dynamic Car	40	+2/5	12	6/75*	1.1	0.6	+3	1+4	10	\$30K	G4W
Exo-Spider	80	+2/2	13	8/16	5	1	+4	1+4PVS	70	\$200K	g6L

Tanks

Light Battle Tank

This tank has a tough composite-laminate hull that is reinforced by electromagnetic armor (p. 129), but it relies on stealth and sensors to get the first shot. It runs quietly on rubber-band tracks, powered by a hybrid diesel-electric engine. The crew (a driver and commander-gunner) are stationed in the hull, protected by a NBC kit (p. 173).

Its unmanned turret is armed with a 100mm tank cannon (p. 88) with the electrothermal upgrade (p. 89) and a coaxial 15mm chaingun (p. 87). Atop the turret is a smaller turret with a strike laser (p. 77) for air defense and missile interception. The rear hull houses 10 tactical missile

launchers (p. 94) in fixed upward-facing mounts.

Electronics include two holographic crew stations (p. 13), a hyperspectral imaging sensor (p. 36), a medium laser comm (p. 24), a medium radio (p. 24), a tactical ESM (p. 37), and a tactical sound detector (p. 37).

It is operated by a driver who uses Driving (Tracked) and Electronics Operation (Sensors) and a commander/gunner with Artillery (Guided Missiles), Gunner (Beams, Cannon, Machine Gun), and Electronics Operation (Comm, ECM, Sensors).

Hovertank

This tank rides on a cushion of air, using auxiliary jump jets to cross rough terrain. The hull is sealed with full life

support (p. 173). The main turret has a 40mm railgun (p. 91) or a plasma cannon (p. 83) in a stabilized mount. The vehicle also has a small turret with a strike laser (p. 77) in a stabilized mount for point defense. Electronics include two holographic crew stations (p. 13), hyperspectral imaging sensors (p. 36), a medium laser comm (p. 24), a medium radio (p. 24), and a tactical sound detector (p. 37). The vehicle is protected by infrared cloaking (p. 62), a multi-spectral chameleon surface (p. 61) that aids any roll to avoid visual detection, radar stealth (p. 62), and a tactical ESM (p. 37).

Crew and skill requirements are the same as the light tank with the exception that Driving (Hovercraft) is used. LC1.

Tanks Table

Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Cost	Locations
Light Battle Tank	150	-2/5	11	2/25	30	1	+5	2S	500/200	\$2M	2CTt
Hovertank	150	-3/4	11	2/50	30	1	+5	2S	700/300	\$3M	Tt
Grav Tank	150	+1/5	11	10/500	30	1S	+5	2SV	700/300	\$3.5M	Tt

Hovercraft

These ground-effect vehicles ride on a cushion of air. Hovercraft are less maneuverable than conventional ground vehicles, but can travel on land and water.

Armored Hovercraft

This armored vehicle is designed to transport a squad of soldiers and provide them with fire support. It is also very effective as a coastal patrol (or smuggling!) craft. It uses a gas turbine or fuel cell power plant, and has a range of 800 miles.

Its crew compartment holds two, and is accessed through a top hatch. A powered rear ramp leads into a compartment that can carry up to eight passengers and cargo. Electronics include two holographic crew stations (p. 13), hyperspectral sensors (p. 36), an inertial navigation system (p. 46), a medium laser comm (p. 24), a medium radio (p. 24), a personal computer (p. 12) with the hardened option, tactical AESA (10 mile range) (p. 40), and a tactical ESM (p. 37). Defenses include infrared cloaking (p. 62) and radar stealth (p. 62).

Hovercraft Table

Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Cost	Locations
Armored Hovercraft	130	-2/4	11f	5/50	20	2	+5	2+8S	150/70	\$500K	tX
Hover Jeep	50	-1/3	12	3/40	2	1	+4	2+3	10	\$40K	OX

Minisubs

These are vehicles designed for underwater research, salvage, and special operations. All three subs described below share certain characteristics.

