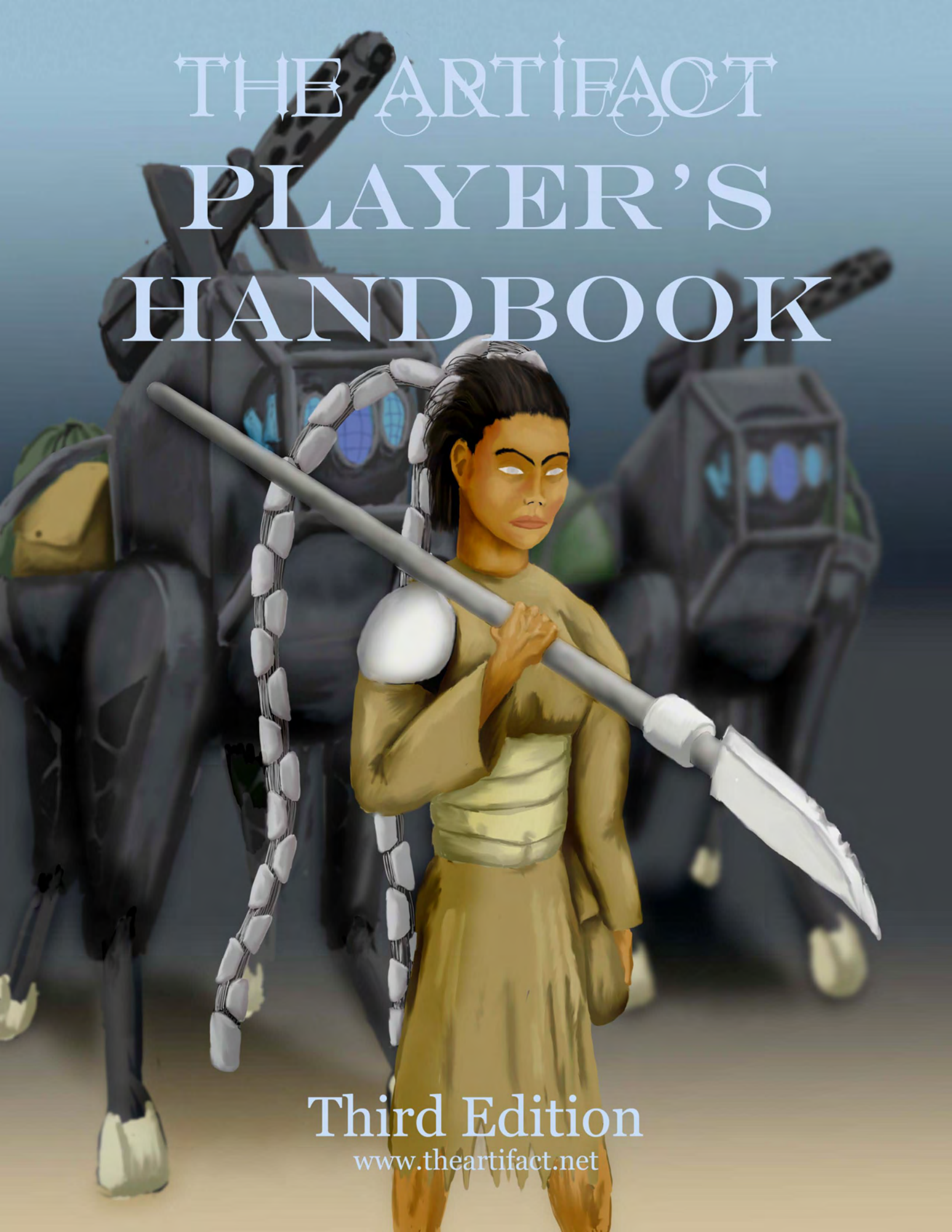
THE ARTIFACT
PLAYER'S HANDBOOK



Third Edition

www.theartifact.net

The Artifact
Player's Handbook

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A Note: This book is designed as a game, in no way are the aliens, monsters, powers, places, and/or governments real. This book does not in any way reflect the author's or company's attitudes or beliefs. If you find any material in any way offensive we give you our sincere apologies. The game enclosed is designed to be fun, and a fantasy version of things in the future.

Dedicated To: Cody for putting up with my crack pot rants.

Player's Handbook

This Player's Handbook is an introductory guide to The Artifact. It is told from the viewpoint of an ASO field scientist Evan Larrs, giving a report to the ASO training branch. There is a lot of general information contained in this book from the viewpoint of a character within the game. There are no stats, and no specific mention of equipment. Players can look to the Equipment section of The Artifact game book. This handbook is designed to let the players know a lot of general information about The Artifact and its inhabitants. (Players also include the Game Master in this instance.) This is done to encourage role play. Some of the information in this book is conjecture on the part of Officer Larrs, and may be substantiated or contradicted at a later time, but for the most part this volume can be considered authoritative.

A Report By Evan Larrs

Hello, my name is Evan Larrs. I signed up for The Artifact project in 2078 and in 2079 I was accepted for the project. I am a field scientist for the Artifact Study Organization (ASO) at the time of this initial writing it is 2086 and these are my findings for my first ten months on the Artifact. I apologize for the occasional sparseness of my documentation. My notes were recovered from my P.D.A. (personal data apparatus) by an alien thinking machine after it was melted by plasma fire. My estimate was that 36% of the information was unrecoverable. (My backups were destroyed six days before by water damage.)

The Artifact Itself

When I first arrived on the Artifact I was astounded by it's immensity. Try as I might, I can find that no words can prepare you for the vast expanses. Perhaps 17th century sailors would have some sense of how it is to travel for months and not see a soul or not have any obvious marker that you had gotten anywhere. In my records I found some initial calculations of volume.

Total Volume
309,510,000,000,000 km^3

Core Volume 93,591,200,000,000 km^3

Polar Volume
215,919,000,000,000 km^3

Number of Hexes (Grier) 1,500,210,000,000

Number of incremental cities
24,593,616,868

Artifact Potential Population
7,082,960,000,000,000,000 or 7.0E18

Plasma Conduits 4068

95% of the current population lives in close proximity to a plasma conduit in .0002% of the habitable area

The above are just rough calculations, but they do serve one useful purpose. They convey that even when presented with aspects of the Artifact it is difficult to grasp. Even when I see these figures, my mind can scarcely comprehend their enormity. Another statistic that has been difficult to swallow is that at one time, there may have been over nine Trillion inhabitants of The Artifact at one time several thousand years ago.

The Artifact is very different from Earth, more so than it would at first seem. Hexes are at the same time like being inside a structure, and like being outdoors. A single hex is beyond the engineering capabilities of earth builders. This all seems academic until one is forced to contend with them. The structures in the Artifact shape the societies that live in them. People have to adjust to the structures around them. There is no real weather, no day or night. Because radio is only good for short range communication (10km or less), and wire based communication is expensive to implement,

messengers are vital to communications. Radar is also a short range (10km) detection system, so other systems are needed. It is so difficult to explore the vast number of hexes that a majority of The Artifact may have never been seen. For all that we know there could be the equvelent to the discovery of America lying in the interior somewhere.

Darkness is ever present underground, with islands of powered areas that sponser life. Plasma power that gives light, heat, and water is the life blood of The Artifact. Without it the hexes inside die and cannot support life as we "Earthers" are accustomed to. I will go into this later but for now it is suffice to say that just as we Earthers look to our Sun for life, the residents of The Artifact look to the super heated plasma gas that distributes power to bowels of The Artifact's interior.

The Industry Hexes are readily available factories able to produce nearly any machine. This has caused a proliferation of manufactured goods, with very few skilled laborers.

Energy is widely available in the form of plasma energy, this cheap availability of power makes for unusual opportunities. Scientists can study high energy physics applications that would blackout a city on earth. It has made the inhabitants of The Artifact numb to the resources they wield on a daily basis.

Technology

As amazing as the technology on The Artifact may seem, there are only a few areas that the inhabitants are truly advanced in. The majority of the advanced technology that the inhabitants use, are found within The Artifact itself. Plasma weapons and tools are an imitation of the technology in the plasma conduits. Many material technologies such as CCC (Carbon Ceramic Composite) are the building materials of The Artifact. In addition, many of the mechanical systems in vehicles such as E-suits can be found in Hosent.

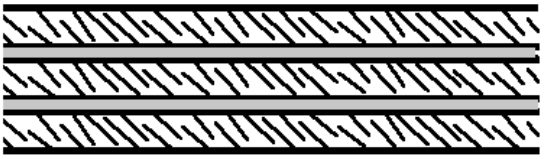
Several true advancements that are not found "naturally" within The Artifact are none the less impressive. Energy storage is one such field. For the most part, high power laser technology is dependent on the ability to store large amounts of energy. The Scimrahn and Kelrath use a conductive carbon polymer to make their high energy batteries and the Chezbah use a lithium ion formula that is extremely advanced.

Other advancements are evident, such as the liquid quantum computers used in most computer technologies on The Artifact. Below is a detailed discussion of several of these technologies.

CCC

Carbon ceramic composite (or CCC) is a substance that looks like stone but acts like a cross between hard plastic and metal. For it's strength it is very light, having a tensile strength only slightly lower than steel.

CCC is one of the most common materials in The Artifact. It is the primary construction material The Artifact is composed of. It is used by the inhabitants in most of the places that people from earth would use metal or plastic. (There is very little metal on The Artifact, and no fossil fuels to make plastic from, although The Artifact's inhabitants have made plastics from raw carbon.) It is constructed from thin layers of carbon and a ceramic adhesive. The thickness of these layers vary with their application. The CCC in Hex (or Grier) walls is a very low grade and the carbon layers are sometimes up to half a centimeter thick. This makes the walls more ridged and brittle. CCC used in every day items such as tools is a medium grade and the carbon layers are often in the range of four to five hundred microns thick. High grade CCC is used in vehicle armor and engine components and uses a higher grade ceramic bonding agent. The ceramic layer is often only ten to twenty microns thick.



The carbon layers of CCC is manufactured in individual paper thin sheets and then laminated (or "glued") together by an even thinner layer of ceramic bonding agent. The carbon layers are made of microscopic carbon tubes (essentially rolled up graphite) that intertwine and hook together to form a flexible sheet. Similar

carbon tubes were discovered in a laboratory environment on Earth in the late twentieth century. These tubes are very difficult to manufacture and manipulate on any useful scale. The tubes are so small that billions of them would hardly be the size of the period at the end of this sentence. The most amazing part of making CCC is getting the microscopic tubes to connect together on a large scale. This is accomplished through a chemical soaking that unbinds the tubes allowing them to be spread like a paste. The paste is then baked in ovens. The fast drying process causes the tubes to again, curl around each other and become a solid sheet.

HDCCC (High Density Carbon Ceramic Composite pronounced "H, D, triple C") is manufactured using a slower manufacturing process and complex drying ovens that are difficult to maintain. This makes HDCCC a much stronger and a higher quality. However it is also very scarce.

When the inhabitants of The Artifact make CCC they break down already existing CCC such as Hex walls. They don't have to make the carbon tubes that makes up CCC. Whoever first made The Artifact could not have had the enormous quantity of these tubes required to build The Artifact available to them. These raw materials must have been created by someone. How this was accomplished is a question that is still unanswered.

The carbon layer of CCC is a good conductor of electricity and heat. If the carbon tubes were to be aligned, CCC would have nearly no resistance to the passage of heat and electricity. However the random alignment of the tubes does cause some resistance.

The ceramic layer of CCC however can either serve as an insulator to heat and electricity, or can be engineered to be a limited conductor of heat, electricity, or both.

An interesting upshot of this is that computerized vehicle or tool can be given a limited sense of touch. A mild electrical field is passed through the carbon layers of CCC. When an object touches the outer hull, a small current is drawn. The computer detects this and registers that the hull is touching something. If a significant amount of pressure is applied to the hull, the pressure alters the resistance of the CCC and the computer can tell how much pressure is being applied by the number of layers that are affected. Likewise, damage to the hull also alters it's electrical properties and is sensed as an artificial pain.

Another application of this is that computers can communicate by touching the hulls of two vehicles together and sending data over their "skin". This allows for quiet communication between vehicles. This feature is included mostly in military vehicles.

LCF

Liquid Carbon Fuel (or LCF) is another carbon based material used by the inhabitants of The Artifact. There are no fossil fuels in The Artifact, so for millennia, methane from the methane wastes, and plasma was used for fuel. However methane is difficult to transport to everyone on The Artifact and Plasma is difficult to store.

Invented nearly two thousand years ago by an unknown Kelrath scientist, LCF is a carbon polymer. This polymer has many times the explosive force of petroleum based fuels used on Earth. It has nearly as much explosive power as some solid rocket fuels.

Energy Storage

One of the few places plastics are used by The Artifact's inhabitants is in manufacture of batteries. Conductive plastics form a cathode of the battery, and a semi-conductive layer becomes the anode. A third insulator layer isolates the poles and allows each cell to be given a high voltage charge. Because of this, these batteries act like conventional batteries, but also behave like capacitors. These high voltage states allow the battery to hold a much higher level of power.

Quantum Liquid Computers

Quantum Liquid Computers use photon energy in a liquid sodium media to store and calculate information. Although computers using a similar processors became

more common on earth after transistor grade silicon supplies began to become scarce (in 2040), Liquid Quantum Computers have hundreds of times the quibits (Quantum Bits) than those built on earth.

Laser Technology

Laser weapons used by the inhabitants of the planet are a never before seen free electron laser or FEL design that is much more efficient than earth designs at converting electrical power to optical power.

These lasers frequently use plasma mirrors as glass could melt under the energy of the laser. A small plasma field is generated that is reflective. This method also has the advantage of being rugged. Some Kelrath designs have been known to use diamonds as reflecting mirrors but these are often in stationary systems.

The most efficient laser inhabitants of The Artifact (namely the Chezbah) have devised is a gamma ray laser that uses meta material black holes to create the energy emission media. However this laser is so prohibitively expensive to build it has only been installed on the Chezbah's orbital defense systems.

The most widely used laser is an violet/ultraviolet laser that is still very efficient in contrast to Earth technology.

Plasma Technology

Most of the advanced plasma management seen in many of the everyday items on The Artifact is either identical to or only slightly modified from the plasma distribution system on The Artifact. From that fact we know that there has been little or no advancement since The Artifact's creation. It seems odd that over thousands of years, this technology has remained so stagnant.

Plasma is in essence superheated gas, well into the tens of thousands of degrees. The molecules become so excited that they shed off their electrons and take on a positive electrical charge. The problem with plasma is that it is difficult to contain. If it touches it's physical container the container melts or the plasma cools and looses energy. Plasma must be kept in a vacuum and away from the walls of it's container. One natural advantage to containing plasma is it's electrical charge. Because of it's charge plasma reacts with a magnetic field. It also creates it's own "magnetic bottle", a magnetic containment field. However plasma is notoriously "slippery", in other words it can seep out of its magnetic bottle. However, whoever constructed The Artifact developed a method of compressing tesla, or lines of magnetic force. This naturally happens in iron and other ferrous materials but is difficult to achieve in air (or a vacuum). This process is still under study. All of that said, one might ask how does a plasma weapon work? The system works something like this. A mild negative electrical charge is passed through the air before the weapon is discharged. Then a condensed magnetic field forces the negatively charged air out of the way. Then a column of plasma is accelerated down the magnetic path. One upside of this method is that the plasma can be accelerated all the way down the path to it's target by the magnetic field giving the weapons a relatively long range. Of course once the negatively charged air is pushed out of the way, electrically neutral air tries to rush in to fill the void. As a result the plasma has only a second of time to travel to it's target.

Force Fields

Force fields are high energy devices that make use of powerful magnetic fields and a cascade of ions to form a temporary curtain to protect anything inside the force field. These devices employ similar technologies as plasma weapons. Tesla compression, as used in plasma storage, allows more precise ion flow control and density. The emitter launches ions into the magnetic field at high velocity and because they are electrically charged, they follow the path of the magnetic field. The ion generator must either use the surrounding air (if there is any) to replenish ions, or preferably reclaim them as they curve back along the magnetic field.

As matter or energy enter the field, they are bombarded by the stream of ions. Plasmas diffuse and dissipate under this barrage. Photons in lasers are diffused or absorbed and become harmless light. Solid object such as bullets are deflected and a majority of their energy is absorbed.

Standing too close to a force field is a hair raising experience (literally). The electrical charge of the ions partially discharges in the air and causes a (surprisingly) mild charge in the local atmosphere, making hair stand on end and causes mild shocks.

Anti-Gravity

Anti-Gravity systems vary in different applications. Some systems only produce lift, some are used in lift and propulsion. Many Scimrahn systems are very simple. As a result they are often not very efficient or fast. However some systems are so reliable, they rarely need any type of maintenance. This is because most use magnetic fields and near vacuums to eliminate friction. A cone shaped super conductor cooled to approximately -120 C is suspended by magnetic coils. The field fluctuates to cause the superconductor to spin. Once the electro magnet reaches one hundred thousand RPM the engine has reached it's optimal lifting capacity. Despite their relative common nature, Anti-grav engines are expensive to build because of exacting material fabrication. The superconducting cone, (also referred to as a core) is an application of nanotechnology. The material that makes up the core is a precisely aligned crystal of carbon, boron, and sodium.

E-suits

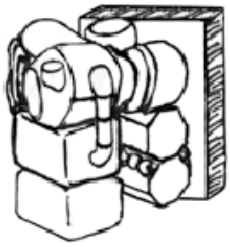
E-suits as a technology is a diverse topic. Essentially the root idea behind the E-Suit is traveling in harsh conditions. However, most designs are military in nature. Each nation has their own strategy to designing E-suits. Scimrahn suits are simple systems and the chassis is designed for easy modifications and repair. Kelrath suits tend to be well armed and heavily armored. Chezbah E-suits are designed to be light, compact, fast and maneuverable. E-suits are mainly hydraulic mechanisms supplying a majority of the system's movement.

Scimrahn and Kelrath suits achieve hydraulic power from internal combustion engines.

Chezbah suits use electromagnetic rails that form a linear motor. Their more rugged construction vehicles use a sonic piston to create hydraulic pressure.

Fine motor skills use a metal and a polymer basket weave tube that contract when and electrical current is passed through them. These "muscles" allow for quick reflexes that would be impossible in hydraulic systems.

The most impressive feature of the E-suit is it's complex and elegant control system. In the TF-2394 two terrain computers, one in each leg, study sensor data and determine how to maintain balance. The main computer determine how to proceed according to the pilot's commands. The controlling computer uses multiple inputs including manual controls and voice command. The systems can adjust on the fly as to what inputs are being used. One moment the manual controls are used to target, the next moment, the pilot can bark out firing co-ordinates. The system's flexibility it's primary strength.



A TF-2394 engine assembly and protective firewall

Subterranean Weather

One of the ways that the subterranean habitat affects the people in it is weather or lack of it. Underground is a relatively static atmosphere. It is most often very cold in many areas underground. Those arias without power can often have temperatures that drop below freezing. These freezing temperatures can cause water supply pipes to burst, causing ice to form. In some instances reservoirs have cracked open flooding an aria then freezing again, and coating large expanses in ice. On the flip side of the coin, regions near plasma conduits can reach temperatures over forty five degrees Celsius. This causes a large

majority of the population to reside in close proximity to plasma conduits.

One way that wind is generated in the underground is by large expanses of White Spoor creating electrical discharges. A highly active colony can warm the air near them, electrical discharges super heat local air and vortexes of cold air rush in, then as the air cools air rushes out. In this way spoor colonies "breath" (or "romosh" in Scimrahn). This suction can at select points become so violent and gust so suddenly, the wind speed can exceed four hundred kilometers per hour. In this way, travelers have been known to be sucked into areas of spoor.

Psudo-weather

The air filtration system of incremental cities, when powered, often create a gentle breeze. However these systems can sometimes gusts of twenty kilometers per hour, more than enough to kick up some dust.

Water cycling through the filtration system can cause a slow steady rain from hex ceilings as the water pipes drip, but this is often not hex (grier) wide. However, powered hexes have rain systems in agricultural arias that will rain in a measured amount once a day in a twenty two hour cycle. Even this rain is often light, unless there is damage to the rain system.

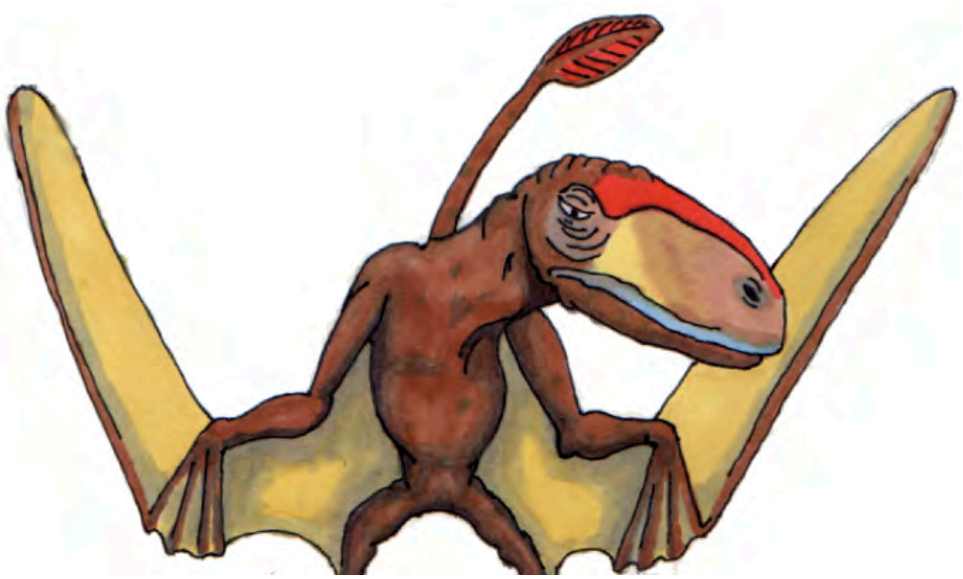
Surface Weather

I have been to the surface only once, and I was lucky enough to see the vegetation bands. When I first read of the vegetation bands, images of tropical rain forests were what came to mind. The area of the bands that I saw bore no resemblance to a rain forest, but rather rolling fields of orchards and rows on rows of giant fern. These farms had no large trees, and structures are built into hillsides or underground. The reason why is the weather. In the heavy and rather uncomfortable atmosphere in these regions, massive typhoons build up and carry much greater force than those on earth. These typhoons travel well inland and lay waste to giant swaths of countryside. Because of the flooding rains however, is the main reason for the vegetation band's lush growth.

Conversely, I would expect that the further out one travels from the bands, and the thinner the atmosphere gets, the less atmosphere plays a role. Although I have heard of "ground lightning" out in the extreme fringes of the atmosphere , where wind friction builds up a static charge and a bolt of lightning races along the ground only to be absorbed by the air.

Biology

I include this information here because it proved invaluable to me and my troop when it came to food and medicine. Many of the Scimrahn are well versed in much of the native fauna and flora. This is not surprising, as this is native to them and they must rely on whatever foodstuffs they can gather. Much of the life is well documented by other biologists so I have not gone into great detail here. Rather it is my aim to document simple survival information that I wish we had when we arrived on the Artifact.



Scimrahn Diet
In the Scimrahn tribes I was exposed to, the following outlines the typical Scimrahn diet, and a small excerpt about each food in order of frequency. My guide to Scimrahn cuisine was a very heavily built man named Mawlk. Mawlk is a Scimrahn gatherer for a carrier tribe. He and several others would strike out every day, and forage for whatever food was available. Gathering reduces the amount of food the tribe has to carry and provides fresh food. Mawlk specialized in harvesting nuts from trees and catching Bah-bahreeth, so I received an up close look at the methods involved in each.

Zah: Although I was never much into eating insects, living with the Scimrahn soon makes it a necessity. Zah comprise a majority of the Scimrahn's protein intake. Surprisingly, Zah aren't all that different from eating shrimp, aside from having a mild nutty flavor.

Seeter: While the Seeter is the largest animal found in any numbers underground, the nutrition value of a scavenger isn't the best. Although it is a welcome change from Zah. Seeter is stringy and gamy, but it is meat and has a good fat content surprisingly. It all just breaks down to, Seeters are very good scavengers, and Seeter meat is better that no meat. I've been told that Seeter tastes like Duck, but I wouldn't know, I never had duck.

Kaydoo: Kaydoos are often serve a double duty, they carry your food for a few weeks and if you haven't gotten there yet, you eat the Kaydoo. Kaydoo isn't any less gamy than a Seeter, but being a herbivore, I'd imagine they're a lot more nutritious. Kaydoo meat tastes like low grade beef, not a lot of flavor and very tough.

Bah-bahreeth: Bah-bahreeth are difficult to catch, as a result they are a bit of a delicacy. To cut to the chase, they're my favorite choice and Mawlk who was quite adept at catching them was also good at preparing them. Bah-bahreeth I feel foolish saying it, tastes like chicken. Bah-bahreeth are found most often in thermosynthetic biospheres, their favorite food are the Ekchok that feed off Zah, and Nicoe. While the Bah-bahreeth are for the most part harmless, their quarry, the Ekchok are not. In order to find Bah-bahreeth you have to find Ekchok. One method of catching Bah-bahreeth is to catch an Ekchok and use it as bait. Mawlk preferred to mimic the sounds of an Ekchok to lure the Bah-bahreeth. This can also however bring in more Ekchok.

Berem: I have rarely heard of anyone but a raider tribe eating Berem. When I asked why, I received a blank stare, and the reply "they're too big". This was a over simplified explanation but it strikes home one point, a six hundred kilogram animal takes more time to prepare than most Scimrahn have. I myself never had the opportunity to sample Berem.

Pettok: A dead Pettok is an interesting event.The average Pettok yields one thousand three hundred kilograms of meat, and it is a lot of meat. That much meat can feed a tribe for three months. The trouble is, few tribes that visit the surface have the facilities to

preserve so much meat.

Vegetation is a large part of the Scimrahn diet, however items such as nuts and seeds tend to be a bit rare and can fetch a good price in the Poord. The items listed here are in order of frequency

Tubers: A variety of tubers make up a bulk of Scimrahn fare. Shek-mog-leech is the most common of these. A starchy pod tasting much like a potato, but with a sourness that is an acquired taste. The leaves of the "shek-mo" as it is often referred to are also eatable, and are often ground and dried to form the closest thing I have ever seen a Scimrahn use as a spice, or garnish. Shek-mo leaves are even more bitter than their root.