Each has a bridge with a pair of holographic crew stations

Grav Tanks

While Grav-Tech does not publicly sell these, they are contracted with many military organizations to produce gwheel-drive-based military equipment, such as these contragravity tanks.

Grav tanks combine the agility of an attack helicopter with the armor and firepower of the main battle tank. The grav tank has the same capabilities as the hovertank, but is capable of transonic flight using its gwheel-drives. Use Piloting (Contragravity) instead of Driving skill.

It has a small stabilized turret atop the hull. Its primary sensors are in a telescoping mast-mounted periscope (the X location) that extends up to 15 feet for over-the-horizon reconnaissance. It is protected by composite armor.

It has a small independent turret that is a stabilized mount; it can be fitted with up to 400 lbs. of weapon systems appropriate to its TL. At TL9, a typical weapon mix would be a 25mm autocannon (p. 87), an MLAWS (p. 94), and two 40mm mortar boxes (p. 87). Appropriate skills are Artillery (Guided Missile), Driving (Hovercraft), Electronics Operation (Sensors), and Gunner (Machine Gun).

Hover Jeep

This open-topped light hovercraft is suitable for both civilian and military uses. It is powered by a single F cell for six hours, giving it a range of 240 miles. It has two front and four rear seats. The pilot uses Driving (Hovercraft) skill. Its equipment is fairly austere: headlights, a computerized crew station (p. 13), a HUD (p. 13), an inertial compass (p. 46), a medium radio (p. 24), and a personal computer (p. 12).

(p. 13) plus a variable number of passenger seats, and a one-man airlock.

Other equipment includes a medium hydrophone (p. 37), a medium sonar (p. 40), microframe computer (p. 12), a periscope (15') with a medium radio (p. 24) and thermal imaging sensors (p. 36), and a medium sonar comm (p.

40). A sound baffling system gives a -3 penalty on rolls to detect the submarines with hydrophones, but only when they are moving at speeds below 50 mph.

A stabilized turret is standard for all the minisubs described below. Civilian versions equip the turret with a searchlight (p. 46) and heavy laser torch (p. 51); military or paramilitary models often carry a blue-green strike laser (p. 76).

Deep-Sea Minisub

This is a 30-foot-long submarine that can dive into the deepest parts of the ocean or explore the seas of alien worlds. It is saucer-shaped, with a spherical pressure hull surrounded by an unpressurized engineering section that houses twin hydrojet propellers. It uses a nuclear power plant which gives it unlimited range, and it can safely operate at a depth of up to 10 miles. Another feature is a pair of ST 30 robot manipulator arms that an operator can control with his own DX and skills, using either virtual reality gloves or a neural interface.

Supercav Minisub

This is a short-range sub designed for underwater courier, attack, or patrol duties. The vessel has a streamlined wedge-shaped body, and is propelled by vortex-combustor ramjet engines that combine aluminum dust with water (this serves as both oxidizer and reaction mass). It uses a gas generator to create a supercavitating bubble around the vehicle, reducing its drag and permitting very high underwater

speeds. The supercav minisub can dive to a depth of 900 feet and has a range of 200 miles.

Nuclear Minisub

This is a fusion-powered multi-purpose minisub. Its features are identical to the deep-sea minisub except that it has ST 45 arms, full life support (limited only by the food that is carried aboard) and unlimited cruising range. The reactor is good for 200 years.

Diver Propulsion Systems

These gadgets let single divers travel long distances underwater. Naval black ops teams find them particularly useful, and in underwater colonies, everyone might use them.

Aquasled

This one-man underwater propulsion system resembles a small sled equipped with a hydrojet propulsion system. The diver grips the control handles on the sled and is pulled forward. It has a headlight and depth gauge; it may carry up to 10 pounds of other gadgets, such as weapons or sonar. It runs for eight hours on a D cell and weighs 60 lbs. LC4.

Underwater Jet Pack

This is a backpack underwater propulsion system using a vortex-combustor ramjet. It has a range of 10 miles and weighs 40 lbs. It takes three seconds to strap on or remove. An extra fuel cylinder is \$40 and 20 lbs. LC4.

Minisub and Diver Propulsion System Table

Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Cost	Locations	Draft
Aquasled	15	0/2	12	2/15	0.13	0.1	-1	1	5	\$2K	E	2
Deep Sea Minisub	150	0/3	12	1/6	28	1	+6	6PS	100	\$25M	2Argst	10
Supercav Minisub	135	+1/3	11	8/150	20	0.5	+5	2PS	30	\$30M	gst	6
Nuclear Minisub	150	0/3	12	2/18	28	1	+6	6PS	150	\$50M	2Argst	10
Underwater Jet Pack	11	0/1	12	6/12	0.11	0.1	-3	1	5	\$600	E	2

Tilt-Rotor Transport

Tilt-rotor airplanes have two oversized propellers that can swivel between a vertical position (to fly like a helicopter) and horizontal position (for efficient, high-speed airplane flight). They are especially useful for military special ops, but may also be popular commuter and cargo aircraft.

The tilt rotor has two computerized crew stations (p. 13) for the pilot and co-pilot, with a cabin and cargo area to the rear. Access is provided by two side doors and a rear cargo door under the tail. The aircraft is sealed with limited life support (60 man-hours). Other onboard systems include an inertial navigation system (p. 46), a personal computer (p. 12), a medium multi-mode radar (p. 39), and a medium radio (p. 24).

A tilt-rotor pilot uses Piloting (Heavy Airplane) when in

fixed-wing flight (required for speeds over 150 mph) and Piloting (Helicopter) when in a helicopter mode. Electronics Operation (Comm, Sensors) and Navigation (Air) skills are useful. A co-pilot is not required, but can share the workload.

Tactical Tilt-Rotor

This is an armored special ops version of the tilt rotor. It has the same capabilities as the tilt-rotor transport plus infrared cloaking (p. 62), radar stealth (p. 62), and a large radar (p. 39). A small independent turret is under the nose. The pilot or co-pilot will usually have Gunner (Beams or Machine Gun) skill.

Utility Vertol

These are wingless direct-lift transport vehicles, similar to the air car (p. 174) but larger. They perform the same roles as helicopters, but their lack of wings or rotors lets them maneuver in built-up areas. Typical missions include aerial assault, flying ambulance, logistics support, and VIP transport.

Utility Vertol

This is a streamlined vehicle like a wingless cargo jet, with a tail assembly, four pods containing vectored-thrust ducted fan engines, and a retractable skid undercarriage. It is lightly armored, but its redundant systems enable it to fly despite systems failures or combat damage.

It has a front cockpit with two crew seats for a pilot and a co-pilot; behind that is a small cabin with eight passenger seats and a cargo bay. There are doors on either side of the fuselage, and two under the tail. All seats are provided with crashwebs (p. 173). Electronics include a pair of computerized crew stations (p. 13), an inertial navigation system (p. 46), a medium multi-mode radar (p. 39), a medium radio (p. 24), two personal computers (p. 12), and a large radar (p. 39). Military models add additional stealth systems – see the Defenses for various options. It has a sealed hull with an NBC kit (p. 173).

The pilot uses Piloting (Vertol) skill. Other useful skills are Electronics Operation (Communications and Sensors) and Navigation (Air). A co-pilot is common, and will have the same skills.

Tilt-Rotor and Vertol Table

Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Cost	Locations	Stall
Tacical Tilt-Rotor	130	-1/4	12f	4/200	20	3	+6	2+18	30	\$40M	gt3WrWi	0
Tilt-Rotor Transport	130	-1/4	11f	4/200	20	4	+6	2+28	6	\$20M	G3WrWi	0
Utility Vertol	90	+3/3	11fx	4/200	10	2	+5	2+8S	30	\$12M	g3Rr	0

Grav Bikes and Platforms

These are small vehicles that use superscience contragravity (CG) generators for lift and propulsion. Grav vehicles are quiet, unless they are hybrid machines that use contragravity only to cancel lift and some other propulsion system for thrust.