Roots: There are two roots that are major portions of Scimrahn fare. One is the root of the kek-leech, a mildly sweet root that is sometimes processed to make sugar. The kek-leech root is soft when boiled and is a welcome change from shek-mo. The frich-leech is another plant with eatable root, this root is hard and is often gnawed on over time. The frich-leech root is, from other scientist's studies rather nutritious, storing many vitamins and minerals. It also appears that chewing on this root may be important in maintaining good dental health, as chewing on it cleans the teeth and gums. I got in the habit of carrying a small stash of frich-leech and find it satisfying and beneficial to maintaining a healthy diet.

Frich-leech is slightly oily and rubbing it on abrasions and light burns has a soothing affect (probably because of a high vitamin E content). This root has a unique taste that is hearty and rich.

Nuts: To say that nuts are not a common food would be incorrect. At the same time, they are consumed in limited quantities. Often only a few nuts would be served with a dish. I had a somewhat disproportionate exposure to nuts when I stayed with Ahadolko, as he was a specialist in harvesting nuts. He maintained a small grove of Thid-gafr tree from which he would harvest his nuts. There are several other verities of nuts that compose a small

portion of Scimrahn diet but the thid-gafr nut is the most widely consumed.

Seeds: There are very few plants that bear an eatable quantity of seeds on The Artifact. Those that do are often frail and difficult to grow underground. (it's actually not a sunlight issue, it has more to do with poor soil conditions). The most widely consumed seed iis from a bush called Boch-gafr that grows a pine cone like seed pod. The pod (simply called Boch) is struck against a hard table several times to release all the seeds. Boch seeds are fried in animal fat and consumed like rice.

Almost immediately the ASO and I-CA have begun growing wheat and other grains on The Artifact to try to supplement the diets of their men.

Water

One of the major difficulties in survival on the Artifact can be getting clean water. Sometimes getting clean water is simply a matter of filtering, boiling or otherwise treating available supplies to make them fit for drinking. Other times water may be so heavily contaminated with toxins of heavy metals that making it drinkable is a large undertaking. Reservoirs may be frozen, requiring the ice be melted to obtain suitable drinking water, or sometimes a reservoir may be "locked down" referring to the valves to the water supply are jammed or frozen shut. In this instance the only way to get to the water is to cut into the reservoir from the top, A difficult and time consuming task.

Clothing

The majority of clothing worn by the Scimrahn and Kelrath are made from the fronds of the "Giant Fern" (mbahch-leech) This material is best described as hemp like in texture. The less affluent wear a course flax like material that is derived from a reed (kezi-leech) harvested from swamp like fields. While it is very sturdy, It is a rather uncomfortable fabric to wear. Often the layer of clothing closest to the skin is made of Mbahch and the outer layers are of Kezi. Another source of clothing is leathers of various animals, Seeter and Kaydoo being the most common.

Photosynthetic Biosphere

The photosynthesis based ecosystem on the Artifact is simple in relation to earth's multiple biospheres (ie tropical, temperate, dessert, etc.) There seems to be only three main divisions in photosynthetic biospheres, these being "Equatorial", "Dessert", and "Subterranean."

Equatorial

The equatorial biospheres are home to some of the largest flora and fauna on The Artifact, despite heavy gravity. Much of the "vegetation bands" has rich soil like that found in river deltas. Immense storms dredge up sediment and dump the silt onto the surrounding land. Very little of the equatorial biospheres is wild. Most of the land area is used in agriculture.

Dessert

The desserts beyond the vegetation bands have thin atmosphere and very little rainfall. The flora and fauna that inhabit these regions are well suited for these harsh conditions. The primary animal life in the desserts is the Kay-doo. This small herd animal is often used as a pack animal.

Subterranean

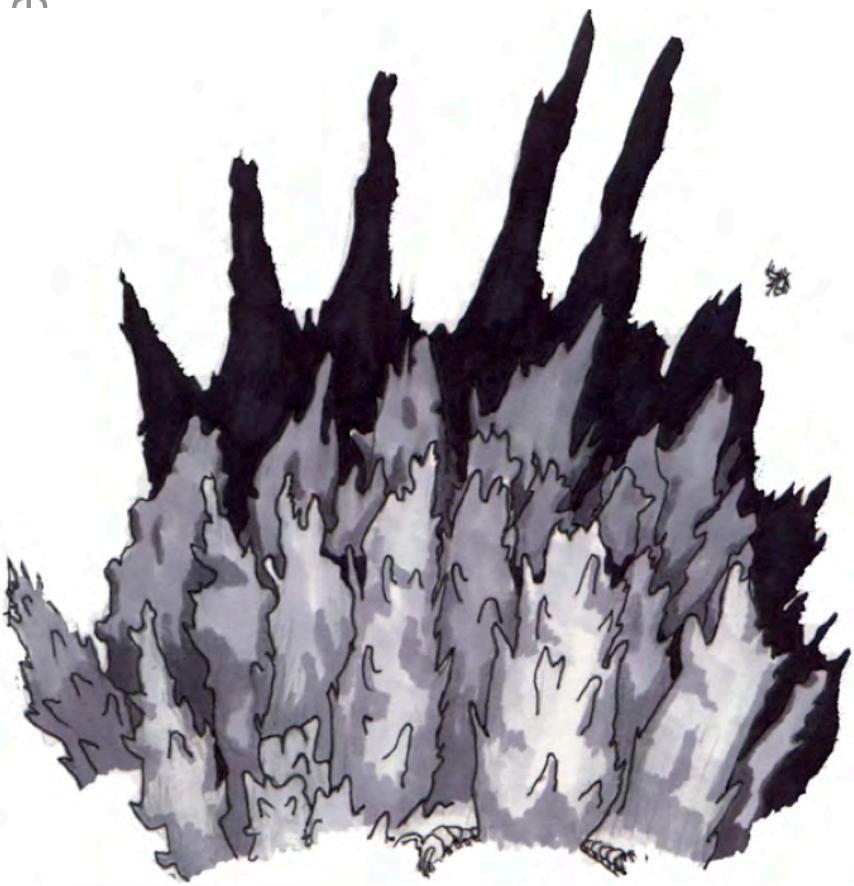
Underground, there is a large verity of plants that have found ways of surviving despite hostile conditions.

Thermosynthetic Biosphere

While these ecosystems are widely thermosynthetic, it should be noted that there are large pockets of this biosphere that are kemosynthetic. (The prefix "kemo" refers to "chemical", or synthesizing energy from chemical reaction) In this subgroup, bacteria

use methane to produce food energy. However the vast majority of this biosphere, bacteria use thermal energy to produce food energy. In these unlit areas a growth called a Fera Sponge creates dense forests of standing sponges. These sponges are not extremely different from those found in Earth's oceans (at least from my observations) aside from the fact that they grow on dry ground, or walls and ceilings for that matter.

The Fera Sponge is a symbiotic organism that houses food creating bacteria. This bacteria are the organisms that carry on the thermosynthisis. The sponge, lives off of waste and gives shelter to the bacteria.



Zah are the next step up in this food chain, feeding on whatever bacteria they can extract from the surface of the sponges. Zah in turn are fed on by Chig, Ekchok, and Seeter. While the Chig and the Ekchok are eaten by Seeter and Bah-bahreeth. The Bah-bahreeth is a winged lizard that hunts nocturnally in lit areas. It is similar in size to a large bat.

The Methane Wastes

I have heard reports that the I-CA has been extensively studying the methane wastes. In the reports there is mention of animal species unlike anything I have ever heard of. At this time I decline to discuss what may be rumors or a ruse, but if the reports are accurate, a new chapter in biology may have to be opened.

Language

These are some simple words or phrases I have compiled from our dealings with the Scimrahn, and (as I will explain later) the Kelrath.

Scimrahn

First things first, the spelling of the word Scimrahn is based on the English alphabet, and is not precisely how the name is pronounced, especially according to dialect. In truth, the pronunciation is usually between the traditional "Scimrahn" spelling, and what would be written as "Shebran".

Spoken language

In English the use of complete sentences is considered desirable, in Scimrahn however clipped or incomplete sentences are considered proper form. If for some reason the statement or question is unclear, it is up to the one being spoken to clarify by a question.

A: Busy?
B: Yes.
A: Very?
B: No.
A: Leaving?
B: Yes.
A: Now?
B: No.
A: When?
B: Later.

To many English speaking "Earthers" this conversation would be frustrating, but it is normal in the Scimrahn tongue.

Prefixes

ahm-father: Denoting either a literal father or a ideological one. After a man becomes a father this prefix is often added to his name as a title of honor, somewhat equivalent to "Mister" in English or "San" in Japanese

ahz-female
it - plural

lah-possessive: Denoting where an object is, or who owns it. The usage is smiler to `s at the end of a word in English. This prefix is most accurately portrayed by the Scimrahn words for that and this, being lahchim and lahchaz respectively. Lahchim broken down would mean people (chim) posses (lah). And lahchaz broken down would mean I (chaz) posses (lah). In a sense the Scimrahn words do carry these literal meanings but also change their root word's meaning to "with me" and "with them" (or "not with me"). As such "lah" does not mean ownership, but more who has something.

lo-ownership: While the prefix lah may indicate ownership, the prefix lo is a more definite indication of ownership. For example, the phrase "lahchim, lochaz" translates to "that's mine". While lah deals with who currently has something, lo is closer to who owns that thing. Lah might be used if the ownership of an object is uncertain and lo when ownership is definite.

minah-future: Used sparingly, this prefix is normally attached to a verb and is normally used to express that the action may take place at a later time. I was surprised to find out how often this prefix wasn't used, I was told very politely that I sounded like a moron when I used it frequently. The only times that this prefix was used in everyday speech is in speculation or more accurately denoting something hoped for or looked forward to.

Nouns

book: ke-podo (ke po-do)
Carrier tribe: rahtor ahzchim (rah-tor az-chimb)
CCC (layer stone): rone gieken (rone gie'-ken)
community (town/city): ahzimroke (ahz-im-roke)
computer: chaw-torma (chaw tor-ma)
chronometer: rahbanaw (rah-mba-naw)
cloths: mizrone (miz-rone)
demon (hounds): brouragh (mbro-wragh)
dirt: ienah (ien-ah)
door (door way): kahnahiz (kahn-ahiz)
Enforcer: Togon (to-gon)
fire: frawamis (fraw-amies)
food: zahahnie (zah-ah-nie)
freighter: rahtorzech (rah-tor-zeich)
gift (narcotics): zahahmies (zah-ah-mbies)
hex: grier (grier)
hole: ahiztor (ahiz-tor)
house (home): roke (ro-ke)
I, me: chahz (cha'-z)
ideograms/ideographic writings: En (en)
judge: mbahn (mbahn)
key: rahahimah (rah-ahi-mah)
knowledge: kelgrentha (kel-gren'-tha)
laser: podok-fraw (po-dok fraw)
layer: rone (rone)
light: fraw (fraw)
machine: torma (tor-ma)
man (person, you): keth (keth)
Matriarch: Ahzeken (ahz-i-ken')
Merchant (Carrier) Rahshaho (rah'-shah-o)
mechanic : rahfeahe (rah-fey)
medicine: feahnie (feah-nie)
Minstrel (tribe): Owketh-meahe (ow-keth mbeah-ie)
music: owketh (owk-eth)
musician: rahowketh (rah-owk-eth)
name: loke (lo-ke')
our: loitchahz (lo-it-cha'-z)
people (they): chim (chimb)
place: po-do (po do)
plant (herbaceous/green stemmed): leech (leech)
plant (woody stemmed): gafr (gahfr)
plasma / plasma energy: ofri (owfrie)
Raider: Rahzahm (rah-zahmb)
Scout: Ziekem (zie-kemb)
sound: boah (mboah)
stone: gieken (gie'-ken)
student: rahgrnthah (rah-gren'-tha)
teacher: rahkel-grnthah (rahkel gren'-tha)
tent: roke-chah (ro'-ke chah)
they: itchim (it-chimb)

time: nawch (nawch)
tool: mah (mah)
trade: shaho (shah-o)
tribe: ahzchim (az-chimb)
wall: ienshaz (ien-sh-ahz)
we: itchahz (it-cha'-z)
weapon: pahk (pahk)
wise man / sage: Kelek (kel-ek')
woman: ahzketh (ahz-keth)
word (expressing thought): ke (ke)
world: zipodo (zi-podo)

Verbs

acquire: shah (shah)
approach: torleke-gieth (tor-leke geth)
ask: gomb
attack: resh-pid (resh-pid)
break: feahesh (fey-sh)
breath: romosh (raw-mosh)
buy: shahe (shah-e)
change: pelien (pel-ien)
choose: niso (nis-o)
clean: geith-ienah (geith ien-ah)
close: ahensh (ah-en-sh)
come: torhaz (tor-haz)
complete: pel-resh (pel resh)
control: lah-kahn (lah kahn)
copy: resh-lahchim (resh lah-chimb)
count: chawf (chawf)
cut: pidahiz (pid-ahiz)
do: pel (pel)
drink: ahfies (ah-fies)
drive: lah-podok (lah po-dok)
eat: ahnie (ah-nie)
empty: geth-poahn (geth po-ahn)
enter: ahenshtor (ahen-sh-tor)
escape: doch-balzi (doch bahl-zi)
fear: ragh (wragh)
fight: ziembiz (ziem-biz)
fill: resh-poahn (resh po-ahn)
find: ben (mben)
fix/repair: feahe (fey)
follow: torchim (tor-chimb)
forget: shgrentha (sh-gren'-tha)
give: ahmies (ah-mbies)
go: tordo (tor-do)
guard (protect): zibahl (zi-mbahl)
hear: gren (gren)
help: reshpel (resh-pel)
hurry: chie (chi)
keep: bahl (mbahl)
kill: pelshzi (pel-sh-zi)
know: bahgrnthah (mbah-gren'-tha)
learn/listen: grnthah (gren'-tha)
lift: toresh (tor-resh)
look/see: bek (bek)
make: meahe (mey)
manipulate: topelien (to-pel-ien)
miss: shipid (shi-pid)
move/carry: tor (tor)
near: leke-gieth (le-ke gieth)
open: ahiz (ahiz)
push: pitor (pi-tor)
ride: torrahshah (tor-rah-shah)
rub: toch (toch)
run: doch (doch')
sell: shahien (shah-ien)
sleep: iensh-pelzi (ien-sh pel-zi)
smell: mok (mbok)
speak/talk/say: keboah (ke-mboa)
stand: dof (dof)
start: nawtor (naw-tor)
stop: shtor (sh-tor)
strike/hit/punch: pid (pid)
taste: ah (ah)
touch: tok (tok)
walk: dok (dok)
warn: kebahlzi (ke-bahl-zi)
wear: shahmizrone (shah-miz-rone)
work (job): pelmeahe (pel-mey)
write (phonetic): pelboah (pel-boah)
write (ideograpic): pelen (pel-en)

Other

about: geith-ien (geith ien)
accept: shawcha (shaw-chah)
across: kem (kem)
and (plus): resh-chawf (resh-chawf)
angry: ziem (ziem)
any: onis (onis)
awake: pelzi (pel-zi)
bad/poor/less: gieth-ke (gieth ke')
before: nawbawke (naw-bawke)
big: resh-leke (resh leke)
bright: resh-fraw (resh fraw)
cold: gieth-miz (gieth miz)
danger: agh (agh)
dark: gieth-fraw (gieth fraw)
dead: shzi (sh-zi)
destroy: shtah (sh-tah)
different: ien (ien)
difficult: sh-torpel (sh tor-pel)
direction (way): podok (po-dok)
down: dopodo (do-po-do)
fast: resh-tor (resh tor)
first: bawke (baw-ke)
for: minah-lah (mbinah lah)
free: ro (row)
gone: torbaw (tor-baw)
good/more/well/fine/alright: resh-ke (resh ke')
happy: resh-zi (resh zi)
hard: olch (olch)
heavy: zechah (ze-chah)
hot: resh-miz
hurt/wounded/injured: geith-zi (geith zi)
if: she-iennis (sha-enis)
in (same as enter): ahenshtor (ahen-sh-tor)
last: resh-tah (resh tah)
left: ienpi (ien-pi)
like (enjoy): resh-zimeahe (resh zi-mey)
light (not heavy): gieth-chah (gieth cha)
live (living): zi (zi)
lost: podobes (po'-dombess)
many: resh-pah (resh pah)
maybe/uncertain: shech (she-ch)
method (way): kahn (kahn)
must: shawpel (shaw-pel)
my/mine: lochahz (lo-cha-z')

new/young: gieth-nawch (gieth' nawch)
next: nawtah (naw-tah)
no/zero/nothing: sh (sh)
not (never): iensh (ien-sh)
now (is, happen): iennis (enis)
old: resh-nawch (resh nawch)
out: ahiztor (ahiz-tor)
ready: peliennis (pel-enis)
right (direction): zempi (zem-pi)
sad: geith-zi (geith zi)
same (together): shien (shien)
slow: gieth-tor (gieth tor)
small: gieth-leke (gieth leke)
smart: kelresh-ke (kel-resh ke')
size: leke (leke)
strong: thezen (thee-zen)
that: lahchim (lah-chim)
this: lahchahz (lah-cha-z')
true (correct): shaw (shaw)
unwise (foolish, silly): kelgieth-ke (kel-gieth ke')
up: bepodo (be-po-do)
very: resh (resh)
want (need, desire): kelahz (kelahz)
warm: miz (miz)
wrong (false): shishaw (shi-shaw)
yes: cheg (cheeg)
your: lochim (lo-chim)

Question Words

what (question): gomb (gomb)
when (what time): nawch gomb
why (what reason): kelgomb (kel-gomb)
where (what place): podo gomb
how (what method): kahn gomb
how (what direction): poduk gomb

Unique Words

Gomb: This word is translated as "what", but it also denotes that the speaker is asking a question, much like a question mark at the end of a sentence. For example: "lahchim shaho keth kelahz gomb" translates to "you want (to) trade that?"

Pord: This is a proper noun indicating a community area. Often located at the center of town, the Pord is a place to buy or sell, talk, eat, sing, entertain, etc. In fact in Scimrahn culture many things are only done in the Pord. Doing them anywhere else would be considered rude.

The Kelrath Language

Although the pronunciation of the name Scimrahn is up to dialect, the word Kelrath is simply wrong. The true pronunciation is actually closer to "kel-grith". The original spelling is drawn from the transcripts of conversation with the Geetin prisoner who at the time appeared to have a throat infection. However my arguments to have the official spelling and pronunciation changed have not gotten very far. Keep in mind however that when saying "Kelrath", pronounce it "Kel-grith" especially when attempting to fool someone into thinking that you are one.

The following is a small sampling of essential Kelrath words I was able to compile, this list is not nearly as complete as the Scimrahn listing but it serves for some rudimentary interaction with the Kelrath.

bad: hephuk (heph-uk)
don't know (don't understand): gychk yvoltha (gy-chk y-vol-tha)
down: fit (fit)
fast: dahom (dah'-om)
food: gavoth (gav-oth)
go: fadin (fa-din')
good: volchk (volchk)
goodbye: nuvo (nuvo)
have access: mahnin (mahn'-in)
hello: pheli (pheli)
how: gelo (gelo)
left: vorud (vor-ud')
man: rakuchk (rak-uchk)
me: voj (voj)
name: maphat (ma'-phat)
no: gychk (gy-chk)
own: dathavo (dath-avo)
quiet: kol (kol)
Rantaa' family head: Mahalin (mah-alin')
slow: thichk (thi-chk)
stop: merchk (mer-chk)
right: gezum (gez-um)
up: yrok (y-rok)
us: helel (he-lel)
what: jeko (je-ko)
when: moko (mo-ko)
where: sido (si-do)
who: daho (da-ho)
why: buto (buto)
woman: lojif (lo-jif)
yes: wami (wam-i)
you (singular): bawen (baw-en)
you (plural): kusaj (kusaj)

Numbers

Kelrath numbers are the same as Chezbah numerals, this may be because many things in the Artifact are labeled with these numerals such as plasma conduits and Hosent. It may not have been practical for the Kelrath to re-invent the wheel.

Common Names

These are the most common Geetin names. These names are sometimes seen in higher castes.

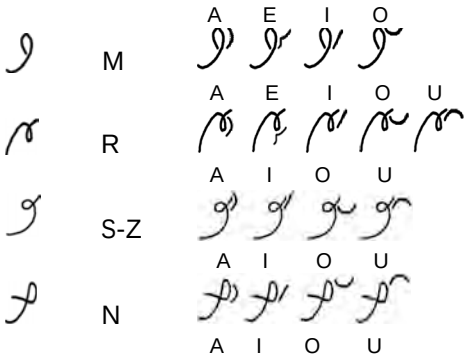
Male
Hessik
Rannil
Szarros
Metizih
Votusk

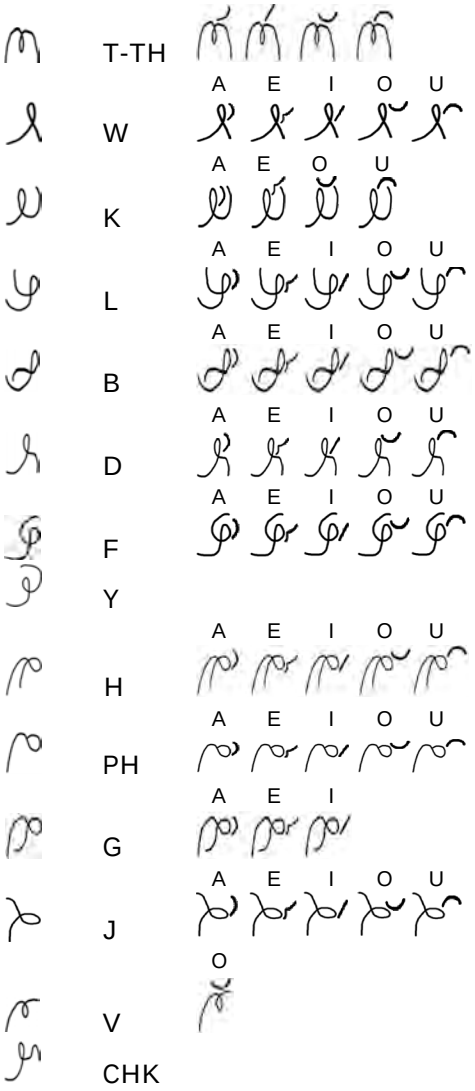
Female
Rahnzi
Rinkuz
Largsum
Menichk
Loma

Kelrath Alphabet

The Kelrath Alphabet is significantly different from the Chezbah and Scimrahn alphabets. In it's written form, each consonant starts at the bottom of the line and progresses upwards to a loop, and then on to form the rest of the letter. These characters are also written using only one continuous stroke. This results in a flowing body of each character that is a form of calligraphy.

Vowels are secondary characters that modify a consonant and are written as tiny accent marks next to their consonant. Because of this words and names that are Kelrath native can never begin with a vowel sound. This rule is exempted when writing Scimrahn or Chezbah words by an accent mark before the first consonant. Another unusual rule to the Kelrath language is that certain consonants can only be followed by a select set of vowels. This is shown in detail below. These combinations must be memorized if one is to be proficient in writing the Kelrath language.





The Scimrahn

Gadios

Gadios is the Scimrahn's primary city. There are a few large industry tribes, but none that come close to the population of Gadios. While much attention was put into determining the political structure of the city in the ASO's first months of setting up a base of operation, much has to be learned as far as the city culture.

The shanties surrounding Gadios are peopled mainly by transients, and therefore the culture in the cities surrounding area is more or less "standard" Scimrahn. However, those that have lived in the city for extended periods have a significantly different outlook than the average tribe. A cursory overview of the differences encountered follows.

Longer life spans is one of the benefits from living in Gadios. This has changed much of the city resident's outlook on life and their desires.

There is a substantial Kelrath cultural influence. Because of the proximity of the Kelrath, an unusually high amount of interaction takes place between Gadios and the city of Penalon in the shadows.

Private space and personal space are two very strongly developed concepts in Scimrahn tribal life. Clear guidelines dictate what is and is not acceptable in regards to "personal space". However because of the large population and larger distances involved, those lines are blurred and redefined in Gadios.

Inter-tribal relations are more extensively developed in Gadios. Issues such as inter-tribal law and city policy are unique to Gadios. One example of this is the judging of those accused as criminals. The Matriarchs of tribes appoint judges to hear native and inter-tribal disputes. In the case of an inter-tribal dispute, the judge also has representatives from other tribes sit in on the dispute. The representatives also give their opinions on the situation at hand, and

normally the judge will honor their opinions especially if they are unanimous.

Music

Scimrahn music is difficult to become accustomed to, it is one of the few things about the culture that is truly unique. I am no music expert, but I will do my best to relate the experience of Scimrahn music.The musician sings in a style I can only liken to the Arabic Criers at mosques. The two are no doubt very different, but it is the closest I can make an approximation to. To this point I have taken to calling Scimrahn musicians criers (the Scimrahn word for them is Rahowketh). Sometimes there may be many singers or criers that will sing together. This is most often done when entering a battle, or to taunt an enemy on the battlefield. The effect is very eerie and I can only liken the far off sound of these singers to the sound of bagpipes for their disquieting nature.

Often in a Poord a crier will play for a small crowd for their enjoyment. The crier does not play any instruments in the conventional sense. Instead, before and during the session he sets up a device called a Zeidowg. The Zeidowg is essentially a computer with preprogrammed software. This device then listens via microphone to the crier and the pitch and pace of their song. The Zeidowg generates tones based on the criers voice, and prerecorded sounds and manipulates them.

Guided by Signs

Scimrahn Scouts use a graffiti like language called En to leave messages of all sorts. This language in signs is uses ideographic symbols to communicate with other Scimrahn information pertinent to the area. This is most often information on where the Scout is, where food may be found, what tribes travel through the area and the proximity of enemy forces.

The amazing thing about this method of communication is that it is subjective to the writer's style and therefore is not a static language. There are a few advantages to this. The Chezbah priest's ability to understand any language and their ability to crack encryption is a hinderance to the Scimrahn. The Priest however do not seem to easily understand En. This may be because ideograms are not easily deciphered. With a phonetic language once a few letters are deciphered the reader can recreate the language. (This by itself is often a great deal of work, but the Chezbah seem to be unusually adept at it.) An ideogram of a bowl may mean a bowl or food or a number of other possibilities. Scimrahn En writers often take advantage of ambiguity to convey a incorrect message or something meaningless like a joke to those who do not sufficiently understand their style. Another advantage of a progressive language is that old signs may not be accurate anymore. The aging style of the En used is in a way "dated" and is then taken with "a grain of salt".