Grav Bike

Another of Grav-Tech's latest line of consumer gwhell-drive vehicles, this flying bike is small and agile. It has two saddle seats and an aerodynamic windshield. Its electronics include a built-in small computer (p. 12), a portable terminal (p. 13), and a windscreens HUD (p. 13). Use Piloting (Contragravity) skill. Its three E cells give it a range of 1,000 miles.

Microplanes

These are portable aircraft that can be stored in kit form and assembled with a few tools.

Dragonfly Microlight

This small propeller airplane is often used as a recreational aircraft or carried by explorers, but it is also useful for covert insertions. The wings and body are constructed of transparent, high-strength polymers over foamed metal structural membranes. The Dragonfly can be broken down for transport into two backpack modules, each weighing a mere 35 lbs. Assembly or disassembly takes a single person only nine minutes; a Mechanic+2 roll and a tool kit are required.

It carries one person in an open saddle. It lands and takes off on skids; it has a range of 100 miles, or more if it can glide with a good tail wind. Its construction provides it with radar stealth (p. 62).

Backpack Dragonfly

This advanced version of the Dragonfly folds into a single 35-lb. backpack. No assembly is required. It takes three seconds for the aircraft to unfold or contract.

Grav Bike and Microplane Table

Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Cost	Locations	Stall
Dragonfly	16	+2/5	12	5/35	0.14	0.11	+2	1	2	\$4K	E2R2Wi	15
Backpack Dragonfly	16	+2/5	12	5/35	0.13	0.11	+2	1	2	\$6K	E2R2Wi	15
Grav Bike	+4/2	11	11	20/80	0.4	0.2	0	1+1	3	\$250K	E	0

Flight Packs

These are strap-on aerial propulsion systems. Most flight packs are controlled by a panel built into an arm curving in

front of the user; computer autopiloting is standard, so only one hand is required to operate them. Instrument readouts are usually projected into a helmet HUD, but the pack can

connect to a neural interface for hands-free operation.

It takes four seconds to strap on a flight pack, two seconds to remove it. All of these "vehicles" require Piloting (Flight Pack) skill to operate.

Helipack

This is a pair of three-foot wide ducted fans attached to a backpack harness and control unit. It's useful for emergency rescue work, and thanks to the relatively quiet power plant, has some military applications. It won't operate in a trace or vacuum atmosphere. It requires two yards of clearance to either side of the wearer – he can't fly through narrow passages or doors. The helipack weighs 200 lbs. and uses an E cell for power. It has a range of 200 miles. LC3.

Zero-G Thruster

These are microgravity flight rigs used for short-range travel outside of spacecraft or space stations. They use cold-gas thrusters to provide maneuverability, and can be easily donned, doffed, and serviced by a single individual. Use Free Fall skill to operate them.

Hand Thrusters

A hand thruster propels the user with bursts of compressed gas. Each burst accelerates or decelerates a normal-mass human by one yard per second in the direction opposite to that in which the thruster is pointed. A successful roll against Free Fall or Vacc Suit skill is necessary to point the thruster in the desired direction. The unit's cylinder is good for 30 one-second bursts. A hand thruster weighs four pounds, including the cylinder; extra cylinders cost \$10, weigh one pound and take three seconds to replace.

Thruster Pack

A strap-on unit for short jaunts in free fall. It consists of a thruster pack, a pair of arms with reverse thrusters, and a control arm that curves in front of the user. Maneuver jets are located at strategic points along the entire pack; a built-in autopilot assists the wearer. It takes 10 seconds and a Vacc Suit roll (which can be tried again every five seconds if missed) to strap into the thruster pack. The large cylinder allows 100 seconds of full acceleration. Successful Free Fall rolls allow the user to control his speed and direction. It weighs 40 pounds, including one cylinder. Extra cylinders cost \$30, weigh 10 lbs. and take five seconds to replace.