The most common and constant En are the calender and the signature. The calender is the Scout's schedule and also gives hints as to the scout's style. The calendar is often depicted as a spoked wheel. Each division within the wheel depicts or describes a landmark, or some point of interest. The calendar also tells how long it takes the scout to complete the cycle on the calendar. From the calender, someone skilled in reading En can also tell approximately where the scout should be at any given time.

The signature is used to tell who is the writer of the sign, but has also come into more common use to do things like mark property

and leave a calling card. The signature is a idealized animal above the picture of a banner flag. The flag symbol contains signature signs that represent the writer's name and tribe.

One of the most fascinating things about En is that it is probably the most technically and artistically advanced art in the Artifact. Chezbah and Kelrath art both resemble very early Egyptian art and seems that there has been little change in Chezbah art in thousands of years. En has references to some of this style, but has advanced in a great number of ways. In many ways En is The Artifact's equivalent to the Italian Renaissance and the development of Impressionistic and other more modern ideas.

Traveling Under Cover

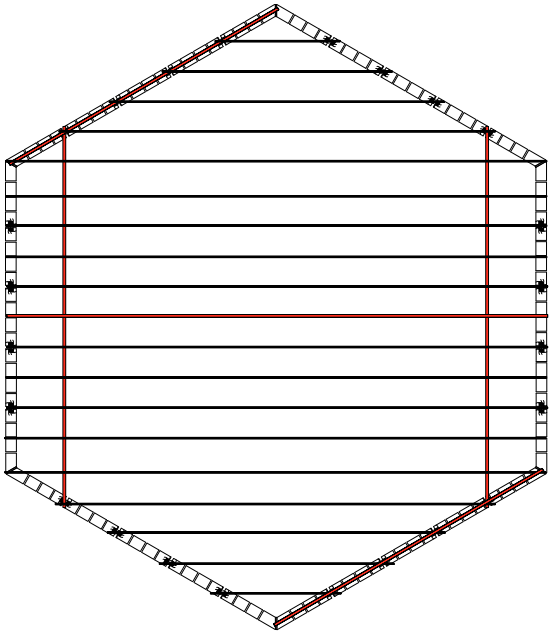
Enemy forces can sometimes be avoided by traveling through tunnels that pass through hexes. The tunnels can present their own challenges as they are not always empty.

Every hex has three layers of tunnels that cross each floor at different angles. (Agricultural hexes have three floors, Industry hexes have six, and Residential hexes have fifteen) and three layers that cross the ceiling.

Five main arteries feed smaller tunnels that are spaced approximately every seven hundred meters. This is seen on page 17, a single layer of the conduits are shown in red. The larger arteries are the thicker lines.

The first two main arteries in a layer runs inside parallel walls. These branch into a third and fourth artery that run sixty degrees to the first two. The third and fourth are also parallel to each other and are approximately eight hundred meters from the closest wall. The fifth main artery is perpendicular to the third and fourth and bisects them and the hex.

This middle artery or bisecting artery in the ceiling of a hex is often used for maglev rails for mass transit. The smaller tunnels run parallel to the fifth artery and intersect the first through fourth arteries.



Bisecting arteries connect to the other bisecting arteries on other tunnel levels by means of short vertical tubes.

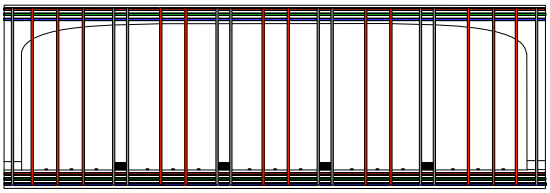
The next level is identical to the first but turned sixty (60) degrees. The third level is turned another sixty (60) degrees, or one hundred and twenty degrees (120) total. This is illustrated as the first or top layer of conduit in red, the second or middle layer in blue and the third layer in green.

Tunnel arteries are roughly ten meters in diameter and are cylindrical except in subfloors of residential hex sub floors where they are flattened on the top and bottom so that they are only five meters in hight and ten meters wide.

Secondary tunnels are five meters in diameter. Electrical Tunnels have several carbon conductors that are elevated to a hight of one meter. These conductors are approximately ten centimeters in diameter. High power conduits like those found in the power and industry hexes have more conductors and these conductors have a thin layer of insulation around them. It should be noted that when in any proximity to these conductors, unshielded electronics may not function or even may be damaged by the powerful radio waves emitted from the electrical field. Radio also may not function properly.

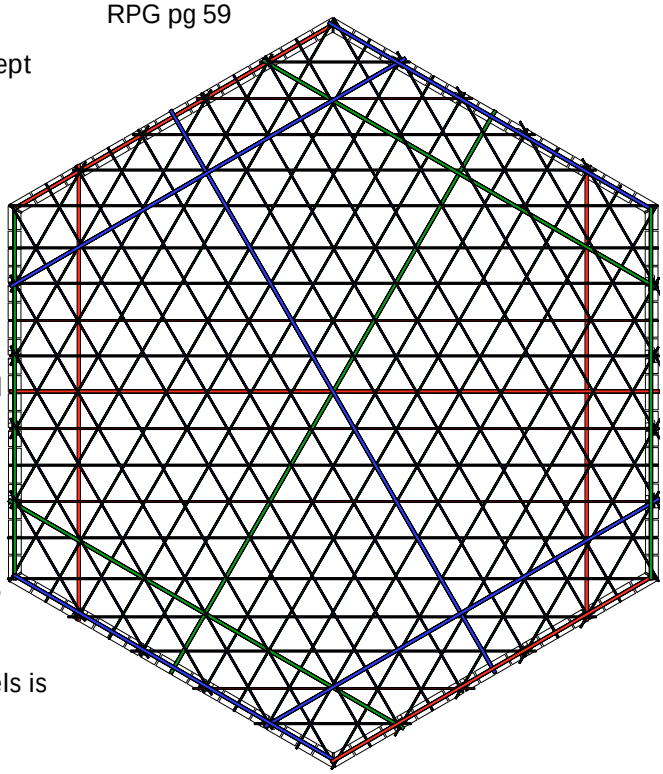
Another feature of electrical tunnels is in the bottom bisecting artery in the very center of the hex. A mainframe QLC (Quantum Liquid Computer) that controls various aspects of the hex are found here. There is only one mainframe per hex.

Ventilation tunnels are often in a conduit layer that is closest to a ceiling. These conduits are usually free of any kind of obstruction except for vertical vent shafts in the floor of the conduit that have fans to move air into the hex.



Each wall also has vertical and horizontal tunnels that are used for transport between levels. Vertical tubes in grey contain conveyors that move material and people in between layers.

Each tunnel connects to the floor above it and the ceiling below it via vertical tubes. These tubes are found at points where the tunnels in different layers overlap. These vertical tubes are sometimes plugged to prevent dissimilar tunnels from connecting. Other times they have mechanisms for transporting either water air or electrical power to a floor or a ceiling. In an agricultural hex, a floor might have a drain grating and an electrical coupling while a ceiling has sprinklers and an air duct. See: The Artifact RPG pg 59



Power Hex Conduits

Several types of tunnel exist and depend on the hex they are in. Power hexes use two thirds of the tunnels in them to carry electrical power. The type of tunnel in this electrical distribution system use wires carrying extremely high voltages. One layer circulates air throughout the hex. However the conduits have some difficulty transporting enough air throughout the hex to keep the air fresh. Often dust and molds accumulate in the power hex. The other layer of the tunnels carry water and solid wastes to the surface and bring fresh water back into the incremental city.

Power Hex Floor

Top Layer: Water circulation in between city levels from filtration hex.
Middle Layer: High voltage conduit.
Bottom Layer: High voltage conduit and Hex Mainframe.

Starting from the bottom of the Power hex, the first two tunnel levels are high voltage power conduits. The tunnel level closest to the floor (the top most layer in the floor) carries wastewater out on one side of the hex and on the other, brings fresh water in. because of this, the tunnels on either sides are separated by tunnel plugs two meters thick.

Power Hex Ceiling

Top Layer: High Voltage and Mass Transit
Middle Layer: High Voltage and Mass Transit
Bottom Layer: Air circulation and Mass Transit

In the ceiling, the floor arrangement is mirrored. The lowest tunnel level the level closest to the ceiling surface is used to circulate air. The levels above that are high voltage conduits. All three of the bisecting arteries in the ceiling are used for the mass transit system.

Industry Hex Conduits

Industry Hex Bottom Floor

Top Layer: Low voltage conduit, high to low voltage transformers
Middle Layer: Water circulation
Bottom Layer: High voltage conduit and Hex Mainframe.

Industry Hex Ceiling

Top Layer: High Voltage
Middle Layer: Air return circulation
Bottom Layer: Fresh air circulation and Mass Transit

Industry hexes must transmit electrical power to the rest of the hexes, but only half of the electrical power that goes into the industry hexes continues to the rest of the incremental city. Two tunnel levels on the very top of the hex and at the very bottom are the same high voltage lines found in the Power hex. A large quantity of water is used in manufacturing, so the majority of the tunnels in the industry hex move water. The second level circulates water, and the third transmits lower voltage power to the Hosent.

Industry Hex Middle Floors

Top Layer: Low voltage conduit
Middle Layer: Water circulation
Bottom Layer: Air circulation

The next five floors of the hex are identical to each other, the lowest circulates air for the floor below, the next circulates water to the floor above, and the top transmits electricity. The hex ceiling uses it's lowest level to circulate air to the floor below, the second transports waste water from the filtration hex to the power hex.

Filtration Hex Conduits

Filtration hexes use one third of their tunnels to transport water, one third to cycle air, and one third to supply power to the filtration pyramids.

Filtration Hex Floor

Top Layer: Filtered water out
Middle Layer: Waste water in
Bottom Layer: Low voltage conduit , high to low voltage transformers and Hex Mainframe.

The lowest level of the filtration hex is used to transmit electrical power to the pyramids. The next brings wastewater in and the tunnel layer closest to the floor, sends freshwater out to the city.

Filtration Hex Ceiling

Top Layer: Low voltage conduit , high to low voltage transformers
Middle Layer: Air return circulation in

Bottom Layer: Fresh air circulation out

The ceiling mirrors the floor. Freshly filtered air is sent out in the lowest level, while the level above brings stale air in. The highest level powers the pyramids that hang from the ceiling.

Agricultural Hex Conduits

Agricultural hexes use two thirds of their tunnels for transporting water throughout the hex and back out. One twelfth of the conduits carry electrical power and one fourth circulates air. Each of the three floors of the Agricultural hex have three tunnel levels as does the ceiling.

Agricultural Hex Bottom Floor
Top Layer: Wastewater collection
Middle Layer: Wastewater circulation out
Bottom Layer: Low voltage conduit and Hex Mainframe.

Agricultural Hex Ceiling
Top Layer: Fresh water in
Middle Layer: Fresh water distribution
Bottom Layer: Air circulation and Mass Transit

The next two tunnel levels up take drain water away from the hex, but the middle layer is used to transport water to the filtration hex.

Agricultural Hex Middle Floors
Top Layer: Wastewater collection
Middle Layer: Fresh water circulation to floor below
Bottom Layer: Air circulation

The next two floors are identical, the lowest tunnel level is used in air circulation. The middle layer brings water into the hex for irrigation, and the layer on top that is nearest the floor above is used too take drain water away from the hex. The first level in the ceiling circulates air to the floor below. The middle layer irrigates the floor below and the top brings water into the hex from the filtration hex.

Residential Hex Conduits

Residential Hex Bottom Floor
Top Layer: Wastewater collection
Middle Layer: Fresh water in
Bottom Layer: Low voltage conduit and Hex Mainframe.

Residential hexes have fifteen floors. On the first floor the tunnel levels start with electrical conduits on the lowest level. The second is for bringing fresh water to the rest of the hex floors. The top layer of this floor collects waste water from the rain system at the center of the hex, and from the residential structures on the lowest floor.

Residential Hex Ceiling
Top Layer: Air return circulation
Middle Layer: Fresh water distribution
Bottom Layer: Fresh air circulation and Mass Transit

The ceiling's first tunnel layer carries air to the floor below and to the garden in the center of the hex. The second brings fresh water to the residential floor below and to the rain system. The top most layer connects to the vertical shafts in the walls and draws air in for circulation.

Industry Hex Middle Floors
Top Layer: Wastewater
Middle Layer: Water circulation
Bottom Layer: Air circulation and power distribution

The middle fourteen floors repeat. The lowest tunnel level on these floors carries air for the floor below. the second level carries water for the floor below and the third level carries away wastewater from the floor above.

Reservoir Hex Conduits

Reservoir hexes use the lowest tunnel level to carry water to pumps. The next two two levels carry water to the rest of the city. In the ceiling the first two levels bring filtered water back into the reservoir. The top reservoir tunnels are used for electrical transmission and power water pumps.

The Reservoir Hex is the only hex where the mainframe is on the top level of conduits.

The Chezbah

Despite our having more direct communications with the Chezbah, we have learned very little about them. The truth being it seems that our relations with the Chezbah may have slowed our progress in delving into the deeper aspects of their society. Diplomacy has made it difficult to be more direct in learning more than what is on the surface.

Definition and Pronunciation

Loc (lohk)
The primary Chezbah deity. The source of the Loc personality is unknown. while Scimrahn sources describe Loc as a driving force and acknowledge him as an "evil god" very little is written as to the origin of this belief. Loc is the name of The Artifact that all native people recognize. To the Chezbah The Artifact is the body of Loc.

Chezbah (chez-mbah)
The nation that serves Loc. A theocracy that is ruled by a priesthood who owe their allegiance to Loc.

Kelahn (kel-ahn)
A word that is normally translated as priest, but literally means "god's thoughts". These priests are the ruling class of Chezbah.

Kelpei (Kel-pei)
The high priesthood that is above all other Chezbah and hand down laws to the people. The word Kelpei is translated as instructor but has additional meaning. Kelpei not only indicates giving knowledge, but also as giving wisdom.

Religion

Religion is the predominant focus of Chezbah life, indeed there is no distinction between the Chezbah nation and religion. They are one and the same. The predominant beliefs of the Chezbah are as follows. Loc is the primary deity and while there are other gods mentioned, they are said to be evil. Loc is also the only deity that is given a name. The Chezbah believe that when a loyal follower is about to die, Loc "absorbs" their mind into himself. Something like a cosmic consciousness

Masks

Chezbah use masks during ceremony and worship. The only ones exempt from wearing these masks are the priest. These masks are made by specially licensed artisans that create the masks to exacting standards. This ritual practice has been difficult to study because no one has been permitted into a Chezbah festival. Scimrahn sources have had little or no information on this matter because the length of their exile has erased many of the aspects of Chezbah culture from their lives.

Law

Chezbah law is handed down by the Priests and is enforced by the Warriors however there is not enough priests and warriors to maintain a constant watch over the populous and still maintain the wars on the Scimrahn and Kelrath. To fill the void, a community of pious men called "Ahnpel" (which translates "as god does") which are chosen by the priesthood will hold lawbreakers until a traveling Priest can hold a trial.

Home Life

Each floor of a residential building has a large community area in the center and private areas along the walls. Chezbah who are not married live in the central community

area and are not permitted to enter a private area until they have a mate. It is assumed that this is the origin of the Pord in Scimrahn society.

The Chezbah strictly enforce the number of mates a man can have based on his religious fervor. The method of determining this is a mystery that the Scimrahn have not been able to shed any light on.

The most unusual Chezbah settlements are those in the vegetation bands. In areas where there is no underground access (mainly near the equator) cities are constructed every year after the stormy season.

Married families build houses out of clay that are then covered in a white paste found in mineral deposits. Community homes for the young and unmarried are large structures in the middle of the town. A large stadium size structure is erected just outside of town is a religious center. Although the population of these small towns are seldom enough to fill such a large structure.

Warriors live in communal homes like barracks but have many comforts earthers do not normally associate with modern military life. When at rest, the Warriors have servants that take care of them. Often one male servant is the Warrior's assistant, helping the Warrior prepare for combat, maintaining his weapons and armor. In addition to this the Warriors have several female servants. However it does not appear that the Warriors take mates from these servants, strongly encouraging the notion that the Warriors are not human at all. The most difficult thing to explain is how the Warriors reproduce. No female equivalent of a Warrior has ever been seen. Some speculate that the Warriors are cloned, but genetic tests have made this scenario unlikely since the Warriors have similar but not identical genetic makeup. Large scale study of the Warrior's genetic material is very difficult because of the nanometer scale devices that permeate their bodies. These can throw off the results of a test and so therefore must be removed from the tissues, a long and difficult process.

Approximately half of all Chezbah live on or within 300 km of the surface. The other half live in the region of the plasma collectors. These Chezbah that live far underground are the population given the task of repairing The Artifact. A full eighty percent of the Chezbah military are found defending the collector wells and the industry pods.

Business

Business is not the open commerce model that Earthers are used to. Industry works for the Priests, however the Priests also compensate a company for working for him. One of the primary occupations is young people rebuilding incremental cities. These people are paid to do this work, they then buy food and tools and supplies to do their work with. Then as their work is done they begin to supply their children with food and resources.

Serving the Priesthood

For the most part the priesthood is supported by a ten percent tithe. However this only accounts for material goods, concubines and manservants. Many other services are provided by skilled artisans that are employed by private businesses.

Serving the Warrior Class

In a similar vein Warriors are taken care of by private industry. In addition, the Warriors require a large quantity of military hardware that private industry supplies.

Warriors also have several servants that take care of of them medically and while at rest.

Farming

Most of the faming done by the Chezbah is done in the vegetation bands. However some incremental cities that have been rebuilt can support most of their population. The only factor in where food is grown, is the settlement's depth under the

surface. Below 300 km communities will produce approximately a half of their own food. Below 1000 km a community will produce almost 90% of their own food.

Entertainment

Despite a very high level of technology, the Chezbah do not have a highly technical entertainment industry. Most entertainment is done by individual or groups of actors or singers that travel from place to place performing for often very large audiences. This is how the Scimrahn movement was able to build it's followings. Through small bands of entertainers spreading their message of dissent from location to location. This is also the source of the Scimrahn minstrel tribe system. As a result of the Scimrahn uprising the entertainment industry suffered a severe blow and the Priests now regulates that all entertainers must maintain a certain "level of piety". Again the how this is determined is not known and probably is an arbitrary measure.

Industry

Industry consists mainly of producing weapons and equipment for rebuilding the Artifact. Minor industries produce clothing and personal goods.

The majority of industry is the production of CCC in the industry pods. While no one has ever reported the processes that take place within these pods, the Chezbah produce thousands of tons of CCC and some of the finest HDCCC on the Artifact. Where the raw materials come from to make the CCC is a mystery. Some of the raw materials is recycled from old collapsing hexes or Kelrath cities that have been taken over. The Chezbah are the only group that has been trying to preserve the Artifact.

Military Service

(E-suit pilots, officers etc.)

Military conscripts are often chosen from the young men. While the Warriors are the all purpose grunt, conscripts are e-suit pilots and man the Chezbah vehicles.

Technology

Technology is viewed as holy and not much different than magic by the average Chezbah. This is not surprising because with the Hosent to build equipment, the people need only feed them raw materials and make a few decisions as problems arise. The Chezbah view manufactured goods as coming from Loc, (or the body of Loc which is The Artifact) and therefore all technology produced by the Chezbah as holy. This also makes producing technology apart from Loc as a blasphemy. This has caused a lot of confusion among the Chezbah on how to view Earthers who have their own manufactured goods.

The Priests have told the people that Earthers are exempt from this law as long as goods are not produced on the Artifact.

Visiting the Kelrath

Although most of my records were destroyed and most of those that weren't, were classified as top secret (due to the nature of the mission we were on), I have been permitted to share some general observations about the Kelrath.

On the whole I found the Kelrath stern, serious, and very, very set in their ways. The Kelrath can often pick out any abnormalities from their norm. In some circles, Scimrahn technologies are considered "fashionable" but even this relative normalcy is often looked down upon. I have very rarely seen a society so rigid in their customs outside

of religious practices. Indeed, Kelrath traditions seem to be the religion that is being followed. Kelrath means "student" roughly translated. Students of the Tanroc Fredar, it seems.

From what I have experienced, it seems many of the traditions handed down by the Kelrath are teachings of, or extrapolations from teachings by the Tanroc Fredar. I question the wisdom of anyone that would oppress eighty percent of the population under a harsh tyranny.

There are references on walls of temples to records of the Tanroc Fredar teachings, but we were not able to find any of those records. In some temples there are quotes from those records and many Kelrath can recite a few dozen from memory, but even those Kelrath that we were able to ask how to find these recordings could offer us no help.

One very interesting deviation from tradition is what seems to be a growing black market for perfume among the Kelrath. The fact that the Kelrath have reacted so enthusiastically about a new idea is quite surprising. However, more true to form, most Rantaa' family heads have outlawed the use of perfume. (Paradoxically, it is the Rantaa' class that has driven the demand for perfume.)

Kelrath Cities

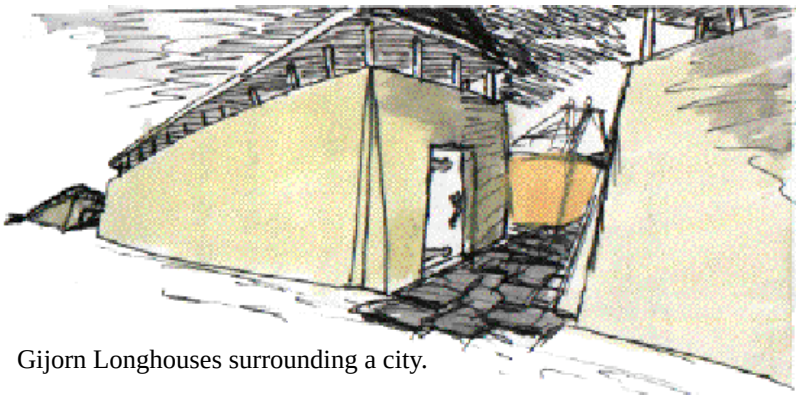
Kelrath cities are arranged around the Rantaa' palace. Around the palace are smaller Rantaa' mansions, temples to various oracles, stately gardens fenced in by high walls, etc. Around these structures are the Kaloord homes that make up nearly a third the city, but only houses a sixth of the city population. In this area are temples to lesser Oracles, and the marketplace. Major roads often radiate from the Rantaa' palace or major temples, making them always visible while traveling in the city.

Around the perimeter of the Keloord are Gijorn long houses. Of all Kelrath structures, these are the most recognizable. Each long house is five meters on the narrow ends, with a door in the middle. The long walls are between fifteen and twenty five meters long. There are no doors on either of the long walls. Around the top of the long house just below the roof is a narrow opening supported by metal bars or heavy posts. This opening serves two purposes one for light and ventilation, and two, if the city is attacked, the long houses serve as a protective wall. The narrow opening can be used to fire out of from the hardened structures.

Outside of the protective row of long houses lives the vast majority of the population. Here the Geetin slums stretch out for hundreds and hundreds of meters. Also beyond the perimeter are storehouses, and hangers for military vehicles.

Kelrath Society

One of the first things that I noticed about the Kelrath is a near complete lack of interest in efficiency. Slave labor makes flaunting inefficiency almost a status symbol. Any well to do house will have no doors, instead, a Geetin stands guard and a heavy curtain keeps out the cold. In Kelrath Kaloord and Rantaa' houses doors are only used to protect valuables. A door on the front of a Kaloord house would be like boarding the windows in your house.



Gijorn Longhouses surrounding a city.

In most Kelrath circles, using electronic equipment is considered to be something a less affluent person would do. This is because most devices are "labor saving", and Geetin do labor. A rich person has more Geetin, and therefore needs no devices.

In the Kelrath culture, architecture is one of the primary status symbols. All structures are built in accord with guidelines dictated by caste. A Geetin home, if it is a free standing structure, is to be no more than one hundred and seventy centimeters tall. For a Geetin to erect any portion of his home above this height is a supreme form of rebellion. The Geetin who is bold enough to try building anything over this height is inviting the Gijorn to burn the structure down along with anyone who might be inside. The other option is to have an underground or subsurface dwelling which is more popular than the afore mentioned structures. Gijorn have absolutely no choice in the construction of their homes, all Gijorn live in longhouses as described above. Kaloord homes have few guidelines, but oddly enough, are restricted to a specific weight of all the construction materials. I did not have the opportunity to quantify the weight restriction. And of course, Rantaa' have no real restrictions to their construction projects. This means that the Rantaa' own any large structure to be found in a Kelrath city. One way that Kaloord work around this size (or weight) restriction is to have a network of structures that are not physically connected. In my short exposure to the Kelrath, I had seen some interesting building networks that were "technically" not connected.

The Geetin

The harsh conditions that the Geetin endure is a testament to their character. The few Geetin I was able to interact with were wonderful people that were warm and highly communal in nature. I don't know if it is from their hardship or because Geetin are allowed to own no property, they have no trace of greed.

Everyone freely gives what provisions they "have access" to never trying to keep anything from others.

The most unexpected thing I learned about the Geetin was the happiness and joy that they have. Despite their oppressed state, the Geetin still manage to have warm extended families, strong ties between friends, and a strong sense of humor! I was continually amazed by this until a very simple statement explained it to me, "We are alive, and while we have love for others, we will be happy". This kind of folk wisdom is prevalent among the Geetin.

The Gijorn

The Gijorn are a complex Caste, following extensive hierarchies. While a large number of the Gijorn police the Geetin and command them in battle, a portion of them have higher appointments.

Gijorn schools in combat follow one of "The Four Ways" those being the ways of Rall, Pho'duk, Rugen, Sha'duk. These are listed in order of frequency, Rall being the most frequent and Sha'duk being the least frequent.

Gijorn schools of combat are the highest level of education a Gijorn can attain. These schools require a student pass a series of trials to prove their worth. Only a few pass these trials. Trial by combat is common often beginning with a long trek to the combat site and ending in the death of a participant.

Schools of Rall emphasize the philosophy that defense is superior to offense. Often a student of Rall is taught to protect first and when the enemy is weakened from repeated attacks, then is the time to strike.

Followers of Pho'duk are taught among other things, to gain the advantage by being the first to strike.