Flight Pack and Thruster Pack Table

Vehicle	ST/HP	Hnd/SR	HT	Move (G)	LWt.	Load	SM	Occ.	DR	Cost	Locations	Stall
Hand Thruster	6	+1/1	12	1/30 (0.1G)	0.1	0.1	-5	1	5	\$50	–	–
Helipack	17	+2/2	12	36/30	0.25	0.15	-2	1	10	\$20K	E	0
Thruster Pack	14	+3/1	12	3/300 (0.3G)	0.12	0.1	-2	1	10	\$2K	E	–

Drop Capsules

These are designed to let their occupants enter atmosphere safely. They have small rocket engine clusters that provide limited maneuverability, but careful landing is a manner of good navigation. De-orbiting takes two or three rotations around a planet with an Earthlike atmosphere (more for a planet with a thinner atmosphere, such as Mars). During this time, radio, radar, and all passive sensors will be blinded due to plasma effects.

Life pods and drop capsules incorporate a computer with Navigation (Space)-12, or the user can override this and program his own landing. Critical success means the user lands within a mile of where he intended. Success means he's within 5d ¥ 100 miles, less 200 miles times his margin of success (e.g., success by 5 reduces the radius by 1,000 miles), minimum one mile. Failure means he could be anywhere on the planet. Critical failure means a disaster of some sort: landing in rough terrain, getting stuck in orbit without fuel to deorbit, or optionally, a too-steep reentry that results in the capsule burning up (a fate best left to NPCs).

Life Pod

This is a four-person escape capsule designed to let people evacuate a spacecraft or space station in the event of disaster.

If launched from a vessel in deep space, a life pod is designed to maneuver a safe distance away from a damaged vessel and broadcast a distress signal.

If launched from a vessel in planetary orbit, the pod provides its occupants the option to land; if they are not responsive, it will do so if its library data indicates it is safe to do so (e.g., it won't try to land on a gas giant!). Reentry is handled by an autopilot. After a series of braking parachutes have reduced speed, the capsule uses a parachute to descend to a soft landing. If it lands in water, air bags are automatically inflated, and the capsule will float.

A life pod is equipped with padded acceleration seats for four people and a pair of lockers holding 200 lbs. of cargo. These are usually stuffed with medical and survival kits, but in an emergency the lockers can be emptied, allowing an extra person to cram into each locker.

The capsule is equipped with a medium radio beacon (p. 24), an inertial navigation system (p. 46), and 90 man-days of limited life support (p. 173). Its internal energy bank will power its beacon and life support system for up to a month.

The pod's surface is equipped with a programmable camouflage (p. 62) intended to give it a radar-reflective surface or adjust the exterior for high visibility. The pod is controlled by a personal computer (p. 12) and a simple crew console. Its maneuvering rockets require Piloting (High-Performance Spacecraft), but most pods are equipped with an AI so they can be used by unskilled escapees. LC4.

Drop Capsules

A drop capsule is a re-entry capsule protected by an ablative shield, allowing an occupant or cargo canister to be safely dropped from a spaceship in low orbit. It takes two minutes to load a drop capsule. The capsule must be launched from a vehicle bay or missile launcher on a trajectory that will de-orbit it.

Re-entry is handled by an autopilot. After a series of braking parachutes have reduced descent speed, the capsule breaks up a mile or so above the surface. A conventional

parachute, parawing, or grav belt can then be used. The drop capsule is not reusable. A drop capsule's split DR is DR 100 ablative armor (all of which is usually gone after the re-entry) on its underside, plus DR 20 from its composite body. LC3.

Stealth Capsules

These are similar to standard drop capsules, but are made of material with a low sensor signature and packed with ECM equipment and decoys. They have radar stealth (p. 100) and sensor jammers (p. 99). A stealth capsules automatically launches radar and infrared decoys and activates its own jamming systems, giving itself an extra -5 to be struck by homing missiles. It may also deploy a spare parachute to "jink" itself off a sensor screen. This generally triggers a second roll (at -5) by the sensor operator to avoid losing contact. A stealth capsule is somewhat more cramped than a drop capsule. LC2.

Drop Capsules Table

Vehicle	ST/Hp	Rd/SR	HT	Move (G)	LWt.	Load	SM	Occ.	DR	Cost	Locations
Life Pod	50	-5/1	13	1/1,000 (0.1G)	1	0.5	+2	4SV	100/20	\$100K	-
Drop Capsule	50	-	13	-	1	0.5	+2	2SV	100/20	\$10K	-
Stealth Capsule	50	-	13	-	1	0.3	+2	1SV	100/200	\$50K	-

Other Transport

Matter Transmission Booths

Also known as Psi Transmission Booths. These booths use psi-amplifying technology and a compatible espers with teleportation abilities to move matter or people from a transmitter booth to a receiver booth. These booths require two espers, one on each end, to function and they must coordinate, either by using network-connected neural interfaces or by way of a third, telepathic esper forming a bridge. Technically, each connection can be temporary, only for the length of the transmission, after which the booth could connect to a different booth to do a separate transmission.

These are expensive. The booths themselves are \$100,000 each, weight 1,000 lb., and run on external power. They require an esper-mind capable of teleporting others, which paying an esper is generally around \$2,500 a month, plus \$100 per transmission. Some planets have established networks which such booths can be connected to, these usually cost around \$1,000 per month to be connected.

Witch Gate

During the reign of the witch covens, many of these structures were created universe wide, arcane portals capable of connecting vastly distant points by traveling across ley lines. While witchcraft is now outlawed near universally, these structures remain. The most obvious of them have been destroyed by witchhunters as a possible root through which the covens could rise and sweep across the galaxy.

Still, though, the subtle gates remain.

Constructing a new gate, permanent or temporary, is an act of advanced witchcraft, and even reopening closed gates is a difficult, albeit easier, ritual as well. For gates that are still open, though, even those without arcane knowledge may step though, granted they can uncover how they work. Some are simple, walk through the portal, doorway, archway, etc. and appear on the other side. Others, though, are shrouded in secrecy, requiring specific steps to "properly" step through. Many such gates are discovered by layfolk by accident and it can be quite unfortunate to find yourself transported miles or even light years away.

Hydra Gates

The Hydra Gate Network is an expansive network of large gates which lead to the inside of the leviathan Hydra, a space known colloquially as "meatspace." The gates themselves are these large, mechanical structures which are made to orbit planets, moons, and occasionally stars (and one black hole!). The network connects nearly 600 star systems and three galaxies. Currently, there are nearly fifty in-construction gates, twelve of which are being built in the galaxy ND-685 in the frontier.

Inside meatspace are tunnels and caves with walls of the Hydra's Flesh. Navigating is difficult, requiring Hydra Network Navigation software which is Complexity 9 software, \$15,000, and an inertial navigation system (p. 46). This software is considered the basic tools to be able to use Navigation (Meatspace) skill to travel through the network. Furthermore, given the shifting nature of the network (the layout changes at 14:00 Universal Time, every second Tuesday

of each month) the software needs an updated database of the tunnels, generally for sale at entrance gates for between \$300 and \$1,000. Specific "a to b" routes are generally available for sale, running from the \$400 to \$800 range and offering a +2 (quality) bonus to Navigation (Meatspace) but only for navigating that specific route (and only for the tunnel layout when that route was mapped).

Travel times vary with the specific layout of the tunnels that month. Generally, going between any two gates will take no more than a week's travel, though a particularly bad route can see this extended up to a month. Traveling without mapping software is the equivalent of no equipment for Navigation (Meatspace) so any rolls are at -10; -5 if only lacking an updated layout database. When navigating through meatspace, make a Navigation (Meatspace) roll. Success means that there is no notable mishaps; critical success means a shortcut was found, cutting travel time by 30% (which the data for which is potentially worth selling at a gate or checkpoint). Failure means you get lost

and are delayed (perhaps encountering hostile Hydrites you must fend off); critical failure means that something has gone very wrong perhaps you are completely lost or that your software is glitching (or a scam!) and led you astray.

Gaining entry to meatspace requires passing through one of the gates, paying the toll and associated fees. The toll is standard \$500, though occasionally there are additional surcharges such as high traffic periods. This toll is waved if that month's gate is still unmapped, as Hydra Gate Company can in no way guarantee safety (they will even pay for mapping data if you make it out alive). Throughout the network are checkpoint stations, which serve as hubs for refueling, resupplying, and updating navigation software.