Schools of Rugen teach law and philosophy of Kelrath culture as it pertains to the Gijorn. In combat, students of Rugen are allowed special rights among the Gijorn. It is illegal for a lower caste member to strike a higher caste member. However students of Rugen know the Kelrath law and therefore are better suited to judge situations. Students of Rugen are the highest position a Gijorn can attain to, and are even permitted to carry out the execution of Rantaa'. Of the schools, the schools of Rugen are the most formidable in combat.

The followers of Sha'duk are butchers. They tend to be unpredictable and very deadly. Sha'duk students are often employed in covert actions against the Chezbah.

Rantaa' Books

Rantaa' carry books in which they record their transactions with Oracles, personal wisdom, interpretations of Tanroc Fredar writings, etc.

Some Rantaa' carry these as relatively small books. Some who are more prolific (or more important) writers, carry large ornate books. Often large volumes are carried by Geetin who take the Rantaa' dictation. At their death, scribes take the writings and inscribe the Rantaa' words into massive stones placed inside a hex. The Rantaa' is entombed inside a hole drilled into the hex wall. A large plug is then inserted into the hole to seal the tomb. These Graveyards are often visited by Rantaa' and wealthy Kaloord. This is both to pay respects and to glean wisdom from the writings.

These grave yards are often beautifully adorned and are homes to great works of art. Because of this, these sites are hidden and only a few know their location.

Banner Stones

Banner stones are used as monuments to mark a Rantaa' territory. The larger and more ornate the stones the more powerful the Rantaa' family. Banner stones are all hand carved and are positioned in the middle of a hex. These towering stones are a principle art form in Kelrath society and say a great deal about the Kelrath. Ranging from three to ten meters tall, each stone is a unique work of art. Some announce the Rantaa's allegiance with an Oracle. Some will declare how the land it guards was aquired. Others have the Rantaa' family history or announce the greatness of a member of the Rantaa' family. There is a constant need to replace these stones because of battles with the Chezbah, or a rival family vandalizing them.

Science and Medicine

One of the primary distinctions of Kelrath medicine and science is that knowledge is a jealously guarded commodity. The last three hundred years of Earth's science and medical industries have been primarily about sharing knowledge. This difference between our cultures makes a big difference in the development of society. For instance, in Kelrath society the internet as we know it on earth could have never come

about. Hospitals are nonexistent because doctors have to co-operate in a hospital. Kelrath doctors pass their knowledge down to two to three students that pay exorbitant fees to learn the master's secrets.

From some of our very early dealings with the Kelrath, we knew that they would not harm a doctor. This seems to stem from this brain trust that each doctor holds in Kelrath culture. Most doctors specialize in one or two fields of study. For one to die would potently put Kelrath medicine back a generation.

Kelrath Parties

The Kelrath live in a very structured society. Even their rivalries are carried out with strict customs. Kelrath festivity are always held indoors, preferably in the home of a friend. The host must provide enough alcohol for everyone. The Kelrath are forbidden by custom to drink anything but a drink called Metsoo.

Each guest is poured a drink. Each drink poured is approximately 400ml of strong liquor. Each drink is toasted, to an Oracle or to someone's health, what starts out as eloquent speeches, slowly degrades to garbled ranting. No one is allowed to drink before a toast, and no one is allowed not to after. If a more than a few drops are left after the toast, great offense is taken.

Parties are the time to settle grievances, as the night wears on, those that have a bone to pick, do so. As most of the participants are in a drunken stupor by the time this happens. The resulting argument ether ends up as a drinking match, or a fist fight. But anything said at a party, is a taboo subject afterwards, or until the next party. Any fights, or injuries cannot be brought up later (at least until the next party). It is a Kelrath saying, "If you forgot your problems at a party, they're not worth worrying about."

The pace of the drinking and the orderliness of the toasts is the only major difference between castes. Geetin and Gijorn often stand around a small table and have toast after toast, while Rantaa' and Kaloord toasts are punctuated by dancing, stories and grandiose proclamations. Often the person toasting is allowed a statement, before a toast, whether it is a marriage announcement, or a insult disguised as a joke. This is also a taboo discuss an insult after the party. By the same token, a toaster can bind a statement to secrecy with a toast. No one is allowed to speak of a matter bound to a toast unless it is to someone who was present at the toast.

Oracle

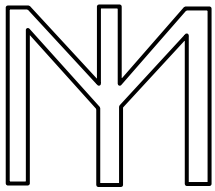
Kelrath Oracles are one of the most hotly contested subjects about the Kelrath. How many are there? What is their social function? Are the Oracles physical objects or simply ideas?

The Kelrath writings I have seen refer to the Oracles as counselors to the Rantaa'. Each one giving advice to the Rantaa' head. It is unusual that an the Rantaa' is the intermediary to the Oracle. In most cultures priests or shaman are the intermediaries and the governmental head seeks out the mystic to have questions answered. In the Kelrath culture the Rantaa' head is the intermediary and priests do the work of disseminating the Oracle's sayings to the people.

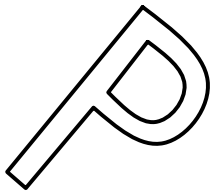
Oracles are not equal in the eyes of the Kelrath. Each one is accorded a certain amount of attention based on how interested people are in what they have to say. The most influential of the Oracles is Depta' "the Great Planner" and second is Rall "the War Master". Among the least well known is Komook "the Historian" and Sha'duk "the Devourer"

The average city may have as few as two or as many as ten temples of various sizes that house the priests of an Oracle. These priests receive word from the Oracle's representative and spread the information to the people. Priests are of the Kaloord class. High level priests approach the local Rantaa' while the lowest level priests address the Geetin.

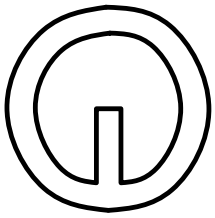
The following names of Oracles are known. There may be more that we have not been exposed to or their following may be too small to be widely known. Oracles are listed in order of how many followers they are estimated to have. Rantaa' often ascribe their allegiance to a single oracle, while lower castes seem to be less choosey. Geetin tend to try to give attention to a number of Oracles



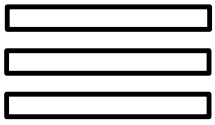
1. Depta'-the Great Planner
Depta' is known primarily for his philosophy and his ability to plan for the long term. Depta' is revered as the primary guide in Kelrath life and temples in his honor are found in nearly every Kelrath city.



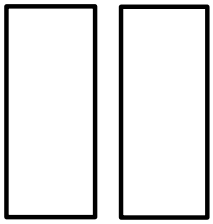
2. Rall-the War Master
Rall is renown for excellent battle strategy. Rall seems to favor a defensive position in battle, and this is reflected in the Kelrath weapons being designed to suit this.



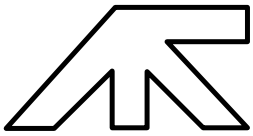
3. Kegre-Giver of Bounty
Kegre's advice is primarily agricultural in nature and as a result is most revered by Rantaa' that occupy the vegetation bands.



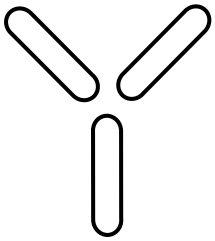
4. Kennis-the Master Builder *
Kennis is responsible for many of the building styles found in Kelrath cities including the restrictions put on the different classes in their building.



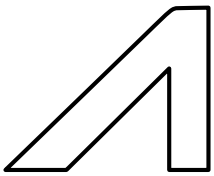
5. Tugen-the Old Thinker
Tugen is the repository for the sayings of the Tanroc Fredar. As such Tugen serves as the Constitution of the Kelrath people.



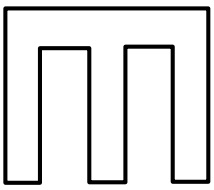
6. Sessa-(title unknown)
Little is known about Sessa at this time except that he may be associated with funeral rites. Aside from this Temples to Sessa are relatively common and many give their support to this Oracle, but little else is known.



7. Dari-Peace
Dari encourages forgoing aggression and ambition and focusing on the staples of Kelrath life.

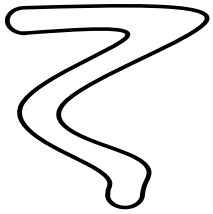


8. Pho'duk-the Destroyer
Po'duk is similar to Rall in that he gives advice about war. However Po'duk is more aggressive in his tactics. Followers of Po'duk are known for aggressively attacking both the Chezbah and the Scimrahn.



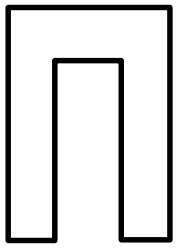
9. Rugen-Justice *
Somewhat equivalent to the Kelrath supreme court, Rugen is the judge of matters considered intrinsic to the future of the Kelrath.

110. Fra'duk-the Champion *
Fra'duk is a bit anomalous as far as Oracles go. Every five months, Fra'duk chooses a champion for a random cause; be it medicine, science, art, war, etc. His champion then is aided by Fra'duk and his followers to advance the cause.



11. Kress-the Reveler
Kress is observed for keeping special occasions for revelries. The Kress representative announces when to have parties and special observances. Kress is also the primary Oracle for entertainers.

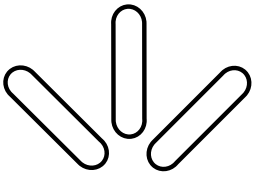
12. Detoon-the Artist
Detoon is the primary Oracle for artists and artisans. The Detoon representative recognizes the greatest artists and artisans and gives advice and guidelines. A large portion of his advice is in the carving of banner stones.



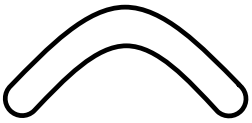
13. Gate-the Beast Trainer
Followers of Gate are the best at animal husbandry among the Kelrath. Those who deal with livestock or using animals for labor, look to Gate for direction.

14. Famal-the Teacher
Famal is primarily known for Schools and more frequently in Kelrath culture, guilds and apprenticeships.

15. Komook-the Historian
Very little is known about Komook. It seems that his name is not widely mentioned.



16. Sha'duk-the Devourer
Sha'duk resembles many other culture's gods of death and destruction. Sha'duk has a limited following.



17. Matin- the Redeemer
Although mentioned in a few texts there have been no reported temples to Matin. As a result few are familiar with him.

Communications Officer's Guide

Communications officers are vital in the ASO's and I-CA's operation on the battlefield. Early 21st century warfare showed that an army with proper logistics support was able to out maneuver the enemy and allowed unprecedented flexibility for small special operations units.

Ancient warfare consisted primarily of the fighting soldier. There were very few that were in charge of organization, logistics and strategy.

The philosophy that has proven effective ever since the information age began is, by giving support to a solder he or she can be more effective than a more numerous foe. This is the function of the Communications Officer, to be the channel and the dissemination point for this support.

The Artifact has proven troublesome to this philosophy however, as Earth forces have grown reliant on satellites for global positioning and communication. But satellites cannot penetrate the vast underground, and both the Chezbah and the Kelrath operate their own orbital defense fleets that make the use of communications satellites impossible. Earth forces must now rely on an increased investment in manpower to maintain the level of communication that is required to operate a modern army, as they are accustomed.

Communication officers give the unit the ability to call for aid when needed and in some cases serve as a conduit for that aid. Both the ASO and the I-CA allow a unit to work with experts in a number of fields. The communications officer is the proxy for the expert. He or she is trained to work with these experts and communicate effectively with them. In essence, the Communications Officer becomes the expert.

A communication officer's role in the modern battlefield is more than mere radio communication. As shown in W.W.II when the English broke the Germans enigma encryption, it turned the tide in the battle against a technically superior opponent. A Communication officer who can crack his opponent's codes can enable his unit to anticipate the enemy's movements and tactics before they occur. He or she must also prevent the same from happening to his unit. Quantum Liquid Computers (QLC) have made a task that once took weeks and teams of code crackers, a task that a single resourceful officer can accomplish in a matter of hours.

The Mission

The Communications Officer's mission consists of four primary tasks. First enable the forces they are attached with to communicate between themselves, natives and base. Second to be the eyes and ears of the forces they are attached to using sensors and computer data. Third, to use the equipment available to protect the forces they

are attached to. Fourth, degrade the enemies ability to attack by defeating security systems and countermeasures.

Communication

Without communication, forces cannot be coordinated, reinforcements cannot be called on, and forces are separated from their commanders. This severely limits the effectiveness of special forces groups and would force a return to armies of brute numbers as the Kelrath use. This is not an option for the numerically inferior Earth forces who must make the most out of every man and woman available.

In game terms this means that the Communications officer that is able to contact their commanders can receive aid from specialists that are not part of their immediate force. Officers can give updated commands and advice. Reinforcements and air support (if available) can be called on. Scientists can be consulted for technical issues. Scimrahn can give advice on survival and cultural issues. On occasion, Kelrath that have entered Scimrahn society can serve as translators.

The Communications Officer's primary job is to enable the allied forces to communicate freely and safely. There are several aspects to this mission. First, the soldiers the Comm Officer is attached to need to communicate safely with each other. This means setting up encryptions and signal scrambling protocols. Second, connecting units to resources such as calling for reinforcements or getting expert advice. Third, units must be able to communicate with command structures to get operational instructions. Fourth, translate for attached forces where possible.

Scrambling Signals

The Communications Officer is responsible for establishing and maintaining a secure radio channel via a frequency hopping spread spectrum (FHSS) broadcast along with adequate encryption.

FHSS is a method of preventing a radio broadcast from being intercepted. The Transmission frequency of a signal is rapidly altered at a set interval of time. This is called the signal hop. An eavesdropper only hears a series of chirps that are unintelligible because only a tiny portion of the transmission is received. The hop sequence is predetermined allowing the recipient to get the entire broadcast.

The Chezbah and the Kelrath do not use FHSS to scramble their signal and instead rely on heavy encryption for security.

Chezbah priests are able to patch together the hopping sequence with very short periods of exposure (1-2 minutes) but priests are not always embedded along with Chezbah forces.

The Kelrath have constructed special Kerdi that can pick up the hopping sequence and transmit it back to a handler but require approximately fifteen minutes to pick up the sequence.

At all times include as little information as possible while still clearly communicating to the recipient. Code words can prevent a message from being understood.

When there is a high probability that there are enemy forces present and stealth is preferable, radio silence should be maintained. Laser communications are more effective in these situations because they are difficult to detect, and even more difficult to intercept but requires a clear line of site between the sender and receiver.

It is the function of encryption to prevent or delay the enemy from understanding a message sent. Encryption does not increase the amount of data being transmitted significantly, but does make the processor in a communicator or computer work harder. Strong encryption will prevent real time communication, as the processor must work harder.

The standing command to Communication Officers is to reduce the processor load on the command site. To do this, there are three grades of encryption, weak, average and strong.

Weak encryption

Weak encryption is useful for sending messages that the Chezbah will not see as threatening and holds no tactical data. Progress reports that hold no tactical data are good examples of this.

Weak encryption usually is cracked in a matter of an hour. This can however be enough to allow a unit to get far enough away from the transmission site.

Transmissions of the nature described above are rarely bothered with (-20 from the likelihood of the Chezbah immediately investigating). It is even sometimes preferable to use a weak encryption to make a transmission look like it is unimportant.

Weak encryption has 18 BP for it's encryption strength.

Average Encryption

Average encryption is used in non-critical transmissions that hold some tactical or sensitive data. Any transmission that mentions the Scimrahn should be sent with at least average encryption. Progress reports that contain troop locations or movement should be sent with average encryption.

Average encryption has 45 BP for it's encryption strength.

Strong Encryption

Strong encryption is very processor intensive. Even computers with the key to the encryption take several seconds to minutes to decrypt the message based on processor load. Any transmissions of tactical importance or information on the whereabouts of Scimrahn settlements should be sent with strong encryption.

The Chezbah are very good at cracking encryption. Even 3840 bit encryption does not seem to phase their code cracking ability. Only encryption with key codes in excess of 245760 bits will result in a significant delay in their code cracking.

Strong encryption encryption has 54 BP or more for it's encryption strength.

Reinforcements

When allied forces are pinned down or a mission objective is in jeopardy, it may be possible that reinforcements from the local area can be called in to assist. These forces may take time to arrive unless the base has access to fast moving vehicles such as Vanguard Helicopters or Scimrahn Deltas.

The GM should determine what resources are available for reinforcement. It may be preferable to have the reinforcements available in the area considered before the game begins. If a base has access to a teleporter a Vanguard or Delta may be teleported in, dependent on where the engineering crew are in the teleporter cycle. Roll 1d10, on a roll of one (1) or two (2) a vehicle can be made available in fifteen minutes (not counting travel from base to the destination). For rolls between three and ten (3-0) multiply the number by one hour for a time of availability (again not including travel time).

Unless the characters are on a covert mission or resources for their base of operation is stretched very thin, a competent commanding officer will have reinforcements lined up.

Expert Advice

When a Comm Officer communicates back to base, they are able to ask for help from experts on a huge range of subjects. A Comm Officer that contacts their base gets the equivalent of any one IQ skill at +30 or any one Dex Skill at +8 for the time that the connection is open. This help requires the use of a network connection or a wormhole communicator. (See: Page 116 The Artifact RPG, Communicating Through the Network)

Tactical Support

By contacting command, the Comm Officer can get updated tactical information. This is especially useful when there are multiple groups in the same region that can contribute status reports. The Comm Officer gets information on obstacles that other teams have encountered and a tactical adviser can give recommendations on what strategies to use in the situation.

One of the most important benefits in getting updated tactical information is avoiding friendly fire incidents.

Resupply

Although most groups are sent out with a standard set of supplies, if a mission requires more equipment, command will almost always provide it if it's available. The Comm Officer can request a resupply when needed. At times this may mean the supplies are delivered to the forces in need but if the area they are in is considered dangerous, they may need to fall back to a point where supply personnel can get to them safely.

Translation

Comm Officers are expected to be available to translate for friendly forces.

When translating, unless it is the translator's native language they must take a roll on their Speak skill for the language being spoken. Then the player rolls on the character's Speak skill for the language that is being translated to. No skill check is required for native languages.

Observation

The Comm Officer can patch into sensor feeds from allied forces and examine them from a HUD. This gives another chance to examine sensor information and the Comm Officer can run comparisons of sensor data that combine weak signals to form a stronger signal. New communicator firmware is also allowing Comm Officers to pool data from static and noise in the CCC conductivity of a Hex and process that information to look for movement in the Hex in a process called Conduction Mapping.

Sensor Inferometry

The Comm Officer can use software built into their communication computer (ASO L.R.C.T.R.S.D. or ICA Heavy T/R/S/D) that combines the input of different sensors from vehicles to enhance sensor information.

Inferometry is a technique where data is compared from multiple sources and then missing data can be inferred giving a clearer picture.

By using this software the Comm Officer can make Sensor Skill rolls to detect targets and gets a 10% Advantage to the skill for every vehicle supplying sensor data.

Conduction Mapping

The Scimrahn know that Hosent can feel through the ground around them and that large numbers of powered Hosent can feel into their surrounding Hexes by comparing what they pick up from the ground. The Scimrahn felt that the processor power needed to copy this long range effect was too high to make portable systems that could copy it. Some prototypes exist but they require large vehicles to move them. This was considered a dead end science and the Scimrahn will ask the Hosent what they feel around them since most industry tribes use powered Hosent. Relying on Hosent has it's limits as power is not always available and the Hosent may betray Scimrahn to the Chezbah.

The Scimrahn have also suspected that Chezbah Priests also use a similar process to detect movement in a Hex and Kelecs confirm that they are able to use Conduction Mapping.

The Hosent create a map of the conductivity of the CCC around them and measure noise transmitted through the CCC that comes off plasma mains and the static that builds from quakes. By reverse engineering the Hosent's ability to map the conductivity of CCC and using algorithms that were developed to decipher patterns in the cosmic microwave background, Earth forces have released firmware patches that enable their communicators to create their own maps. A minimum of five communicators are required and the Comm Officer's communication computer (ASO L.R.C.T.R.S.D. or ICA Heavy T/R/S/D) to compare the individual readings to form a map.

Conduction Mapping generally registers force on CCC so the faster or heavier something is, the more force it generates on the CCC. Wheeled vehicles produce less impact force than a running E-Suit but can build up static that may become detectable. AG vehicles do not exert force on the CCC but their engines can produce weak signals that will travel through the CCC but are still relatively stealthy.

An individual human is usually too small to detect but dozens of humans will show up as a diffuse signal.

Conduction Mapping will give a reading of all forces on every floor or surface of a Hex. Readings may indicate quake forces building and can give phantom readings. Cracks in the CCC of a hex can block the mapping process and make some segments of a hex effectively invisible to the process. Moving to the area that is cut off and repeating the mapping will allow that section to be checked.

Hosent Conduction Mapping

Powered Hosent that know how to make a CCC conduction map can be asked for information on what they have felt moving around. Because there are usually a large number of Hosent in a hex they have a 5% chance for every 150 kg to notice an object or group of objects within one hex away from them. For every 10 Km/h the object is moving they get a +5% to detect the object or group of objects. AG vehicles are -30% to detect and wheeled vehicles are -10%.

Some Hosent have not learned how to do this (20% chance) and have to be taught how to perform conduction mapping. A Physics Skill roll and then a Computer Programming roll is required to teach them how.

Comm Officer Conduction Mapping

A Communications Officer must have at least five communicators touching the CCC of a Hex at once to pool data from and form a map. The Comm Officer rolls against their Sensor skill to interpret the data.

Objects or groups of objects of around 10,000 Kg are baseline difficulty for detecting. For every 1000 Kg less than that gets a 20% impairment to the Sensor Skill roll. For every 5 more communicators supplying input and processing power there is a 10% Advantage to the sensor skill roll. Every 1000 Kg more is a 20% Advantage to the Sensor Skill. For every 10 Km/h the object or group of objects is moving there is a 10% Advantage to the sensor skill roll. AG vehicles have a 60% Impairment to detect and wheeled vehicles have a 20% Impairment.

Remote Processing

The Comm Officer can send readings to a computing center back at base and have the data analyzed. To do so they must communicate back to a base through The Artifact's network (see pg 116 of The Artifact RPG).

Remote processing takes ten minutes and has a 5% chance for every 100 kg to notice an object or group of objects within one hex away from the original reading. For every 10 Km/h the object is moving they get a +5% to detect the object or group of objects. AG vehicles are -30% to detect and wheeled vehicles are -10%.

If the Chezbah are using Conduction Mapping, then use the Remote Processing rules to determine success.

Protection

The Communications Officer's role includes monitoring electronic systems to make sure they are not being infiltrated by enemy attacks.

Most pilots do not the training to protect themselves from computer based attacks and may be too busy to use ECMs or ECCMs. The Communications Officer's responsibility is to monitor the systems on the battlefield and prevent intrusion, monitoring countermeasures, activating them, and tuning them remotely.

Countermeasure Assistance

Comm Officers can remotely operate a vehicle's ECMs and ECCMs to help protect friendly forces. This can be in addition to the pilot's ECM skill roll or the Comm Officer can operate the equipment even if the pilot does not have the skill needed.

Even if a pilot has the skills to use their ECMs and ECCMs, the Comm Officer can monitor their systems and make

corrections when needed. In game terms this means that the Comm Officer can roll for the pilot or both the pilot and the Comm Officer roll for ECM or ECCM and the better roll is taken.

Chezbah Hex Mainframe Virus

It does not appear that the Chezbah used viruses before the arrival of Earth forces so these nasty bugs are brand new. The Chezbah most likely picked up the idea from Earthers, possibly from reverse engineering an antivirus program on a captured Personal Computer. The Chezbah plant these viruses in Hex Mainframes at random. They realize that any one type of virus would be easily defended against and so place different viruses in systems they think an enemy is likely to connect to. Hex Mainframes have not been flooded with these viruses as it would appear they could be. This may be an attempt to lull network users into a sense of complacency.

Although these viruses are found in Hex Mainframes some Chezbah Priests have been known to infect systems with viruses like these.

The GM may place viruses in specific Hex Mainframes or roll randomly to determine if there is a virus. There is a 10% chance (roll a 10 or under on a 1d100) that any one Hex Mainframe is infected with a virus that has not been patched for yet.

While some Chezbah viruses can attack multiple systems, most are tailored to one specific kind of computer. For instance, many viruses are designed to attack the Scimrahn Comm/Comp while others are designed to attack Earth made Personal Computers or their communicators.

Roll on the table below to see what computer system a virus is intended for.

Roll 1d10
1-4 Scimrahn Comm/Comp
5-6 ASO Communicators
7-8 I-CA Communicators
9 Personal Computer
10 TF-2394

These viruses are startlingly effective but so far lack the abundance of different types of viruses that Earth's Internet has. As a result, when a new virus emerges it can seriously compromise a system but once contained and examined an Anti-virus, system patch or firmware patch can be created for it. This has become a priority for ASO forces to repair these gaps in security but has also become a learning experience because the powerfully efficient programming of Chezbah viruses.

This has lead most Communications Officers to use a virtual system to connect to mainframes and then when infected freeze the system and store it for later analysis. As soon as a virus is detected the system must be frozen because some viruses have been able to break through the virtual system and into other systems on a computer but early detection is not always possible.

Typical Chezbah Virus

Defeat Security Rating: 20
Barrier Points: 16
Self Propagating: Yes
Social Engineering Rating: 4

Effect Table
Roll 1D6
1 Kill Virus
2-4 Code Stealer
5-6 Backdoor

Monitoring for Intrusion

The Communications Officer can monitor communications and watch for enemy intrusion attacks.

The Communications Officer can check how many Barrier Points a system has by making a Computer Operation skill check. Each check takes one action.

If the Barrier Points of a system are low, they can rebuild them with a Computer Programming skill check. Each roll requires 15 minutes and restores 1 BP for each Fractional Success.

Hacking

The Communications Officer is trained to degrade the effectiveness of enemy forces. This process is referred to as hacking for computer systems or cracking for codes.

The Communications Officer is not the only type of character that can use these methods. Other characters with the needed skills can also perform these actions, which can include enemy NPCs, most notably the Chezbah Priest. Because of this, the person intruding on a system here are usually referred to as 'the hacker' where the person that normally operates a system as 'the user' or 'the pilot' for vehicles.

Hacking is not usually a quick process. Because of this a Communications Officer must be prepared ahead of time with the tools and have a plan in place for how they will accomplish their tasks.