In addition to the official Hydra Gates, there are rumored to be black market gates operated by some syndicates and militaries in order to use the network for themselves. The Hydra Gate Company's internal enforcement agency works to stamp down on any such illicit use of its network.

Part XI

Appendix

Core Technology

Power Cells

Power Cell	Weight	Cost	LC	Page
AA cell	0.0005 lb.	\$1	—	10
A cell	0.005 lb..	\$2	—	10
B cell	0.05 lb..	\$3	—	10
C cell	0.5 lb	\$10	—	10
D cell	5 lb..	\$100	LC4	10
E cell	20 lb..	\$2,000	LC4	10
F cell	200 lb..	\$20,000	LC4	10

Generators & Energy Collection

Generator	Weight	Cost	Refueling/Maintenance	LC	Page
Semi-Portable Fission Reactor	1,000 lb..	\$100,000	\$50,000/5 yr.	LC2	10
Semi-Portable Fusion Reactor	100 lb..	\$200,000	\$20,000/20 yr.	LC3	11
Solar Power Array	500 lb..	\$10,000	—	LC4	11
Solar Paint	100 lb..	\$2,000	—	LC4	11

Computer Models

Computer	Complexity	Storage	Weight	Cost	Power	LC	Page
Tiny Computer	Complexity 3	1 PB	0.05 lb..	\$50	2A/20 hr.	LC4	12
Small Computer	Complexity 4	10 PB	0.5 lb..	\$100	2B/20 hr.	LC4	12
Personal Computer	Complexity 5	100 PB	5 lb..	\$100	2C/20 hr.	LC4	12
Microframe	Complexity 6	1,000 PB	40 lb..	\$10,000	external	LC3	12
Mainframe	Complexity 7	10,000 PB	400 lb..	\$100,000	external	LC3	12
Macroframe	Complexity 8	100,000 PB	4,000 lb..	\$1,000,000	external	LC3	12
Megacomputer	Complexity 9	1,000,000 PB	40,000 lb..	\$10,000,000	external	LC2	12

Computer Upgrades

Upgrade	Complexity	Weight	Cost	LC	Page
Compact	—	×1/2	×2	—	12
Fast	+1	—	×20	—	12
Genius	+2	—	×500	-1	12
Hardened	—	×2	×2	—	12
High-Capacity	—	—	×1.5	—	13
Printed	-1	—	—	—	13
Quantum	—	×2	×10	-1	13
Slow	-1	—	×1/20	—	13
Data Storage (Per PB)	—	+0.0001 lb..	+\$1	—	13

Terminals

Terminal	Weight	Cost	Power	LC	Page
Datapad	0.05 lb..	\$10	2A/20 hr.	LC4	13
Heads-Up Display (HUD)	neg.	\$50	external	LC4	13
Sleeve Display	neg.	\$50	Af/10 hr.	LC4	13
Portable Terminal	0.5 lb..	\$50	2B/20 hr.	LC4	13
Workstation Terminal	5 lb..	\$500	C/10 hr. or external	LC4	13
Computerized Crew Station	50 lb..	\$2,000	external	LC4	13
Holographic Crew Station	50 lb..	\$10,000	external	LC4	13
Multisensory Holographic Crew Station	100 lb..	\$50,000	external	LC4	13

Complexity	Cost	Skill	Good (+1)	Fine (+2)
Complexity 1	\$1	Diffi-		
Complexity 2	\$3	culty		
Complexity 3	\$10	Easy	Complexity 4	Complexity 6
Complexity 4	\$30	Average,	Complexity 6	Complexity 7
Complexity 5	\$100	Hard,		
Complexity 6	\$300	or		
Complexity 7	\$1,000	Very		
Complexity 8	\$3,000	Hard		
Complexity 9	\$10,000			
Complexity 10	\$30,000			
Complexity 11	\$100,000			
Complexity 12	\$300,000			
Complexity 13	\$1,000,000			