Intrusion Methods

The first challenge of hacking a computer system is to communicate with it. For systems like Hex Mainframes and Hosent, a terminal connection anywhere in a Hex is all that is needed. For vehicles, it is more difficult to connect to their computers.

For any intrusion method there is a limit to how much the hacker can send and receive from the target system because of the connection's bandwidth. Because of this there is a limit to how many Barrier Points can be broken down per turn.

Network

Any system connected to The Artifact's communication network can have that connection used as an intrusion method. The only protection for these systems is to disconnect them from the network or through their Barrier Points, if any. Hosent and Hex Mainframes are not considered to have Barrier Points because they are not designed with user control systems.
Barrier Point Limit: 11 in 15 min

Radio

It is possible to connect to an enemy's systems via radio communications but military vehicles will only accept data connections from a signal carrying a encryption that it recognizes. In other words, first the enemy's signal encryption must be cracked and then the hacker can start reducing Barrier Points to their computer systems. This usually requires a large investment in time or computer processing power most often accomplished by employing a Hosent Hive Virus (See: Page 36 Hosent Hive Virus).

If an enemy realizes they are being hacked over radio, they may change their signal encryption or shut down their radios to prevent this type of attack.
Barrier Point Limit: 5 in 15 min

Magnetic Gun

A plasma gun can be modified to only fire a magnetic field at a target. That magnetic field induces a signal in the vehicle's electronics and can be used to create a communication path. Modifying a plasma gun to do this requires an Electronics Repair Skill roll, proper tools (as found in the Deluxe Tool Kit) and a computer to send and receive from. The process is a Tech Challenge with 8 Challenge Points but the gun can continue to be used for this purpose. Damaged plasma guns already recycled for this purpose can usually be acquired from most Scimrahn tribes for half the cost of a regular plasma gun.

Range class Advantages and Impairments apply to all rolls using this communication bridge because the magnetic field gets weaker over distances. Active force fields prevent the magnetic field from reaching a target and are an effective countermeasure to this type of attack. However this kind of attack is difficult to detect (40% Impairment to Sensor Skill) and may not be noticed by a vehicle pilot until their computer's are compromised.

Aiming and operating the magnetic gun usually is done by two people. One to keep the gun aimed at the target and another to defeat the target's security systems.
Barrier Point Limit: 9 in 15 min

Radio Tags

Used on vehicles and robots not from Earth, these are small radio receivers with adhesive pads that are placed on a vehicle, thrown onto a vehicle or more recently some have been designed to launch from an AVW or grenade launcher. The tag communicates through the vehicle's skin which is designed to carry data for damage control systems and

communications and offers a path to a vehicle's control systems.

The tag has a range class of C to communicate and range class modifiers apply to any rolls made over this type of connection.

ASO and I-CA Comm Officers may request these tags on assignment.
Barrier Point Limit: 7 in 15 min

Sticky Tag
Cost: ¥300

Tag Grenade (for Grenade Launcher)
Blast Range Class: A
Cost: ¥6,000

Tag Missile (for AVW)
Blast Range Class: B
Cost: ¥20,000

Advanced Hacking Rules

Barrier Points listed for vehicles and computer based systems are intended to simulate the effort that is needed to fully compromise a system. Once a character has reduced the barrier points to zero they have full control of the system and can in effectively lock out other users. However, this process is slow and not practical for most combat situations.

A hacker does not have to completely compromise a system to have a meaningful effect on it. A hacker can attempt to get only partial control of a system. This may be used to degrade it's abilities or possibly to shut down systems for a short period of time.

Limited Control

Instead of trying to get full control of a computer system, a hacker can attempt to get limited access to the computer. This can be useful if at the right moment, a hacker brings down the shields of a vehicle. Nothing would prevent the pilot from reactivating them after the attack has been made but it would give friendly forces the advantage. Another useful example is disabling communications when a enemy may try to call for help, they may not immediately recognize that their requests are not being transmitted.

A limited control hack allows the hacker to give a single command to the target system.

The hacker must declare that they are making a limited control hack. They can then make Defeat Security rolls against the Barrier Points of the system in combat turns instead of the normal 15 minute hacking turns. Hacking story transforms are rolled for as normal. Any Barrier Points reduced in this way can only be used to make the limited control attack. Once the the command is given for this attack, the Barrier Points of the target system are restored to their full amount.

A hacker with limited control can operate as though they were a regular user of the system but cannot damage a system or do anything that cannot be reversed by regular operator. Anyone with the Computer Programming skill can restore Barrier points to the system.

Hacking a Vehicle's Systems

When hacking a vehicle's system the hacker may not need to get control of the computers that control it. In fact the vehicle may not need to be computer controlled. The Hacker is trying to exploit flaws in electronics or computer systems to degrade the performance of those systems. For example, a radar on a vehicle may not be computer controlled and thus have no Barrier Points listed but it may be hacked and disabled, under the right circumstances.

When attempting such an exploit, the hacker is often operating blindly. They may not know what system they will be affecting or even what effect the exploit will have. Once the hacker has reduced enough Barrier Points, they roll on the vehicle's critical hits to determine which system is disabled and follow the critical hit effects with the exception of any pilots or crew being killed. If the hacker gets a bridge or cockpit hit then the controls of the vehicle are disabled.

If the pilot makes a successful piloting skill roll, they can bring the system back on line but this takes an action.

Computer Controlled Vehicles

To hack a computer controlled vehicle's systems, the hacker only has to defeat 3 Barrier Points. The Barrier Points reduced in this attack cannot be used to further compromise the vehicle's computers and to make another attack the hacker must reduce another 3 Barrier Points.

Electronic Systems

Hacking electronics on a vehicle is usually slightly harder than a computer

controlled vehicle. Only a magnetic gun can be used as an intrusion method for this kind of attack. These systems have the equivalent of 1d6+1 Barrier Points. This roll should be taken in secret by the GM.

Social Engineering

The technique of social engineering is used to exploit human logic or emotions to compromise the security of a system. The hacker tries to trick someone with access to a system or code to reveal information that will get them access or at least make getting access easier.

Using the Social Conflict rules, the character reduces Barrier Points rather than inflicting stress points on the system operator. Each fractional success in this social conflict reduces one Barrier Point but without the usual story transforms.

The system operator can inflict stress on the hacker in return.

Deploying Viruses

The purpose of a virus is to make a distributed social engineering attack. A virus is programmed with an attack that is designed to bluff the operator into thinking the virus is giving them a valid or even vital action to take. In reality it uses the system operator's actions to compromise the computer's security.

For example a virus intended to infect an E-Suit might give the pilot a message that there is a minor system failure and there is more information on the failure. When the pilot investigates, their action gives the virus permission to install itself.

The virus is programmed with between one and four Social Engineering Fractional Successes and a certain number of Defeat Security Fractional Successes. These are the Social Engineering rating (SER) and the Defeat Security Rating (DSR).

The hacker can create their own virus, buy or acquire a freely available one to be used.

Deploying A Virus

To get a virus to a target the hacker must first have an intrusion mechanism such as connecting over radio or with a magnetic gun for example. It is possible to infect multiple systems at the same time if the hacker has a connection to all the systems.

Next the character must pass a Computer Operation skill roll to deploy the virus.

All the systems that the virus is distributed to now defend against the Social Engineering Rating (SER) of the virus. The defender may roll against their IQ, Psyche or both. Rolling takes an action and rolling for both requires two actions. The character's Computer Operation skill may be added to this roll. For vehicles the character's Piloting skill can be added to the roll instead.

Any systems who's operators fail the SER defense roll are now infected with the virus and it's Defeat Security Rating (DSR) is subtracted from the system's Barrier Points.

Virus Lifespan

Operators and pattern recognition software in computers will quickly get used to a virus and notify others of it's existence. This means that the virus will become less effective over time. Each time an operator defends against the virus, its SER is reduced by one. If the virus no longer has any SER left it is no longer effective.

Creating A Virus

A virus must be designed to attack a specific kind of operating system. For example the virus that is designed to attack the computers on a Rall 4 will not work on another kind of E-Suit.

To program a virus, the programmer must have access to one of the systems they intend to infect. If a virus is intended to infect the systems on a Chezbah Cruiser, the character must have one of the computers available to test the virus on.

Roll For SER

The first programming challenge is to establish the Social Engineering Rating (SER) of the virus. The player rolls for the programmer's Computer Programming skill. The number of fractional successes is the SER

of the virus. The player may reroll as many times as desired to try and get a better result. Each roll takes 4 hours of programming.

Set DSR

The next programming challenge is A primary skill tech challenge to decide the virus' Defeat Security Rating (DSR). The primary skill is Computer Programming. The challenge gains one CP for each point of DSR desired for the virus.

Set BP

The virus may set up it's own defenses to being removed. The programmer gives a virus a number of Barrier Points that must be reduced to zero in order to remove the virus. For every Barrier Point the virus will have, add one CP to the programming challenge.

Define Payload

If a virus reduces the BP of a system to zero (0), it may deliver some kind of a payload. This can be a command that is run on the system, opening a backdoor, sending information back to the hacker or installing a program. Each payload function adds 1 CP

Set Propagation

Lastly, some viruses are self propagating, meaning that they will spread themselves whenever they have a connection to a system like the one they are on. To make a virus self propagating add 5 to the CP of the challenge.

The Programming Challenge Tables

When the character rolls to make a modification, use the following tables. If the roll succeeds, us the Successful Transform table. If the roll fails use the Failure Transform table.

Successful Transform

Roll 1d6

1. 4 hours of programming
2. 5 hours of programming
3. 4 hours of programming and a different skill must be used to make the next roll. Players should make skill probe rolls to find a suitable skill.
4. 4 hours of programming but has moved important files or settings to a new location. Int roll required to find it and proceed.
5. 2 hours of programming and a different skill must be used to make the next roll. Players should make skill probe rolls to find a suitable skill.
6. The last roll takes off double BP but The next attempt will require a character to get at least two Fractional Successes to reduce any Challenge Points.

Failure Transform

Roll 1d10

1. Frustration sets in 3 Mental stress.
2. The virus is tripping internal safety systems. The next roll must be under the Defeat Security skill.
3. A file the virus needs becomes corrupted. +1 CP that does not increase the DSR
4. The virus has a telltale signature that is easily identified. For the virus lifespan, each time the virus is defended against the SER is reduced by one more point than normal.
5. 16 hours spent with no progress.
6. The virus destroys the test system from repeated infection. The test system needs to be rebuilt. +3 CP
7. Hacker's computer is compromised by the virus. Looses 2d6 BP of it's own.
8. The SER of the virus is reduced by one. The SER can be re-rolled for but each attempt requires 8 hours.
9. The skill last used will no longer work for the rest of the challenge even if it was Computer Programming. Players will have to probe for new skills.
10. Lose ground, the challenge gains 2 CP.

Backdoor

Once a system is compromised the hacker can install a backdoor so the system can be accessed more easily in the future. This is most often done by delivering a virus to a system that then creates a backdoor for the hacker to use later.

A backdoor requires a system's BP to be reduced to zero either by the hacker or by a virus. Then the hacker must make a successful Computer Programming skill roll.

A Backdoor once installed is usually difficult to detect unless it is widely used or

known about. A backdoor used once can be detected by a Computer Operation skill roll but has a 90% Impairment to the skill. Every time that same back door is used, the Impairment is reduced by 10%. This means that a backdoor used twice has a 70% Impairment to be detected, three times 60% etc.

Trojan Viruses

A hacker can embed a virus in their encrypted communications. The reason for doing this is to infect the system that is used to decrypt the message. When the transmission is decrypted, the virus attacks the system being used to decrypt.

The operator of the system must roll for virus detection to notice that a virus has been delivered to the system.

Hosent Hive Virus

While some scientists have used Hosent Hives to run calculations and simulations the Hosent Hive is most commonly used to attack large numbers of computerized vehicles. The Hive runs software that is equivalent to the Defeat Security or Code Cracking skill but on a massive scale. The Hive can crack dozens of barrier points a turn. This is often enough to nearly instantly crack encryption or breach the security of most security systems.

Every Hosent has a massive QLC that can be repurposed to perform computing tasks. Comm Officers have written viruses that take over the QLC and allow them to run programs designated by the Comm Officer. The Virus propagates itself to all the Hosent in a Hex and every infected Hosent spreads the virus to more Hosent. This allows the Comm Officer to run programs on what is in effect a massively parallel supercomputer. There are 26,496 Hosent in a Hex. Each has 383 processor points for a total of 10,147,968 processor points. Unfortunately only about 5% of that is unused and available, it takes eight hours to get a Hosent to erase all of it's instructions which is usually too long for Communications Officers in the field, so any commands must leave the Hosent AI intact. It's also likely that 10-60% of Hosent in a powered hex still function (roll 1d6 x 10 for the percentage). That means that between 305,000 and 50,000 processor points can quickly be repurposed for the Comm Officer's use per hex.

The Hosent Hive Virus usually carries a program as it's payload such as a Code Cracking or Defeat Security software. Since the hive is so powerful, the hive's DSR and CCR are how many Barrier Points the hive can defeat per turn instead of every fifteen minutes.

Number of Functioning Hosent
Roll 1D6

	Hosent Functioning	DSR per Fractional Success	CCR per Fractional Success
1	2,649	5	8
2	5,298	10	16
3	7,947	15	24
4	10,596	20	32
5	13,245	25	40
6	15,894	30	48

The hacker controlling the hive must guide and control the Hosent to use it to it's full potential. The hacker's Computer Operation skill is rolled and the fractional successes are multiplied by the DSR or CCR rolled on the chart.

It takes time for the Hosent virus to spread. Each Hosent takes about a minute for the virus to take effect. It then infects five others, now six are infected. In the next minute those six each infect five more Hosent each for thirty six infected. In the following minutes 216, then 1296, 7776, until finally all the Hosent in the Hex are infected. The process takes only about seven minutes.

Chezbah Reaction to Hosent Hives

Whenever a hive is left connected to The Artifact's network for 2d10 minutes it is attacked and dismantled from the prime addresses and from different locations all over the network. It is thought that the attacks from different directions are Chezbah priests but the system at the prime addresses is extraordinarily powerful. In 1D6 turns the entire Hex of Hosent are commanded with instructions that erase key components of their AI and cause all of them to crash.

Stealing A Hive

Hosent have very little system security and are easily compromised. This makes the virus easy to use but also makes the virus easy to repurpose by another hacker.

The Hive Virus has a minimal amount of security itself which is represented as Barrier Points. Once those Barrier Points are depleted the hacker can use limited control on the entire hive (There is no way to get Full Control because there is no way to lock users out of the Hosent).
Barrier Points: 5

Hosent are Intelligent

Hosent themselves can at times realize what the Defeat Security programs can do and will begin to use them for themselves. Although each individual Hosent is not very intelligent, they do communicate with each other and as a group they can slowly figure out how to use the virus.

In the first ten minutes of the virus being used, there is a 5% chance that the Hosent will gain control of the virus. Each hour after that there is a 30% chance that the Hosent will take control. The massive processing power of the Hosent make it very difficult to prevent this from happening but the Hosent can be distracted by a character keeping them busy by having a conversation with them. A successful Charisma or Storytelling skill roll must be made each hour to keep them distracted.

Remote Hives - The ASO and I-CA along with some corporations have set up hidden Hosent hives that can be called on to perform Defeat Security or Code Cracking attacks. To use these hives the PC must know how to contact them and be allowed access to the system. This information would be provided to them at the start of a mission. However these systems are usually in use and so are not wholly devoted to the character's request.

The PC must connect to these locations over the network and must keep the connection open. Each turn the connection remains open the Hive can take down 2D6 Barrier Points in a target system.

The Network

The Artifact network is the single most powerful communication system available to Communications Officers. Using it is dangerous. Not using it means isolation, and vulnerability. Other methods of communication are useful for short distances but fail to satisfy the needs of a modern army.

A single mainframe QLC manages each hex, and the mainframe in the power hex manages the incremental city. Each hex has roughly one hundred to several thousand terminals dependent on what type of hex it is. Plasma conduits carry inter-city communications.

1. The Artifact QLC mainframes use a four quibit structure similar to the numbering system used by the inhabitants of The Artifact. Because of this, Computers made on Earth need to run special emulation and translation programs in order to communicate on The Artifact's network. There are many versions of these programs and they are often freely available.

2. Each hex mainframe has what is translated to an eight byte address (for example 00.30.FC.00.45.6C.E2.3E) to designate where the hex is in The Artifact. This address is in hexadecimal (where 0-9 are treated as normal, but A-F are counted as 10-16. The first two octets (the first four digits) is the number of the plasma conduit the hex is fed from. Some Communications officers have compiled databases of plasma conduits and programs that translate a mainframe's address into a location in The Artifact.

3. The Prime Addresses are the first one through eight addresses on The Artifact (00.00.00.00.00.00.00.01 to 00.00.00.00.00.00.00.08). A bulk of the communications that the Chezbah generate is sent to or from these addresses. Locating these systems is problematic because they do not conform to the standard addressing scheme that all hex mainframes conform to. Because all transmissions to these addresses are routed up to plasma conduits, it is assumed that these addresses are somewhere in the collector wells or in the industry pods. Security for these addresses is seemingly impenetrable all attempts to crack into these addresses has been unsuccessful.

6. Data links between QLCs can carry 128Kilobits per second. This rate is barely adequate for the demands of most network applications that are used on the Internet on Earth. Old programs that had not been used

in over fifty years have been dusted of and adapted to The Artifact's data network.

7. Data links that run along the plasma conduits can have a throughput of 145 Megabits per second. This capacity is used to about a third of its capacity by status reports sent by Hosent and the mainframe QLCs. While the transport capacity of these lines is much more accommodating, the Chezbah monitor them more closely. Because of this most communications officers avoid using them.

8. Routing of messages is not as dynamic as the networks that Earth uses. The Internet on Earth is designed to be failure transparent. If a single link in the transport chain is broken the network quickly reacts to the loss of connectivity. On The Artifact, the network is static and all the data paths are known. QLCs do not react very fast to failures. The system will recognize that a failure occurred, but will continue to attempt to use the data path that it is programmed to use. Only after a lengthy failure (over fifteen minutes) will the QLCs try and find a path around a failure.

9. Security on QLCs is almost non-existent there are a few commands that cannot be run from regular terminals or externally, such as wiping the QLC and bringing down ports. There is also no file structure on the QLC. All files are stored in a "soup" without any structure. This can make it difficult to find a specific file or program.

QLC Commands

These are commands that can be run from on a QLC emulator, some can be used directly from a terminal to a Hex Mainframe QLC. Entering commands to a terminal requires the user to have the Read/Write Chezbah skill. Scimrahn Comm/Comps can execute these commands by speaking Scimrahn.

call (Network address)
Connects to a Hex Mainframe from anywhere on the network with a temporary terminal id. This connection acts as if the user was in front of one of the Hexes terminals. The command, call -b ends the call command.

call -s
This call command searches for working Hex Mainframes in a range of addresses and returns a list. This is a powerful command that can be used to find powered hexes in a large region.

find (Criteria)
Only available on QLC emulators. Finds files or programs based on size or type.

kill
Stops a program or process on the QLC.

poll
Checks the status of equipment in the Hex. Returns a long list of responses from devices such as terminals, Hosent, air pumps, water pumps, filtration pyramids, light panels, electrical and communication lines. Gives a status of the device as on, off or in error (usually if the device does not respond). Also returns the device id and terminal id (if applicable). By using the "call" command, polling can be done from anywhere in The Artifact.

poll -w
Checks the status of equipment with work to do in the Hex (such as Hosent). Gives a status of the device as on, off or in error. Also returns the device id and terminal id. Also gives the jobs of the devices that are being processed. Occasionally terminals and filtration pumps will show up in this command but it is mostly used for getting information on the Hosent in the Hex.

port (number of port)
Toggles a port to the QLC to on or off. This command can only be run from the terminal directly on the QLC. There are six ports to each QLC, one from each neighboring Hex. The numbers start coming from the Hex side closest to the Power Hex and to the counterclockwise side of the hex and continues counterclockwise around.

terminal (Number of terminal)
Send data to the terminal's video and/or audio output. Text is displayed in Chezbah characters.

terminal -g Gets all the terminal ids connected to the Hex Mainframe.

terminal -gt Gets the temporary terminal ids connected to the Hex Mainframe.

terminal -g (Floor)
Gets the terminal ids on a specific floor of the hex connected to the Hex Mainframe.

terminal -o (Number of terminal)
Toggles the connection to a terminal on or off (Hosent connect as terminals). This command can only be run from the terminal directly on the QLC. Some emulators support entering a range of terminals (for example 1-150).

top
Stolen from Unix, displays how much of the processor power is being used and what programs or processes are using the processor the most.

work (service)
Toggles a service on or off. Jobs include: rain cycles, air circulation, pumping water, electrical power, lighting. When looking for covert passages, plasma and water mains are excellent considerations, but only if they are off. The status of these conduits can be found, and if still on, they may be turned off for limited periods. Added to that is possible tactical advantages of turning lights on and off during combat.

QLC Software

Communications Officers and Field Scientists have developed a large body of useful tools to operate on QLCs and especially on Hex Mainframes. Some of the available software is listed in the Computers and Software section of this book under software. Players with the Computer Programming skill also have the ability to write software for their use. The Game Master should scrutinize new programs for anything that would be game unbalancing. As the GM, you should ask your players how their software is supposed to work. If the player simply wants to recreate a program that already exists in the real world the GM should allow it but would take into account the complexity of the program to be written. Developing a GUI operating system for a Hex Mainframe would be a complex and difficult task. It is also up to the GM to introduce glitches in player developed software.

Chezbah Reaction

When a character uses The Artifact's network to communicate to a remote location (following the process on Page 70 of The Artifact RPG) and they fail a roll, the Chezbah may be alerted to their presence. This section gives some structure to that possibility.

The Chezbah response to network use is greatly reliant on the proximity of Chezbah forces from the transmission. If the local forces are planned out because of the game then this question is relatively straightforward. If the game does not directly require the presence of Chezbah forces then the question can be answered through the random table below.

If the characters are in Chezbah territory, add 20 to their roll. If they are in Kelrath territory subtract 20 from their roll. If the characters are in remote areas subtract 22 from their roll. If the characters are in the Methane Wastes this table does not apply. There is almost no likelihood of Chezbah forces in the area.

1D100 Local Chezbah	
01-75	No Local Chezbah Forces
76 - 77	5 Roaming Hounds 40 Km away
78-79	2 Warriors 10 Hounds 40 Km away
80-81	10 Warriors and 1 Priest 40 Km away
82	Convoy of Civilians 1 Priest 10 Warriors 50 Hounds 40 Km away
83-84	2 Hunter e-suits 40 Km away
85	1 Demolisher, 1 Priest and 4 Hunter E-suits 40 Km away
86-87	5 Roaming Hounds 10 Km away
88-89	2 Warriors 10 Hounds 10 Km away
90-91	10 Warriors 1 Priest 10 Km away
92	Convoy of Civilians 1 Priest 10 Warriors 50 Hounds 10 Km away
93	2 Hunter e-suits 10 Km away
94	1 Demolisher, 1 Priest and 4 Hunter E-suits 10 Km away
95	5 Roaming Hounds 1 Km away
96	2 Warriors and 10 Hounds 1 Km away
97	10 Warriors and 1 Priest 1 Km away
98	Convoy of Civilians 1 Priest 10 Warriors 50 Hounds 1 Km away
99	2 Hunter e-suits 1 Km away

100 1 Demolisher, 1 Priest and 4 Hunter E-suits 1 Km away

The chance of local Chezbah forces (see above) investigating a signal that has not been decrypted is 90% but is effected by the range from the transmission source. The Range Class modifiers of D apply to this roll. If the Chezbah are 40 kilometers away there is a -50 to their chance of investigating.

The Chezbah and the Network

The Chezbah make use of The Network with autonomy. Even Chezbah civilians are permitted and encouraged to transmit messages for friends, relatives and business dealings over the network. These messages carry very simple encryption (count as weak encryption).

The Chezbah civilian bring their message to a designated office that then relays the message to the remote office where the recipient is close to. The recipient office then hand writes out the message and delivers it to the intended recipient. This kind of traffic is easy to decrypt and is full of details on Chezbah society, but normally has little tactical value.

Chezbah Warriors are able to use the terminals located inside of a Hex to send progress reports and distress signals. These messages have strong encryption but are very useful in gaining tactical advantages (count as strong encryption).

Chezbah troop movement and positioning can be found and followed by looking for Chezbah transmissions which are almost constant. If the Chezbah encryption can be cracked, then more information may be discerned by the message sent.

Chezbah Priests and Hounds use the strongest security in their transmissions. While hounds will transmit their location and status every 48 minutes, Chezbah Priests transmit continuously. Both use very strong encryption (1200 BP), but even after the encryption is cracked, the message has little intelligible data in it. The transmissions are not text and while some video data can sometimes be recovered, it is unclear what the bulk of these transmissions contain. It is apparent that whatever data is being transmitted, is intended for an operating system that is very different from the QLC mainframes.

Whenever a Chezbah Priest is in the area, the network is used to its maximum capacity. Any other transmissions have difficulty getting through. However if there is more than one Chezbah priest in the same area, the network traffic remains the same it appears that only one priest transmits for the group. This is the same for hounds. If there is a single hound or a pack the network traffic is the same.

Chezbah Priests do not connect with QLCs through a terminal id. They seem to link directly to the processor allowing them to send commands as if directly to at the QLC. When they move from hex to hex, the Priest connects to the mainframe of the hex they are in. The exception to this is if the Hex mainframe is not functioning. In this case the Priest remains linked to the last functional mainframe that they pass. As soon as there is a closer mainframe, the Priest connects to that mainframe.

Kelrath Communications

The Kelrath do not use the network extensively but will establish secure routes between cities by isolating a string of QLC Mainframes. The ports that lead anywhere but the intended path are disabled or more often physically cut. Terminals are also disconnected. This method prevents Chezbah eavesdropping but does not exclude the possibility of the line being tapped. Periodically patrols of Geetin escorted by a Gijorn trace the communication path to make sure no one is tapping the line.

The Kelrath use average encryption in their network and radio communications.

Computers and Software

Personal Computer

Personal computers saw a meteoric rise in the early part of the century. The last radical improvement in the personal computer came in late 2052 with third generation quantum dot computing. However, as the energy needs of Earth's population diversified, solar panels caused processor grade silicon to become more and more scarce.

While this slowed the advancement of the personal computer, supercomputers using a verity of exotic optical and liquid processors became more important to information processing. While the early part of the century saw a rise in distributed computation, the latter saw a return to centralized processing in mainframe systems usually referred to as cloud computing. The Artifact has the potential to mimic the network that has been established on Earth because of its data infrastructure, but the stranglehold of the Chezbah on these systems has so far prevented this from being implemented.

The operating system of personal computers includes voice recognition (98% successful), and limited translation features (30% successful for major earth languages).

PCs can use a military or Scimrahn communicator as a bridge to the Artifact's data network. A short range radio chip that is common to most computers connects to the communicator and the communicator can then connect to the data network.

A computer can run as many programs as their processor points allow. Each software program has a number of processor points used. Once all of the computer's processor points are used it cannot run any more software until programs are shut down.

Desktop

Personal Computers or PCs come in a variety of styles and types. The most versatile and expandable of which is the Desktop. It is designed to be stationary so its components are slightly larger and less expensive.
Processor Points: 12
Storage: 100 Terabytes
Mass: 30 Kg
Cost: ¥20,000

Laptop/Tablet

The laptop or tablet personal computer is usually a centimeter thick, twenty centimeters deep and thirty to forty centimeters wide. The laptop or tablet is designed to be a portable system but is often used while stationary. The line between a Laptop/Tablet computer is often blurred when using a HUD (Heads Up Display) as the primary video output.
Processor Points: 10
Storage: 50 Terabytes
Mass: 2 Kg
Cost: ¥30,000

Wearable

The Wearable computer is designed for processing on the move. It is most popular with augmented reality systems (see software). Wearable computers are systems that are built into clothing or strapped onto the body. Wearable Computers are more resistant to shock, dust and impact than laptop or tablet computers.
Processor Points: 8
Storage: 20 Terabytes
Mass: 2 Kg
Cost: ¥35,000

Quantum Liquid Computer (QLC)

Quantum Liquid Computers use photon energy in a liquid sodium media to store and calculate information. Sodium atoms are kept under high pressure and begin to behave as a liquid in chambers called "wave guides". Electrical current applied to these wave guides alters the sodium atoms spin and thus the properties of the liquid. Dependent on the spin state, the liquid takes on different optical properties that allow the wave guides to store photons or emit photons with different spin states. Although computers using a similar processor design became more common on earth after 2040, they relied on ultra cold temperatures to operate. Quantum Liquid Computers developed on The Artifact have hundreds of times the quibits (Quantum Bits) than those built on earth.

The processors of a QLC also function as data storage instead of using a separate storage device such as a hard drive or caterpillar drive.

Personal QLC

These are the processors for the Scimrahn Comm/Comp.
Processor Points: 13
Storage: 500 Gigabytes

Mass: 200 g
Cost: ¥2,000

Small QLC
Two of these computers manage the terrain handling and balance of the TF-2394 E-Suit.
Processor Points: 32
Storage: 200 Terabytes
Mass: 50 Kg
Cost: ¥6,000

Medium QLC
One of these computers handles the operation of each TF-2394.
Processor Points: 73
Storage: 800 Terabytes
Mass: 200 Kg
Cost: ¥8,000

Large QLC
Processor Points: 156
Storage: 3 Exobytes
Mass: 600 Kg
Cost: ¥12,000

Hex Mainframe QLC
Hex Mainframes are massive QLCs that maintain each hex. In truth they are overkill for what they are used for. Only one percent of the processing power is used to handle the operation of the hexes.
There are several native programs on these QLCs that should be noted. The operating instructions allow the system to be "self healing". In other words the system will restart any crashed or errored processes to bring them back into operation.
Processor Points: 92
Storage: 1 Exobyte
Mass: 480 Kg
Cost: ¥4,000

Hosent Brain
The QLCs used in Hosent are widely available in industry hexes and are used for a large variety of functions where the size of the processor is not an issue. The Hosent Brain is a tube measuring 120 cm tall and 120 cm in diameter.
Hosent Brains that are for sale are usually just covering the labor costs of removing and transporting the processor.
Processor Points: 383
Storage: 20 Exobytes
Mass: 2,000 Kg
Cost: ¥4,000

Kerdi Brain
The Kelrath manufacture and sell the QLC that is used in Kerdi robots. They are sold without the control instructions that the Kerdi function by.
Processor Points: 264
Storage: 15 Exobytes
Mass: 500 Kg
Cost: ¥10,000,000

Software

Computers have been in general use for just over a hundred years. In that time, a vast number of programs have been written for nearly every conceivable purpose. The following is some of the software that has been found useful on The Artifact. Some of the technology and strategies that are used on the Earth's Internet have proven themselves effective on The Artifact's network. However, there are some limitations to the data transfer between mainframes. Some of the programs have been written by communications officers and are distributed freely, while others are commercial programs.
A computer can run as many programs as their processor points allow. Each software program has a number of processor points used. Once all of the computer's processor points are used it cannot run any more software until programs are shut down. It takes one turn per processor point used to start or shut down a program.

Address Spoofer
Gives a false transmission address in a data message to prevent revealing the sender's location. Note: the receiving address has to remain intact in order to get to the intended recipient.
This hides the sender's location but not the receiver's. It also means that the receiver cannot reply because they do not have the correct address to reply to.
Used Processor Points: 0
Size: 2 Megabytes
Cost: Freeware

A N R T M (Artifact Network Relay Text Messaging)
While military communicators have the ability to send streaming audio messages

over The Artifact's data network, PCs need this program to send text messages.

Text messages are advantageous for several reasons. They are small and encrypting them takes little processor power, They are less likely to be noticed due to their small size, data can be sent in one short burst instead of the long continuous streams used in audio and video communications.

This program makes sending data over the network easier and gives a 20% Advantage to the Computer Programming skill for writing a script to avoid Chezbah probes.
Used Processor Points: 0
Size: 4 Megabytes
Cost: Freeware

ASO Operations Manual (Electronic Form)

The information in the ASO operations manual can be very useful for defining how to proceed in most common situations. It includes some rudimentary Scimrahn and Kelrath. Includes tips for handling social and combat interactions in the different cultures. It also includes a good amount of information on how to find food, electricity and water. The electronic version is searchable by table of contents and by keyword.

For game purposes the manual has similar information to what is in the first 27 pages of this book but would also contain detailed procedures on how to accomplish tasks. Effective as a Foraging skill (+5) and a Scimrahn, Kelrath and Chezbah Culture skill (+5). Takes five minutes of reading each time the character wants to use the skill.
Size: 30 Megabytes
Cost: Freeware

Augmented Reality

Augmented reality software uses video cameras and audio inputs to monitor the outside world. It acts by processing video information, finding patterns and offering data back to the user. AR software uses databases of patterns that can be generated on the fly or can be pre-generated and distributed.

An example of how AR software works in normal use on Earth could go as follows. A police officer is driving his patrol car, a number of cars are in front of him. A special database of license plate patterns and a database of license plates and their owners allows the AR program to identify the cars on the road. It checks to see if the plates are on the wrong model car (an indicator that they might have been stolen). It also checks for outstanding warrants on the plate owners. If a match is found, the software notifies the user and tells them which car has the offender.

This technology is useful in military intelligence in identifying unknown targets, their fighting power and effective countermeasures. There are several databases under development for The Artifact.

AR software can use a HUD (Heads Up Display) to display information, overlay text data, highlight objects for identification, augment poor quality video by overlaying 3D models and overlay sensor readings over visual data (such as infra-red, sound or radar).

The strength of the AR software is that it processes video and audio data in real time and displays results in real time.
Used Processor Points: 2 per database
Size: 30 Gigabytes
Cost: ¥18,000

Chezbah Database

Identifies and classifies all known Chezbah personnel, whether they are combatants or not, and suggests combat strategies known to be effective. Also classifies common Chezbah equipment and can identify Chezbah vehicles.

This database is effective as a Military Intelligence skill (80% Advantage) for Chezbah targets.
Size: 20 Gigabytes
Cost: Free

Kelrath Database

Identifies and classifies all known Kelrath personnel, whether they are combatants or not, and suggests combat strategies known to be effective. It should be noted that the database has a difficult time classifying Geetin who are not in armor. Also classifies common Kelrath equipment and can identify Kelrath vehicles.

This database is effective as a Military Intelligence skill (80% Advantage) for Kelrath targets.
Size: 40 Gigabytes
Cost: Free

Scimrahn Database

Identifies and classifies all known Scimrahn personnel, and suggests combat strategies known to be effective. Also classifies common Scimrahn equipment and can identify Scimrahn vehicles.

This database is effective as a Military Intelligence skill (80% Advantage) for Scimrahn targets.
Size: 30 Gigabytes
Cost: Free

Military Vehicles Database
Identifies and classifies military vehicles common to The Artifact and suggests strategies that are known to be effective. This database can identify critical hit locations for targeting by snipers.
This database is effective as a Military Intelligence skill (80% Advantage) for military vehicles.
Size: 15 Gigabytes
Cost: Free

Vehicle Repair Database
A database of the internal workings of ASO, I-CA and Scimrahn vehicles. Can identify worn parts, locate sources of engine noise, and display the proper method of removing or replacing parts. The program requires a directional microphone to implement some of these features. This database is effective as a Repair Machinery skill (40% Advantage with directional mic, 30% Advantage without one).
Size: 60 Gigabytes
Cost: Free

Personal Contacts Database
Can identify personal contacts and biographical information about them that has been entered by the user, or is picked up by listening to conversations. The database creates captions about the contact and the conversation. The database records every conversation and tracks who the conversation was with. This allows the user to never forget the details of their personal contacts.
The personal contacts database can use video identification software to instantly recognize any contact that is in the database.
Size: 10 Gigabytes
Cost: ¥2,000

Rare Items Database
A database of rare and mythical items, people and places pertaining to The Artifact. When the user examines an object, the possible matches for an item are displayed based on the user giving a dialog about the item. The database attempts to match key words and phrases.
Size: 5 Gigabytes
Cost: Free

Plant Database
The Plant Database is useful for identifying Flora and the properties of the plant subjects. The database can pull up information based on video of the plant or a verbal description.
This database is effective as a Botany skill (80% Advantage) and Foraging skill (40% Advantage).
Size: 30 Gigabytes
Cost: ¥2,000

Biology Database
The biology database is a robust and well developed tool that can identify and classify known animals and plants. It also can be useful in cellular studies, dissections and can assist in classifying unknown species.
This database is effective as a Biology skill (60% Advantage).
Size: 40 Gigabytes
Cost: ¥4,000

Chemistry Database
The chemistry database aids in identifying chemical compounds and their potential functions. It can also take a group of chemicals, and determine all the known substances that they can be combined to create and the process of how to create them.
This database is effective as a Chemistry skill (60% Advantage).
Size: 50 Gigabytes
Cost: ¥6,000

Backdoor Virus
This class of viruses spread themselves to a target system and then open a full access backdoor that the hacker can use.
This listing is not a single program, it is a whole class of programs. Once it is detected for the first time it's lifespan starts to be used up. (See: Deploying Viruses: Virus Lifespan)
Each purchased virus only works on one vehicle or computer system. When purchasing a virus, the type of system it effects should be noted.
Defeat Security Rating: 15
Barrier Points: 7
Self Propagating: Yes

Class A
Social Engineering Rating: 4
Cost: ¥32,000

Class B

Social Engineering Rating: 2
Cost: ¥14,000

Botnet Virus

This virus spreads itself and carries either Defeat Security software or Code Cracking software.

Each infected system lends a little bit of computing power to help with hacking another system or code cracking. Every five systems infected give the botnet a DSR of 1 per fifteen minutes.

This listing is not a single program, it is a whole class of programs. Once it is detected for the first time it's lifespan starts to be used up. (See: Deploying Viruses: Virus Lifespan)

Each purchased virus only works on one vehicle or computer system. When purchasing a virus, the type of system it effects should be noted.
Defeat Security Rating: 15
Barrier Points: 6
Self Propagating: Yes

Class A
Social Engineering Rating: 4
Cost: ¥65,000

Class B
Social Engineering Rating: 2
Cost: ¥28,000

Box in a Box

This program copies the operating system and conditions on a QLC and then creates a virtual system that pretends to be the QLC. Any transmission to the QLC, or attempt to shell into the QLC is sent to the virtual "Box". This way anyone who looks into the QLC will only see the status quo. The only way to detect the presence of a virtual box is by a brute force attack on the data capacity of the QLC (trying to fill it over its capacity. The user of this software can monitor all broadcasts that are coming in and can monitor anyone sending commands to the QLC and what commands they are sending.
Size: 1 Terabyte for the program 100 Terabytes for the virtual QLC
Cost: Freeware

Broadcaster

Sends a message out to all systems. This is used to keep the receivers location a secret, but nearly insures that a message will be intercepted.
Used Processor Points: 0
Size: 1 Megabytes
Cost: Freeware

Defeat Security Software

This is a software package that contains several programs that are useful for hacking computers.

The speed that a computer can hack the Barrier Points on a target computer depends on how much processor power it is given. In addition, several computers may be networked together and combine their processing power.

The software breaks down one (1) Barrier Point for every point of Defeat Security Rating (DSR) every fifteen minutes it is attacking the system.
Used Processor Points: 10 per each +1 DSR
Size: 70 Gigabytes
Cost: Freeware

Code Cracking Software

Code Cracking software is used to "guess" at codes used to encrypt messages. While military communicators have powerful processors built into their hardware for this purpose, a PC must have this program to perform the same function.

The speed at which a PC can crack a code is not as fast as military communicators. However the computers may be used in tandem with a communicator to speed up the process. In addition, several PCs may be networked together and combine their processing power.

The software breaks down one (1) Barrier Point for every point of Code Cracking Rating (CCR) every fifteen minutes it is analyzing the transmission.
Used Processor Points: 7 per each +1 to CCR
Size: 50 Gigabytes
Cost: Freeware

Emulator for Artifact Quantum Liquid Computers

The Artifact QLC mainframes use a four quibit structure similar to the numbering system used by the inhabitants of The Artifact. Because of this, Computers made on Earth need to run special emulation and translation programs in order to communicate on The Artifact's network. There are many versions of these programs and they are often freely available.

This program is needed to connect a Personal Computer to the Artifact's network or to connect to a Scimrahn Comm / Comp.
Used Processor Points: 4

Size: 30 Gigabytes
Cost: Freeware

Encyclopedia (Electronic Form)

Encyclopedias can become very useful when the data in them is instantly available. Text to speech software can be used to read passages for "quick studies" on subjects. Electronic versions are searchable by keyword and subject.
Size: 3 Gigabytes
Cost: ¥400

Fast Kill Virus

This class of viruses disables the computer's operating instructions by deleting vital files. It does not attempt to infect other systems and because it disables a system immediately once it has broken down the system's barrier points it does not need Barrier Points. This makes the virus very small and difficult to detect.

This listing is not a single program, it is a whole class of programs. Once it is detected for the first time it's lifespan starts to be used up. (See: Planting and Deploying Viruses: Virus Lifespan)

Each purchased virus only works on one vehicle or computer system. When purchasing a virus, the type of system it effects should be noted.
Defeat Security Rating: 20
Barrier Points: 0
Self Propagating: No

Class A
Social Engineering Rating: 4
Cost: ¥75,000

Class B
Social Engineering Rating: 3
Cost: ¥30,000

Class C
Social Engineering Rating: 2
Cost: ¥10,000

Kill Virus

This class of viruses spread themselves to a target system waits until it has infected two other systems connected to it and then disables the computer's operating instructions by deleting vital files.

This listing is not a single program, it is a whole class of programs. Once it is detected for the first time it's lifespan starts to be used up. (See: Planting and Deploying Viruses: Virus Lifespan)

Each purchased virus only works on one vehicle or computer system. When purchasing a virus, the type of system it effects should be noted.
Defeat Security Rating: 18
Barrier Points: 2
Self Propagating: Yes

Class A
Social Engineering Rating: 4
Cost: ¥32,000

Class B
Social Engineering Rating: 2
Cost: ¥14,000

Network Gateway

This software is an intelligent firewall designed to act as a secure gateway for large networks such as a Hosent Hive.

The gateway is installed on any system that talks to computers outside the network. For the example of a Hosent Hive, the network gateway would only have to run on the Hex Mainframe in that Hex.

The Network Gateway uses intelligent agents to monitor traffic
Barrier Points: 5 +1 for every 3 Processor Point allocated to the gateway.
Used Processor Points: 4+
Size: 400 Gigabytes
Cost: ¥1,000

Packet Sniffer

These programs listen to the network and pick up messages that travel across the computer the packet sniffer is on. Normally, if the data packet is not meant for the computer you are at then the computer will simply forward the message and otherwise ignore it. A packet sniffer forwards the message as normal, but keeps a copy to be examined. The Chezbah use a version of this kind of program to monitor The Artifact's data network.
Used Processor Points: 1
Size: 2 Megabytes
Cost: Freeware

QLC Unix

This is a port of the Unix operating system for use on a QLC. It allows a QLC to run any of the programs listed in this section and provides a familiar operating environment for Earthers.
Barrier Points: 4
Used Processor Points: 3
Size: 100 Gigabytes
Cost: Freeware

Scimrahn Comm / Comp OS

This is the operating system used on the Comm / Comp but is designed to be installed on any QLC.
Barrier Points: 4
Used Processor Points: 8
Size: 200 Gigabytes
Cost: Freeware

Security Software

This software is a bundle of security programs including firewalls, antivirus programs, and algorithmic monitoring agents that monitor communication on the system and look for patterns of harmful communications and processes.

The security package can be installed on either a personal computer or there is a version ported over for QLCs.

Personal Computer
Barrier Points: 7
Used Processor Points: 3
Size: 300 Gigabytes
Cost: ¥1,000

QLC
Barrier Points: 7
Used Processor Points: 8
Size: 800 Gigabytes
Cost: Freeware

Translator software

Translator software uses multiple processes to find the most likely translation of a spoken phrase. The program is normally effective in everyday conversation, but has difficulty with technical or unusual subject matters. Often when the translator does fail it is in the syntax of the translated phrase. This can make the translation difficult to understand or can twist the meaning into something entirely different.

This program is effective as a single language skill (40% Advantage). A different program must be purchased for each language that needs translation.
Used Processor Points: 2
Size: 20 Gigabytes
Cost: ¥4,000

Video Identification

Video identification software uses biometrics to record an individual's identity. This biometric data can be entered manually, or the program can generate the information from still images or video files. It can then be used as security to verify a person's identity, or can be used to locate a person in live video or recorded video.

This software can be integrated into an augmented reality software system to generate possible matches in real time.
Used Processor Points: 3
Size: 50 Gigabytes
Cost: ¥5,000

Video mapping software

Video mapping software is designed to take input from a camera, process the video information and produce a three dimensional map of the solid objects in the video.

The program can generate a map in real time from video input, or use recorded video. It is important to note that the software will only be able to record what it "sees". If something such as a door or hole is blocked from the camera's view, the software will not be able to extrapolate that it was there. Likewise if the camera is never pointed in a certain direction, the software may attempt to extrapolate what was there, but will choose to insert blank walls or that nothing was there at all.

The mapping program will use the video information to create images that are automatically applied to walls, floors etc. so the map may be toured as if it were the real place.

Maps can be re-touched by more video of an area that is taken at a later time. The program can also export its map as a three dimensional object to other programs. These maps are compatible with augmented reality software.
Used Processor Points: 2
Size: 150 Gigabytes
Cost: ¥6,000

Virtual Private Network (VPN)

Virtual Private Networking is a system that establishes an encrypted session between to computers. This is used to create a secure connection over an insecure network such as the Internet or The Artifact network. The hazards of communicating over The Artifact's network warrant that any VPN use a very strong encryption and are therefore very processor intensive.
Barrier Points: 50
Used Processor Points: 10
Size: 7 Gigabytes
Cost: Freeware

Engineer's Resource

This Resource is to clarify the role of the Character Occupation of Field Engineer. Although some information is given in the description of the CO this resource greatly expands on what a Field Engineer does and how to do it.

The Field Engineers can be given an enormously wide array of tasks to accomplish supporting the fighting forces from Earth and their allies the Scimrahn. Normally, in modern militaries the jobs of Military Engineer and Mechanic have separate responsibilities, but because of the limited manpower available on The Artifact, these two roles have been combined into one. The primary job responsibilities of the Field Engineer are as follows.

1. Mobility – Both facilitating friendly troop movement and impeding enemy movement.
2. Hazardous Ordinance Disposal – Disposal of enemy ordinance
3. Defense – Fortification construction
4. Demolition – Destruction of enemy fortifications and structures
5. Maintenance - Supporting fighting vehicles

The Field Engineer has access to any and all materials that are available and will support these goals, including using troops and combat vehicles when these are not already in use in combat roles. This authorization has paved the way for the Field Engineer to use Hosent to develop tools that would not normally be available to them. Because of the Field Engineers training, they are in a position to design and build both vehicles and weapon systems on location without a long supply chain, thus greatly enhancing the mobility and fighting power of small units.

This resource will assist the player in using a Field Engineer character. It will step through the five goals to flesh them out and give a better understanding of how to use the environment of The Artifact to their advantage. To do this, the Engineer must understand the materials that are available to them, both supplied and native. The next section will address how the Engineer can obtain materials and general techniques to build using those materials.

Note to Players: Although this sourcebook does it's best to simplify the tasks an Engineer would perform, the job of the Engineer is a technical one and that is reflected in this book. To use these rules to their fullest, the player should enjoy dealing and thinking about strategic and technical problems.

The Engineering Team

Engineers are often deployed in groups. These groups consist of several engineers, footsoldiers, E-Suits and any other support vehicles and their crews. Each element of the team is under orders to take direction from the engineers and work to complete any tasks that the engineer needs to complete their mission. That mission may be to accompany and support a larger unit or it may be deployed ahead of a main force to prepare the way for them. Because of this the engineer can be a plot driver for the game. If there is a larger regular forces unit, and their success depends on the engineer, the commanding officer may authorize the engineer to use more or all of the regular forces to complete their tasks. In a combat situation, the engineer must defer authority to regular forces.

The ASO engineering team normally consists of 5 engineers, 10 footsoldiers, 2 E-Suits and whatever support vehicles are deemed necessary for the task assigned dependent on availability. I-CA engineering teams are often twice that size but are more often assigned much larger tasks such as developing defenses and housing for colonies.

The Engineer does the planning and instructs others on how to accomplish assigned tasks. Any direction they give to regular forces must be for unskilled labor and instructions must be detailed enough for enlisted forces to complete the task. Any work that requires skilled labor must be done by the engineer.

Footsoldiers are both for the defense of the team and to assist the engineer with manpower needed to complete the task at hand. They take all direction from the

engineer unless it is in a combat situation. The ranking officer of the regular forces assigned to the team is also responsible for security and surveillance, but must balance these responsibilities with accomplishing the engineering tasks that the engineer directs.

E-Suits are used to defend the team and when other specialized support vehicles are not available, they are used for heavy lifting and earth moving. These E-suits are often supplied with one or more optional systems for construction purposes. The choice of these systems is up to the engineer.

Measuring Work

Much of the work described in this sourcebook is defined in manhours. This is the work of one man over one hour. However it in almost all cases can be divided among the people working on the job that are skilled in the task at hand. Unskilled tasks do not require any skill. E-Suits are equal to unskilled labor but count as 20 men.

For example, a designated task requires 1000 manhours. An ASO Engineering Team has the equivalent of 55 men (5 engineers, 10 footsoldiers, 2 E-Suits). The number of manhours (1000) divided by 55 men would take less than 19 hours to complete.

A Command Skill roll can reduce the time that a project takes to complete (A Commanding Officer can make this roll or the Engineer). Each fractional success reduces the total number of manhours by 5%. However this requires the Engineer or Commanding Officer to supervise the task from start to end.

Measuring Energy

This book uses a unit of energy that is roughly equivalent to 14 HP or 10,000 Watts of power. These units tend to work well on the scale that the engineer will work with. These units are simply called Energy Units.

To learn more about generating power for engineering applications see: Building -> Generating Power.

Mobility

The importance of mobility is easy to understand. The Engineer must promote the mobility for friendly forces by constructing bridges and roads where needed and removing obstacles such as choked passages and enemy blockades.

The first option is always to go around an obstacle but in some instances the obstacle is large and engineering a way through it may be more cost effective. This is especially true when fuel must be conserved.

Every 300 KM traveled roll on the table below.

1D100 Path obstruction table
1-20 Heavy rubble
21-50 Overhead hazards
51-65 Grade impassable
66-80 Cracked Hexes
81-100 Vertical Travel required

Heavy Rubble

This obstacle represents a wide field of rubble from combat in the area or fallen CCC that is large enough to prevent or seriously slow vehicular traffic. Clearing the obstruction is a Road Building primary skill Tech Challenge with a CP of 2d6. Every roll against this tech challenge requires 40 manhours of unskilled labor. Going around will increase the distance needed to travel 1D100x10 KM.

Overhead Hazards

This obstacle represents an area in which the roof of the hexes are damaged and loose CCC is hanging. These hazards should be cleared before traveling underneath or a rock fall can occur. Going around will increase the distance needed to travel 1D100x10 KM.

Clearing overhead hazards is a Structural Recognition primary skill Tech Challenge with a CP of 1d10. The Explosives skill may also be useful in this challenge for placing charges to dislodge hanging hazards.

There must be some way for the engineer to reach the ceiling to place the charges. This is often done with an E-suit or AG vehicle such as a Skiff.

An addendum to the Random Encounter Tables: A structural recognition roll can identify the “falling rocks” encounters.

Grade Impassable

Structural damage has caused hex floors to tilt to such a degree that vehicles that are not capable of flight cannot safely travel up or down the slope. This is usually a pitch of 30-40 degrees or more. The engineer may use lifting equipment to carry vehicles over the obstacle or they can make a switchback road using earthmoving equipment and a road construction skill roll. Clearing the obstruction is a Road Building primary skill Tech Challenge with a CP of 1d10. Every roll against this tech challenge requires 40 manhours of unskilled labor. Going around will increase the distance needed to travel 1D100x10 KM.

Cracked Hexes

The Hexes being traveled through are cracked, leaving a gap 2-12 meters across (2D6 meters). A bridge must be built or the company will have to go the long way around. Going around will increase the distance needed to travel 1D100x10 KM.

Vertical Travel Required

To arrive at a designated point moving up a number of floors is required. The group must move vertically 3D6 hexes. Some vehicles will be able to move vertically on their own but wheeled vehicles must be lifted or lowered by some other means.

The following sections outline how many of these obstacles can be overcome. These are not the only methods that will be effective but they should be considered the standard to follow. Engineers are given the operational flexibility to make decisions based on technical challenges they face as they have the technical knowledge to accomplish their mission goals.

Road Building

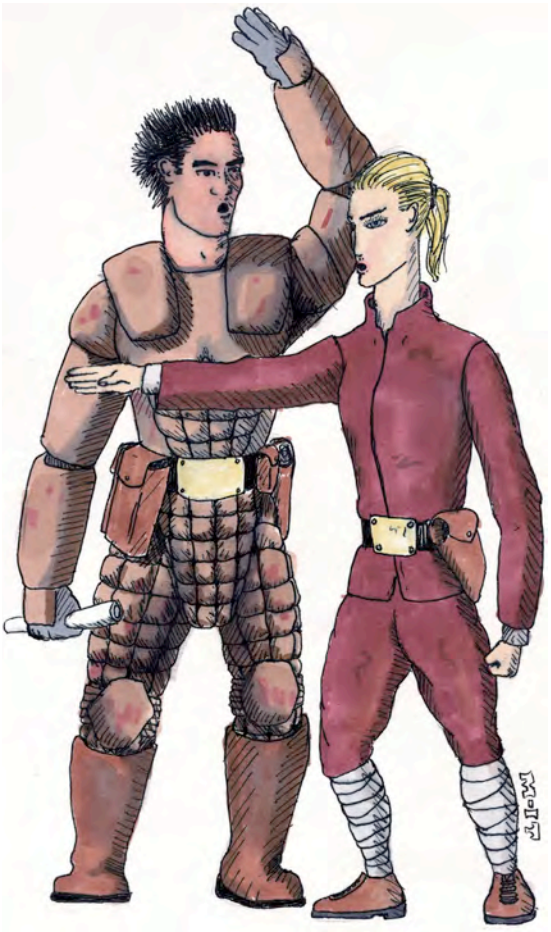
Most heavy combat vehicles are designed to be all terrain, however even these suffer less wear and can move faster over flat ground. The Artifact is a manufactured environment and even Agri Hexes have roads built into the structure of the hex. However, in some instances point to point travel may traverse an area not on one of these paths. Especially in Agri Hexes the soil can be very wet and vehicles such as heavy trucks may become stuck. In other areas broken ground may impede movement. Clearing a path and providing a smooth pass is often the job of a field engineer.

Another important concern in preparing routes for friendly forces is clearing over head hazards. In Hexes where there has been seismic disruption, it is the Engineer's responsibility to clear any hazards such as loose pieces of CCC that could fall.

In most instances packed soil or CCC fill with soil over are the quickest method for building a road. This can be surfaced with thin (1-3 cm) CCC slabs at a later time if needed.

Road construction tech challenges require 40 manhours of labor for every 1 CP of the challenge. Although conditions may increase the CP of a challenge and the labor needed, one CP represents building a road on a flat surface a single lane 10 meters long.

For CCC Slab cutting see: Building – CCC



Bridge Building

In some locations, the structure of a Hex or many Hexes has failed creating an obstacle to travel. If the obstacle cannot be negotiated or if it will cause significant delays on a regular route a bridge or bridges may be required.

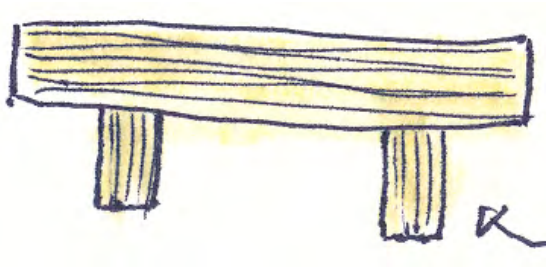
It is highly recommended that local CCC is used to build bridges. A span of CCC thirty (30) cm thick and three meters long can support a vehicle up to 30 metric tons. When determining the load that a bridge can support, it is important to calculate for a heavier load than the vehicles that are expected to travel over it for safety. This safety factor should be a factor of two or more.

Slab

To calculate the needed strength of a span, the weight of the heaviest vehicle that is expected to go across the bridge and the distance that the bridge will have to span must be determined.

Take the weight of the heaviest vehicle in tons and multiply by two (2). One ton is equal to 1000 Kg. This is the required carrying mass of the bridge. This is a Road Building primary skill Tech Challenge with a starting CP equal to the tons the bridge must carry.

Add one CP for every meter that the bridge must span.



For CCC Slab cutting see: Building - CCC

Repairing and Starting Hex Conveyors

The upper floors of hexes are less frequently patrolled than lower levels. This makes them safer to establish camps in but presents the problem of moving heavy equipment the higher floors.

In the large openings in hex walls, there are several vertical tubes. In these tubes is a conveyer belt with platforms. When functioning one side of the conveyer is going up while the other is going down, this facilitates movement between hex floors. In many cases these conveyors are no longer functioning. This may be because of power loss, wear on the mechanism or both.

In a few instances the conveyer may simply be turned off, this is rare but it does happen. To turn a conveyor back on, a command must be entered into the terminal located near the conveyer or at the mainframe itself along with the conveyor number.

In many cases if power is still available, the conveyor is simply worn out from centuries of unattended operation.

Roll 1D100

	Cause of failure
1-22	No power
23-37	No power and belt snapped
38-52	No power and platform jammed
53-67	No power and motor failure
68-69	No power and turned off
70-79	Belt snapped
80-89	Platform jammed
90-99	Motor failure
100	Turned off

Getting a conveyor operating again is often a major undertaking but when an engineer has access to an entire company of 100 men and several E-suits the task can be accomplished in a matter of hours.

Fixes

No power - Electrical power must be supplied to the hex for the conveyor to operate. Restoring power from the plasma lines is often not be feasible although the possibility should be investigated. The conveyor can be powered by another source of electricity such as a powerful generator. The conveyor requires 1713 power units (24,000 Horse Power or just under 18 million watts) to operate at full power, or a minimum safe power level of 480 power units (6,700 Horse Power or 5 Megawatts).

See custom power generation.

Belt snapped - The belt may be repaired by taking undamaged links from conveyors in nearby hexes. The belts are modular and sections weigh ten (10) metric tons. The entire belt is made up of four thousand (4,000) links.

The entire belt weighs forty thousand tons (40,000,000 Kg) but the conveyor has a locking mechanism to prevent the entire belt from falling. The collapsed section can be no more than one hundred (100) links and therefore weights between ten (10) and one thousand (1,000) tons. Roll 1D100 to see how many links must be lifted to re-connect the belt.

The first one to ten links to be repaired is a Tech Challenge with a CP of 1. For every ten links after that, add one CP. It requires 1000 Manhours per roll against the challenge to re-connect the belt.

Platform jammed - The conveyor has misaligned and jammed itself against the wall of the tube.

Realigning the belt is a Tech Challenge with 1D6 Challenge Points. It

requires 100 man hours per roll against the challenge to align the platform.

Motor failure – The electrical motor for this conveyor is burnt out. It may be possible to rebuild it using parts from other motors. The motors weigh thirty seven (37) metric tons but can be moved in 5 parts (approx. 7,400 Kg each).

Repairing the motor is a Tech Challenge with 2d6 Challenge Points. It requires 300 man hours per roll against the challenge to align the platform.

Turned off - A command must be entered into the terminal located near the conveyer or at the mainframe itself along with the conveyor number. Turning the conveyor back on requires a computer operation roll.

At this power consumption rate The Artifact can only power 19,333,333,333 conveyors (assuming 348 Pettawatts of solar input or two of earths suns) and there are 1.5 trillion hexes or at least 9 trillion conveyors with a total power consumption of 162,000,000,000,000,000,000 watts (162 Exawatts). So it would be likely that the Conveyors were not designed to run all the time. (Possibly only once an hour)

These figures are not accurate as Tose and Humid are much closer to the planet and the magnetospheres are aligned to deliver power into the poles. This would provide greater amounts of energy than being simply in orbit. In addition, the planet is significantly closer than earth is to the sun. Since the Earth's Sun has a total luminosity of 386 Yottawatts, Tose would have a roughly equivalent output. Humid might be slightly less.

Even if the Artifact could capture 20% of the output of these stars (which would be a lot) it would capture 154.4 Yottawatts. Even at that rate the Conveyors would use 10% of the power consumption of The Artifact if left on all the time. Recent findings point towards, The Artifact not being powered primarily from the collector wells and power is actually coming from the industry pods.

Vertical Transport of Heavy Equipment

Travel between Hexes vertically is difficult for vehicles not capable of flight. In some cases a Scimrahn freighter with a hoist rig can be used to lift vehicles but have difficulty moving tanks. Some engineers have built rigs to allow two freighters to lift a single tank, but piloting the two freighters together can be very difficult. On occasion heavy lift helicopters are used to transport vehicles between levels.

In some circumstances, the motor from a hex conveyor can be removed and placed near a location to lift or lower vehicles. See: Repairing and Starting Hex Conveyors for information on disassembling and moving the motors.

Then a sufficiently strong cable must be obtained or made. The power cables in a hex are able to suspend approximately 1000 Kg. However this does not take into account shock loads so for safety the safe load of these cables should be considered 300 Kg. The cables may be wound together to make a stronger cable.

After moving the motor, collecting enough cable and modifying the motor to pull a cable up the vertical shafts in a power hex is a Tech Challenge with 1D6 CP. Each roll against the challenge requires 100 manhours of work.

The preferable mode of transport is an AG Mass Transit but these can be difficult to locate.

Overcoming Enemy Defensive Blockades

While it is the role of regular forces to fight enemy forces, it is the Engineer's role to overcome any defensive structures that have been erected to impede movement of friendly forces. This includes blocked passages, walls, any hardened buildings that the enemy may be hiding in, and disarming any traps that are identified before being sprung.

First, common Chezbah Defenses will be reviewed and then Kelrath Defenses. These are not the only defensive measures that the characters can encounter but are intended to give the Game Master a quick way to introduce enemy engineering techniques.

The engineer should be given access to this information as it would be trained in how to overcome enemy defensive blockades.

Common Chezbah Defenses

The Chezbah have procedures on defending cities and other assets. They emphasize non-destructive fortifications, that is, fortifications that do not mar the structure of the hexes they are in. They will however disassemble some structures and then re-assemble them when done.

Chezbah Warrior Bunkers

Chezbah Civilians will transport powdered CCC to a location and then use local Hosent to build a domed structure three meters tall by 6 meters diameter. This structure is used as an outpost for camped Chezbah Warriors. In some instances a seldom attacked location may have conscripts instead of Warriors.

The structure has 10 closeable window slots designed to be fired out and a force field that can protect one quarter of the building.

Bunker stats
AR 50
HP 1000
Window Shield stats
AR 30
HP 70
Force Field
HP 300
Battery power for one hour

Effective Strategies:

Berm - Constructing a Berm in between friendly forces and the Chezbah bunker will give cover and allow friendly forces to use indirect fire weapons on the bunker in safety such as missiles, grenades, mortars and artillery.

Cut Communications – Although it may be guarded, the Hex mainframe should be disabled as quickly as possible to prevent the Chezbah from reporting back for reinforcements. Initial jamming can be done by Communications Officers, but it is the Engineer's role to disable the hex mainframe

Lookouts

Chezbah will set up an E-Suit lookout in an overhead air duct. This is often little more than a forward lookout position and the E-suit will rarely engage unless attacked. Most often the pilot will signal for re-enforcements.

Effective Strategies:

No Engineering Role - Since there is no structures that need to be overcome, simply being aware of this countermeasure and notifying regular forces to be on the lookout is all that is required.

Hull Down Positions

The roads in Agri Hexes are actually built into the floor of the hex and dirt fills the basin that is in between the roads. As a result the roads make excellent barriers for hull down positions.

A hull down position is a concealing position where only the top portion of a vehicle is visible. The vehicle can normally fire from this position but are under soft cover.

40% Impairment to hit a target in hull down position.

Effective Strategies:

Berm – In this type of hull down position, line of sight weapons such as lasers and Plasma are greatly hindered by barriers, while projectile artillery (Air Burst rounds) are able to fire over barriers and still hit their target.

Berms are mounds of earth that form a barrier. It is important that the Berm is above grade and not simply a hull down position like the Chezbah defense. This elevation difference gives friendly forces hard cover while the Chezbah are in their hull down position.

See: Countermobility - Berms

Hound Holes

Hound Holes are a defensive measure where a large number of hounds are buried under dirt in a hibernating state. They remain hidden until enemy troops pass over them and then are signaled to attack the flank of the enemy. (5D10 Hounds in the hole)

Effective Strategies:

Ground Penetrating Radar/Sonar - The Engineer may be able to locate a Hound Hole with ground penetrating radar or sonar systems and alert regular forces to their existence.

Earth or CCC Barrier - The Engineer may aid regular forces by preventing the hounds from breaking out with a barrier of earth or CCC. In most cases a one meter layer of earth will effectively prevent the hounds from breaking out. This must be done quickly or the hounds will break out before the barrier is in place. A CCC barrier of only ten to fifteen (10-15) cm thick is effective in preventing the hounds from breaking out.

Artillery - Once located, a hound hole can be shelled with artillery killing the hounds before they break out. The shelling is partly absorbed by the dirt over and around the hounds and therefore requires that ten percent (10%) more damage (22 HP per hound) is done to kill the mass of hounds.

Buried Demolisher

On occasion the Chezbah have completely buried a demolisher as a forward operating base in enemy territory. Usually the Demolisher's role is to spy on the area and to attack only if discovered. The Demolisher takes ten seconds to a minute to break out of the ground (1D6 turns)

Effective Strategies:

Ground Penetrating Radar/Sonar - The Engineer may be able to locate a buried Demolisher with ground penetrating radar or sonar systems and alert regular forces to their existence. However this is subject to ECM rolls by the Demolisher's pilot

Shaped charges – If the Demolisher is located before it has emerged from the ground. Digging down only a few centimeters a shaped charge can be placed on the hull of the Demolisher.

Common Kelrath Defenses

The Kelrath are very interested in defensive positions. Many communities are adherents to the the oracle Rall, who emphasizes defending against an enemy until they have tired out and then striking.

Most defenses are designed around defending against Chezbah attacks.

Towers

The Kelrath build heavy tower fortifications in the center of Argi Hexes. At the entry ways are large earth berms (mounds of earth that form a barrier) that block the view into the hex. The top of the tower has a mirror array and is just visible from over the top of the berm. The berm is ramped so that there is no place to hide when entering the hex. The mirror array allows the defenders in the tower to see with great magnification anything at the doors of the hex, it is also used to aim a laser emplacement at any targets

coming in the doors. The bottom of the tower usually has between four (4) and ten (10) Rall4s defending it. The goal of the tower is to delay an invasion, not stop it. At first sight of an enemy the Rall4s will try and close the distance between the attackers and the tower, while the Laser strikes at anything entering the hex.

Power Supply: Electrical Power from Hex and battery reserve

AR 30
HP 10,000

Laser

	PB	S	Med	L	Ex
Damage	1,500	1,400	700	450	250

Range Class E
Rate of fire 1
Fire Arc 1-8

Effective Strategies:

Cut power to the hex - There is usually some kind of patrol along power and communication lines, but this is often easier to overcome than the full force at the tower. This strategy may be difficult to implement if the power lines lead away from your position. The tower's batteries will still hold enough charge for five blasts from the laser.

Structural Recognition - Identifying potential weak spots in the tower (Structural Recognition roll) and directing regular forces to strike at the tower in these locations allow greater damage to be done (10% more).

Assault on the Tower

If an assault on the tower is successful it is the responsibility of the engineer to demolition the structure to prevent falling to enemy hands. If this is not possible due to time or material constraints, then disable the Laser and set booby traps as the opportunity presents itself.

Plugged Hex Passages

Wherever possible, the Kelrath will plug the entrances to hexes both in hex walls and service passages in the floor. This is done with huge amounts of soil and one meter diameter and smaller chunks of CCC. On occasion they will miss blocking an overhead passage because these are difficult and dangerous to collapse.

Industry and Agri hexes often have the vertical passages in the walls filled to prevent moving up and over defenses.

Cities and Towns especially will have two entrances on opposite sides and a secret exit for Rantaa' and Kaloord.

These plugs can be very difficult to clear, however Kelrath patrols may be light on either side of them if they are not expected to be breached. The last 20 meters can be removed with explosives, but this will alert the enemy. This may be preferable if a patrol is likely to discover the breach, allowing for a surprise attack.

In key locations, the Kelrath will cap a plug on the inside with CCC. This can add considerable strength to the plug and resist an explosive charge. A smaller core should be taken prior to blasting to ensure that there is no cap. If there is a cap, then the entire plug must be removed and the cap can be removed mechanically or by blasting.

Plug thickness

3D6x10 meters

Effective Strategies:

Tunneling - Tunneling through the plug is a slow and labor intensive task, but it is the primary method of defeating this countermeasure. Blasting will quickly alert the enemy and can therefore only be used at the very end of the plug.

Although the work of burrowing through a plug is unskilled labor, making sure the tunnel does not collapse is a Structural Recognition primary skill Tech Challenge with one CP for every ten meters. For each roll to defeat the challenge, 30 manhours of unskilled work is required.

Scouting For Missed or Poorly Plugged Tunnels - Although not the responsibility of the Engineer it is often the fastest strategy to try and find a passage that has not been blocked. It may also be possible to check for a passage that does not have a thick plug, or light fill has been used. Determining the thickness and mobility from such a plug is the engineer's responsibility by making a Structural Recognition roll.

Casemate Lookout

A casemate is a fortified gun emplacement. The Kelrath burrow Casemates high into walls of Filtration Hexes and Power hexes there may be several on each wall of a hex, but there is usually minimal crew to work guns that are stationed at them. The crew will drive through tunnels bored in the walls on Zemot to move between emplacements.

Hitting these targets is difficult, they are small targets and under cover. In addition they are often a kilometer up the walls, putting them just out of range of Range Class C weapons.

Power Supply: Electrical Power from Hex

Laser

	PB	S	Med	L	Ex
Damage	750	700	450	225	110

Range Class E

Rate of fire 1
Fire Arc 1

Effective Strategies:

Cut power to the hex - There is usually some kind of patrol along power and communication lines, but this is often easier to overcome than the full force at the Casemate. This strategy may be difficult to implement if the power lines lead away from your position.

Locate the entry - Locating the entry for the crew will allow the Casemate to be stormed, but fighting can be difficult up the narrow passages because the Casemate crew has the advantage.

Flying insertion - Flying up to the Casemate is the most straightforward method of entry. This allows the engineer to enter and begin destroying the guns

Kelrath Boobytraps

In some situations, the Kelrath will leave boobytraps in areas they are not able to patrol regularly. The preferred method of protecting these sites is to use Kerdi but not all Rantaa' have access to them. These can often be extremely dangerous and if detected early, every possible caution should be taken to avoid triggering them.

A favorite tactic is the use of chemical weapon mines. These can be small devices, but most often are designed to trigger a large release in the center of a hex and block all passage through it.

Uniforms should be re-coated with nan0-encapsulators and gas masks (See: Player's Handbook) and any openings should be properly sealed before any other action taken if such a device is discovered.

There are a large number of Booby traps that have been employed by the Kelrath, but they are not often very elaborate. In some cases weapons or parts from vehicles (most often Rall4s) are used to set up a kind of laser mine that triggers when a certain event occurs. In some cases the trap is disguised as wreckage from a battle. This can sometimes be noticed by evidence of the wreckage being moved to the location, or other inconsistencies.

Most smaller traps are located in the four large passages in hex walls. This makes it safer to use smaller passages in the walls when possible.

Explosive mines or traps are often containers of LCF with some kind of trigger. These are often crude and have a high misfire rate.

In some instances a fast boobytrap that Geetin sometimes set up is to flood a section of a hex and then put an electric current through it. This is often most effective against hounds and will slow footsoldiers until the water can be drained or the electricity cut.

Effective Strategies:

Disposal - In the case of a chemical weapon plasma or napalm should be used to destroy the mine. If a boobytrap is overtly obvious it may be a decoy or meant to trigger another trap when approached or disturbed.

Berms

Berms are mounds of earth that form a barrier. These are often employed to direct or restrict the movement of enemy troops and provide cover. Geetin often will create a mound of earth one (1) to three (3) meters tall around a city to protect them against attack.

In addition the roads in and out of a city are most likely lined with berms to direct attackers in a straight line.

Some berms are reinforced with slabs of CCC.

A berm is not an impenetrable barrier. It serves two purposes, to provide cover for troops and slowing enemy movement. A berm must be sufficiently steep that it is difficult for footsoldiers and land vehicles to drive over it to do so it must have an incline of over thirty degrees (30) and be over 1.3 meters high. Pilots driving their land vehicles over the berm must make a piloting roll with a 20% impairment for every meter in hight. If the roll is failed they cannot get over the berm that turn.

Soldiers on foot have a 20% Impairment to movement rolls for every meter of berm hight. A Constitution roll must be passed or characters take one Physical stress point per meter of berm.

Infantry take one point of stress per meter of berm hight if the impairment value is rolled under.

Effective Strategies:

If regular forces can establish a foothold in the hex, armored bulldozers (or C-Suits) can move the berm to provide cover for friendly forces.

Gates

At the entrances to a city there are usually heavy gates that are built into the Hex passages. These will sometimes be left open, but can be closed in less than two minutes (2D6 Turns). Passages that have a gate usually have a forward observation point built into the vertical shafts which are filled with dirt.

Gates usually have firing ports in or around them to allow firing on the enemy.

HP: 40,000

AR: 180

Shields: 500 HP

Effective Strategies:

Explosive charges at the hinges of the gate can quickly defeat this countermeasure, but help from regular forces to suppress enemy fire is required to successfully plant explosives.

Magnetic Mines

The Kelrath make extensive use of magnetic mines to defend their cities and outposts. These are often placed in or near the doorway entering a hex. As the enemy enters the city, the magnetic mine reduces or eliminates the effectiveness of their shields.

Effective Strategies:

The Engineer can use a gauss meter to locate the mine and an explosive charge designed to penetrate the ground it is in can be used to destroy the mine.

Countermobility

In addition to aiding the mobility of friendly forces, it is also the Engineer's responsibility to impede the mobility of hostile forces. Some common methods are listed below.

Walls

Walls are everywhere in The Artifact, this makes the Engineers role much easier since with very little effort, a durable barrier can be imposed. Kelrath techniques may be the most well developed to this end and should be considered the model to follow when plugging Hex passages. However in most cases an Engineer will not have the resources to properly emulate the massive effort that the Kelrath employ to defend a city.

The following methods can be used to slow or prevent movement through hex doorways. Several of these measures can be used together to prevent or control Seeter attacks on colonists.

Mines

Mines are the quickest method of slowing an enemy's advance. However passages between hexes are solid CCC and a good deal of effort is needed to bury the mines and camouflage them. The fastest method of cutting a hole large enough to bury a mine is with explosives, this is noisy and leaves the matter of camouflaging them. This requires an Explosives Skill roll to cut the hole, another Explosives Skill roll to lay the mine, and a Camouflage roll to cover them.

There are several stop gap measures that can be taken to impose a temporary barrier in short order. Traps are most effective when placed in hex passages as they virtually ensure the enemy passing within a fixed distance of the trap. When explosives are readily available, holes can be drilled to a depth of 90 cm every 5 meters (or every 25 square meters) and with a charge of explosives doing 200 points in each hole. At least 300 holes must be drilled to dislodge enough CCC to block a small hex wall passage.

Often a mound of loose dirt across a Hex wall passage may be mined making an effective deterrent. This naturally camouflages the mine's position since the whole plug is disturbed dirt and leaves no visual indicator of where the mines are placed.

Bulldozers can quickly create a large mound of dirt in the passageways of a hex while actually filling a passage like this is a major undertaking, creating a partial barrier that is mined can greatly slow enemy advancement.

For the amount of work required to make a loose dirt barrier see: Berms

CCC Plug

A large block of CCC can be cut out of the wall of a hex directly above a door so that it falls into the doorway. If time permits, earth can be heaped up behind the plug to reinforce it. This method can be done quickly but cutting the block correctly is crucial to it falling in place properly. See: Building - CCC

A CCC plug the size of an hex passage has the following attributes.
AR = 10
HP = 500 per cm in thickness

Wire Obstacle

Wire obstacles are fast and easy ways to block a passage from foot traffic. See: Player's Handbook - Razor Wire

Where there are enemy foot soldiers anticipated, a wire obstacle can be quickly put in place to slow their advance. This is often used in concert with mines. Wire obstacles are fences of razor wire, while most armor is effective protection from the wire, Armor becoming tangled in the wire will still slow enemy movement.

Enemy infantry attempting to move through a wire obstacle must make a successful Agility roll and one turn to overcome the wire obstacle.

Several wire obstacles may be placed, one after the other. It takes one manhour to lay 50 meters of wire obstacle.

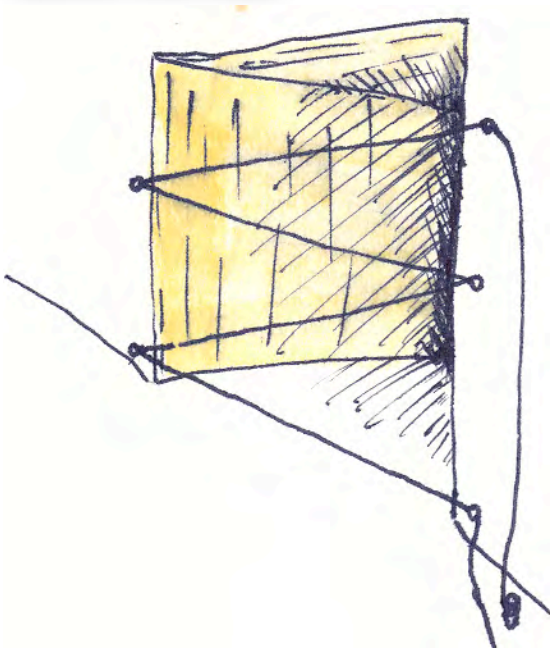
Flooding

Flooding an area of an Agri-hex even to a shallow depth of a few centimeters can slow forces considerably (movement or piloting Impairment equal to 3% x cm of water), especially e-suits that have a very small footprint compared to their mass.

This is ineffective against flying vehicles.

Flooding can also be used to force E-Suits into the air and make them vulnerable to surface to air missiles.

Electric Wire Fence



The electrical power supply in the incremental cities makes any connected and uninsulated conductor an effective electrified fence. If the conductor is thick enough, it will be able to carry lethal charges and can even be used to disrupt vehicles.

Collecting enough cable and arranging it for the trap is a Tech Challenge with 1D6 CP. Each roll against the challenge requires 100 manhours of work.

Damage 25 per turn touching the fence,

The electrical attack automatically gets an avoiding armor effect and the electrical attack and increases the chance of getting a critical hit on a vehicle that touches the wire by 20%.

Traps

There are numerous kinds of traps that can be devised. There is a wide variety of effects that can be engineered but four basic concerns apply.

Durability – A trap that is easily removed by weapons fire will not cause much of a delay. However the more durable the trap is the more time it will take to put it together.

Speed of Construction – A trap that is easy to put together can be put together many times and provide redundancy.

Simplicity – A simple trap has less opportunity for failure, however simpler types of traps often require more brute strength to be effective.

Strength – The amount of force that a trap can exert greatly defines what it can do, however a trap often becomes more complex or requires more materials as it is made stronger.

Using large external weights can have a strong psychological impact if the damage done is particularly severe. Therefore even a small number of devices can turn a larger force away if more traps are anticipated. Although these devices can be very simple mechanically, they generally require a large amount of energy to build.

The skills for building traps define how much time it takes to create a trap but some techniques can be used to accelerate the process. By including explosives or already available mechanical devices into the construction of a trap, an engineer can greatly accelerate the construction of a trap.

Explosives

By using explosives in a trap, use the normal process for trap damage and then roll for the character's Explosives skill. Multiply the damage by the point blank damage that would be done by the explosives themselves.

Example: Andre is preparing a trap that he will use some of his available explosives in. He works for two hours on the trap. The first hour he gets his Full giving the trap a damage of 1. The next hour he rolls his Half which adds 2 to the damage for a total of 3 points. Now he adds a small amount of C-4 explosives to the trap that would normally do 20 points of damage at point blank. Andre passes his Explosives skill roll. 3x20=60 So the trap damage is now 60.

Spare Parts

Using mechanical devices that are already available such as vehicle components or Hosent parts can greatly accelerate the process of building a trap. The character collects the parts by making repair machinery rolls and notes how many fractional successes are made. Each roll requires one manhour of skilled effort. Any vehicles that have their parts used suffer the effect of a critical hit with the exception of explosions or crew damage.

Now the character rolls for their trap construction skill and follows the normal process for building a trap.

The fractional successes from collecting parts are now multiplied by the successes from building the trap. The result is either the damage of the trap or the number of turns that it ensnares for.

Example: Andre is going to use one of the damaged trucks to take parts from. He rolls four times and gets six fractional successes. Getting the parts has taken four hours. He now spends three hours working on a trap and gets two fractional successes. 6x2=12 The trap now does 12 points of damage.

Shock Value

In addition to doing damage, there is often a shock value to traps. Mental stress can be inflicted, not just on the victim of the trap, but also to those that observe the trap's action.

Some of a trap's damage can be converted to Mental stress. For every point of damage converted, the trap inflicts 3 points of Mental stress to ten allied forces.

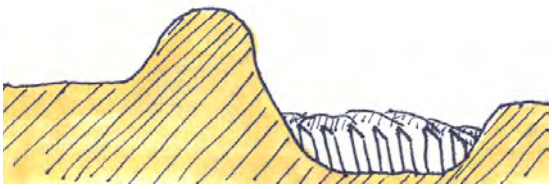
After the stress in applied, infantry squads must make a Psyche roll or panic.

Trap Concepts

The following are examples of the kinds of traps that an engineer might build. This information is simply for ideas on what form the traps involved might take. Use the rules for traps given in the Skills section under Construction Mantrap and Construction vehicle trap of The Artifact RPG and the optional rules given above.

Mechanical Force

Nearly all traps use some manner of mechanical force to work, this can be obtained in any number of ways but the most common are below. Notable exceptions to this would be traps that use explosives or energy weapons as the damage inflicting components.



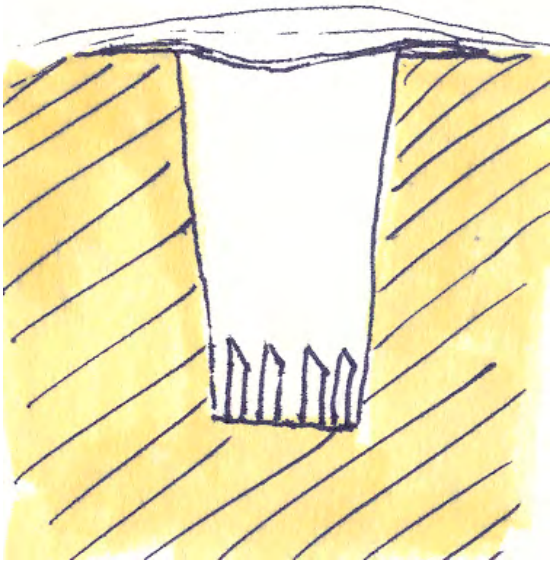
Weight

Either the weight of the target itself can be used to do damage or another heavy object can be used to do damage by falling. This falling energy can be used to generate motion, through simple machines like pulleys or levers and drive other components of the trap or they can be used to do damage directly.

Using the weight of the target is usually good for a trap that resets itself, using an external weight is usually only good for single use traps. This kind of trap can be very useful for vehicles as the forces they generate

are usually very large, but tend to become jammed in a trap when disabled by them usually rendering the trap inert. These are most often the simplest traps to implement.

Using large external weights can have a large psychological impact if the damage done is particularly severe. Therefore only a few devices may be able to turn a force away if more traps are anticipated. These traps can be very simple mechanically.



Damage from falling objects is complicated and is based on both the mass and the height the object is falling from. Increasing either variable (mass or height) will increase the damage done.

The table below shows the relationship between height, the time it takes an object to fall, and the speed of the falling object. The speeds shown are approximations.

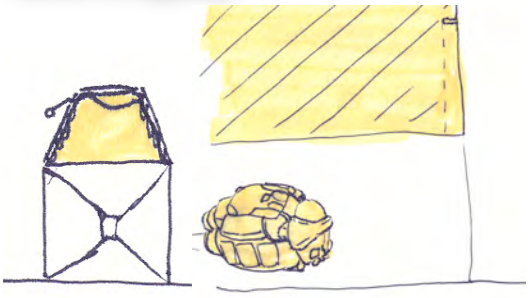
While damage is calculated as normal according to the trap skill rolls, the following information can be used to get an idea of what kind of distances are involved in the trap's action. By multiplying the mass in Kg of the falling object by the speed and then divide by 500 and round up to the nearest whole number, the player can get an idea of the speeds and distances involved. This applies to items dropped on a target and if the target falls.

Meters to Fall	Fall Time in Seconds	Speed Km/h
<5	<1	35
5-20	1-2	70
21-50	2-3	115
51-75	3-4	140
76-125	4-5	180
126-175	5-6	210

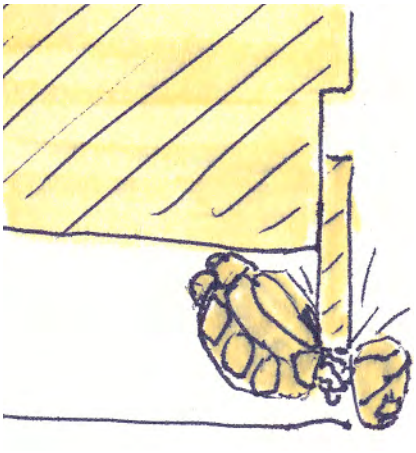
Spikes

Spikes may be added to the bottom of a pit or on the striking side of a falling weight to increase the damage of a fall significantly.

Block Dropping



Block Dropping is a Scimrahn technique where a large block of CCC is cut out over a door and then sheared off when an enemy is passing through. This traditionally took great skill to time correctly so that it struck the target, but with the addition of explosive charges to this attack, the timing can be done with a fair amount of accuracy. This technique is most often used against Chezbah Demolishers but works with any target. This is an example of a trap that uses explosive charges to increase the damage to a vehicle.

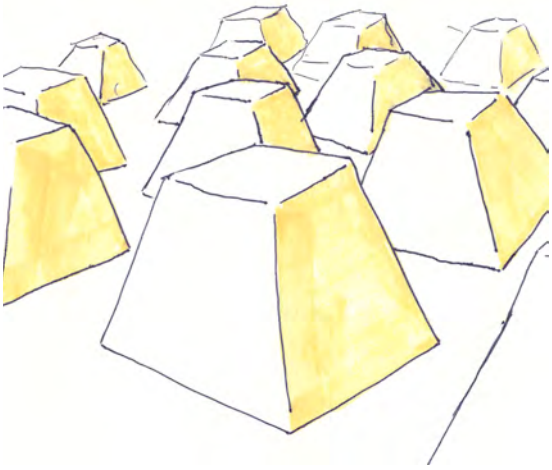


If a large Hex doorway is used then the block will be falling in the door for 76-125 meter fall. This means the block would be traveling at approximately 180 k/ph. To destroy a Demolisher it would take a damage of approximately 5000 hp. This would require a block with a mass of 13889 Kg. (180 k/ph x 13,889 Kg / 500 = 5000 HP)

Vehicle Impact Traps

This same rule applies to using a vehicle's own momentum to damage it. The mass multiplied by velocity of the vehicle divided by 500 can be inflicted by a properly engineered trap. When the trap is struck by a vehicle the trap takes damage equal to the damage inflicted on the vehicle once the trap is destroyed it can do no more damage.

Example: A trap consisting of a palisade of spikes has an armor rating of 40 and 10 Hit Points can only do a maximum of 50 damage before it is destroyed. Traps using this method are usually very simple and may be intentionally obvious. Examples include the Czech Hedgehog and Tiger Teeth antitank traps.



E-Suit Leg Snares

E-suits have a very high degree of maneuverability and can usually fly over obstacles that would block other vehicles. Leg snares consist of small traps that do relatively little damage (40-90 hp) but each one has the potential to do a critical hit and each stands a small chance of disabling a leg of the E-suit. Leg snares are vehicle impact traps, however the leg snares can also be designed to snag the E-suit's legs if time is taken to build them to snare the vehicle in addition to doing damage.

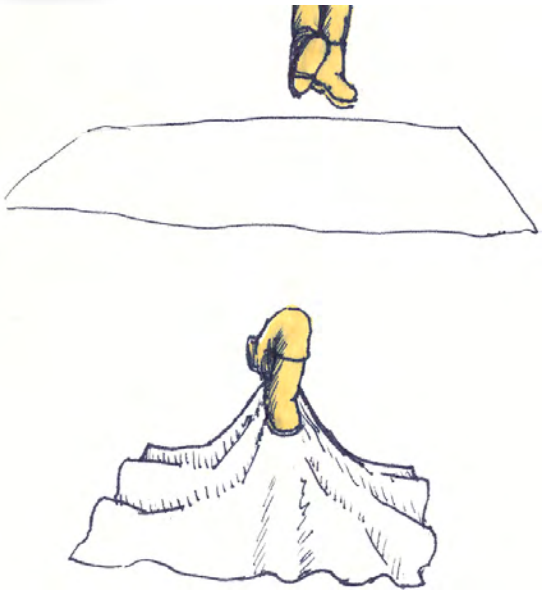
Springs

A spring is a way of storing mechanical force. A large number of traps for catching animals use springs to deliver energy. However with a few exceptions springs do not do well in storing large amounts of energy and therefore are usually only useful for man sized targets. Thin strips of CCC are flexible enough to anchor on one end and then bend acting as a spring.

With very few exceptions, spring based traps are single action traps.

Springs made from CCC can inflict a maximum 12 points of damage per spring, but using multiple springs makes them harder to build.

Snares



A snare is any kind of trap that holds onto its target. This can be accomplished by entanglement, mechanical constriction, adhesives or mechanical vice. The snare must either be durable, threaten harm if disturbed or have a great deal of redundancy to be effective.

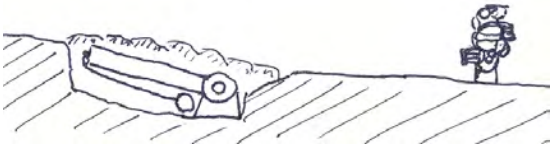
Entangling Snare traps usually use the targets own weight and a large redundant number of thin strands to slow enemy movement and possibly inflict damage. Examples of this type of trap are nets, barbed wire and concertina wire. Adhesive traps that stick to any body part it touched on a target is a variant of a net with an added adhesive.

The function of a snare is highly dependent on the materials used to build them but tend towards being complex to construct.

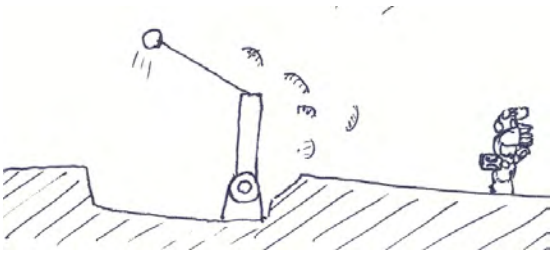
Heavy Glue

This is a method of slowing or disabling both ground forces and flying vehicles. It can be used in conjunction with other materials. Heavy Glue is a material that is made from mixing a thick black reactant agent with water. The Foam is filled with water and is therefore very heavy when applied in a thick coat and will slow ground movement and can ground flying vehicles. The reactant agent is a foaming fast drying glue that sets to a gel quickly when in contact with air. The Glue is pumped at high pressure out of nozzles or can fill a depression to a depth of several cm to meters deep.

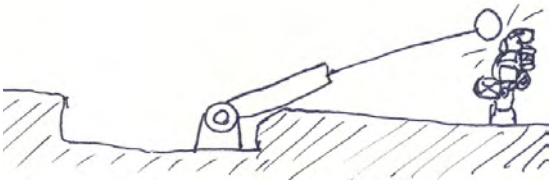
Powered



Using powered equipment can deliver very high forces and are usually able to be used more than once. This can be from hydraulic, pneumatic, electrical, combustion, heat, steam, plasma or chemically powered (explosive) and convert this energy either directly to damage or translate the energy to mechanical force.



Scimrahn tend to use electric motors in their traps either to spring them or more often, to retract them. The electric power may be supplied from hex power, but will almost always be backed up by a battery that can last through several actions.



See the section of this book on power generation for information on supplying power to the trap.

For every power point used by the trap, multiply the fractional successes the character gets by 10. This can be used for damage, ensnarement or shock effects.

Planted Weapons

Weapons that self trigger are common on the battlefield. The most recognizable example of this is land mines. However the weapon that natives of the Artifact are used to is the laser, setting up a lane of fire for a disguised weapon to fire once something moves into it's path.

These are traps that make use of pre-made devices. They do not require the ingenuity and crafting of the other traps mentioned so far. They simply need to be put in place and activated.

Explosives

Explosives are the most common type of non-mechanical boobytrap. They can be tripped in any number of ways and can strike multiple targets with one device of low complexity. Explosive traps are single use traps.

Setting Explosives usually takes only a single turn per detonator and bomb pair.

Lasers

Lasers turned to extremely low power can be bounced back with a mirror to a detector near the laser itself. When the beam is broken, the laser increases the power and does damage. If the mirror is destroyed the laser fires until it has exhausted it's power supply.

Rigging a laser gun in this manner takes one manhour and an Electronics Repair skill roll.

Plasma Spray

A plasma clip can be rigged to release it's entire payload of plasma, this modification it is as effective as explosive traps. The clip is destroyed when used in this way.

The plasma release does the following damage per clip.

	PB	S	Med	L	Ex
Damage	15	5	2	1	1

Blast Range Class: A

Rigging a plasma clip in this manner takes one manhour and an Electronics Repair skill roll.

Magnetic Mines

The use of magnetic mines greatly increases the effectiveness of friendly fire on the enemy. Tanks have great range that keeps them outside of the radius of the mines. Footsoldiers can more effectively assault vehicular targets even while within the effect of the mines. It is recommended that while possible use magnetic mines when fighting in unshielded vehicles.

Burying a Magnetic Mine takes two manhours and if it is to remain hidden, a camouflage skill roll is required.

Hazardous Ordinance Disposal

The Engineer has the responsibility to detonate any unexploded ordinance and disposal of enemy stockpiles that are hazardous such as plasma devices and fuel.

This is especially important when there is not enough time to remove the equipment from the site.

There are instances where it may be important to keep an enemy's fighting capabilities intact if the collapse of a local power is holding back another.

The commanding officer has the responsibility to identify if enemy ordinance should be destroyed or if it should remain.

Plasma Weapons

Plasma weapons require caution when being disposed of because sudden release of plasma is hazardous and all personnel should maintain a proper distance (minimum 10m) during demolition.

Large plasma discharges exhibit powerful electromagnetic pulses that can damage electronics (5% chance of damage to unshielded electronics in 300m).

Furthermore, electrical charge stored in plasma can travel long distances before finding a ground point (5% chance of electrical damage to one target in 300m). This can make destroying plasma stocks unpredictable.

Destruction of plasma storage systems can be used in a cascade to destroy other hazardous stocks.

Fuel Stores

Due to the explosive nature of LCF, destroying stockpiles of the fuel is extremely dangerous. The blast radius is usually much larger than plasma (30-200 meters). Safely destroying these stocks requires an Explosives Disposal Skill roll.

In some operations, burning or detonating fuel stocks will draw unwanted attention. In these situations, fuel may be degraded by adding an acid or powerful detergent to the fuel, breaking it down and may damage vehicles that attempt to use it.

To degrade fuel stocks, an Acids skill roll or a Chemistry skill roll will determine the proper solution to degrading the fuel.

Laser Weapons

Although most lasers are electron excitement lasers, some Kelrath emplacement lasers are chemical lasers and can contain hazardous chemicals that must be taken into consideration during demolition so as not to put friendly forces in harm's way.

To further complicate this, many larger laser systems use chemical coolants that may be mistaken as those found in a chemical laser. Even these coolants can be hazardous if not handled properly but are not as hazardous as the media in a chemical laser.

An Electronics Engineering roll can determine the nature of the Laser or any chemicals present can be identified by a Chemistry Skill roll.

Batteries

Like lasers Batteries can contain caustic materials, these are sometimes used by Kelrath and Scimrahn but almost never by Chezbah. Any chemicals present can be identified by a Chemistry Skill roll. The batteries containing hazardous chemicals are usually used in vehicles and some generators. It is rare that they are stockpiled in any significant quantities to pose a large demolition hazard. Chezbah use lithium ion batteries that pose no significant health hazard to troops disposing of them.

Chemical or Biological Weapons

Chemical and biological weapons may be disposed of by means of incineration. This is often done with napalm, LCF, alcohol, or petroleum fuels. Alkali or oxidants can be alternatively be used to break down the chemical or biological agents. These may not negate the toxicity of a chemical agent but often reduce the toxicity.

Examples of Alkali that can be used is sodium hydroxide, potassium hydroxide, or calcium carbonate. Oxidizers such as nitric acid are also effective, successfully neutralizing biochem weapons with acids requires an acid skill roll.

It is advisable to keep all personnel upwind and as far as possible from any disposal site. This is especially true if biochem weapons are being incinerated.

In emergency situations, plasma weapons can be effective in reducing the hazard of biochem before they are deployed. Because most plasma weapons deliver a single point of heat, it is still possible that some of the biochem agent may escape before being broken down. Because of this, plasma weapons should only be used at a safe distance from a weapon discharge.

Nanotech Weapons

Nanotech weapons have never been reported to be used directly against earth forces so there are no proven methods for disabling or countering this type of attack. However, from examinations of other Chezbah nanotech, Plasma and very strong oxidizers (strong acids) can damage the molecular structures and most likely will render them inert.

Kelrath reports indicate that plasma will either damage the nanotech, or make it enter a dormant phase. The fact that these reports only report a partial reduction in effectiveness is troubling. It may be that the Nanotech weapon used by the Chezbah replicates and if any is left it will grow back to cover an area.

Defense

Maximizing survivability of troops is one of the oldest roles for a military engineer. By building fortifications and controlling the available paths to those structures, the engineer can hold off an enemy much longer than would otherwise be possible.

Elevation

Elevation is an important advantage to any force, it allows increased line of sight and impedes the enemy's ground movement. In most cases the manufactured environment underground provides very little opportunity for this but earth mounds and tunnels into walls can provide elevation advantage.

Grade

Grade is the slope of a surface. In terms of defensive structures, Grade is usually used slow enemy approach by making enemy forces move up hill. This is usually accomplished with bermed earth. Another use for a grade is to deflect fire and make penetration resistant walls.

While moving up a grade the percent of the grade equals the Impairment to movement rolls.

When Earth is used to reinforce a wall, the Hit Points of the dirt is added to the wall. This is 10 HP for every 10 cm of Earth that is built up over the wall.

Some damaged hexes may have a grade to them but if the character is trying to create a grade as a defense, a berm is the most likely candidate for slowing enemy advancement with a grade. See: Earthworks - Berms

Water Barriers

Water flooding a basin can be an effective impediment to movement. For standing water, movement or piloting Impairment is equal to 3% x cm of water.

Characters must make a Constitution roll or take one Physical stress each turn they move through standing water. Infantry take one point of stress if the impairment value is rolled under.

Flowing water is a even greater impediment to movement. The readiest source of water is a reservoir hex which can hold 130 cubic Kilometers of water weighing 130 million tons. While not always full, blasting a hole in the reservoir liner can release a flood equal to most of the Earth's major river systems.

In the doorways of each reservoir hex is a fountain for drawing water. Modifying the fountain or damaging it can cause it's water to flow out into the doorway (Repair Machinery roll or 200 HP). After several hours (2d6) the water will flood the hex next to it.

The wastewater system in the Agri Hexes will drain the water away unless they are covered over or plugged. The more drains that are plugged, the further out into the hex the water can flow. The process of flooding a whole hex takes days even with multiple fountains opened.

Digging out soil from in between the roads in an Agri hex makes it possible to make deeper pools of standing water. Letting the water soak into the soil for several days turns them into mud pits. For each day of flooding there is a 10% impairment for movement or piloting rolls while moving over land.

While not always full, blasting a hole in the reservoir liner can release a flood equal to most of the Earth's major river systems.

Cracking open a reservoir liner is not an easy task, but it can be done. This is a Tech Challenge with 3d10 CP to find a fissure in the liner that can be expanded with explosives. Once found the fissure will require a charge able to do 3D6 x 10,000 points of damage to rupture the Reservoir.

When this is done, the water is expelled with enormous force. The water will drain in 1d6 hours into the surrounding hexes. Consider the water flowing out like as an area effect centered on the mouth of the hex doorway. Damage is for each turn an object is in the flow.

Rushing Water Damage

	PB	S	Med	L	Ex
Damage	300	150	75	50	20
Strength	3200	1600	800	400	200

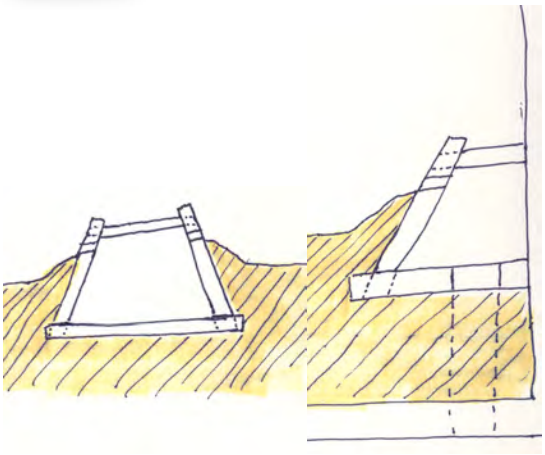
Blast Range Class: C

Channeling Enemy Approach

Controlling enemy movement is an important strategy for conserving resources. It allows the most effective use of mines and traps and greatly improves the defensive ability of small force.

Channeling forces can be done through a wide variety of methods. Earthworks can also be used to control enemy movement. Hex doorways can be used to channel an enemy force. Pools of water are often avoided by foot forces.

Bunkers



Bunkers are defensive structures that are mostly below ground. They can be part of a trench system and provide extra cover from aerial attacks.

Forward bunkers are usually used as a machine gun or mortar emplacement. Rear position bunkers are used for command posts, storage and as field hospitals.

While Hex tunnels can be used for a bunker with two ends plugged by pouring soil into them, this makes it difficult to monitor for approaching enemies since there is little opportunity to observe the bunker from an external location such as a scout post. Smaller bunkers can be constructed with slabs of CCC to form the floor, walls and a thick slab for the roof and then partially burying the structure.

Follow the rules for building a bunker under the skill Construction Bunker. One day of work and heavy equipment or large amounts of manpower is required to build the bunker for each CP of the challenge. Defined in terms of manhours of work, each CP of the bunker construction challenge requires 40 Manhours of work.

Earthworks

Earthworks are any structure formed from massive quantities of soil or unformed stone (alternatively CCC rubble).

On an alien world the use of this term may be questionable (there is no "Earth" in the work) but there is little need to coin a new word.

Modern defensive earthworks are primarily trenches and berms. While soil is not particularly strong, in large quantities it can form a significant barrier to enemy attacks.

Vehicles such as a bulldozer or C-Suit for moving soil greatly reduce the time it takes to create these simple structures, but in the history of military engineering the majority of this work fell to the foot soldier and in the absence of earth moving equipment, this method should not be forgotten.

There are two factors in moving soil. One is the volume of soil in cubic meters, the other is the distance that the soil is to be moved to its new location. It takes one Manhour to move one cubic meter of soil one meter using only shovels.

Trench

A trench is an excavation that creates a condition of hard cover for friendly troops along a line. A trench has an advantage over a berm in that it is very difficult to penetrate the barrier between enemy fire and friendly forces. However there is no elevation advantage to such a structure.

All objects in a trench are under hard cover (60% Impairment to hit).

It takes 3 manhours of unskilled labor for every meter of trench.

Caponier

A caponier is a structure such as a bunker built into a trench system that is designed to fire down the trench. Usually the trench is built so that it is relatively easy to advance into, but more difficult to exit. Lasers are particularly useful in this role because when the caponier is camouflaged the weapon may be difficult to notice.

Planning out a caponier is a tech challenge with 2d6 CP.

Moat

Trenches can be flooded to turn it into a moat. In medieval times the moat would be filled with sewage to deter anyone swimming across. Petroleum fuel can be poured into a moat and then set on fire to deter anyone from crossing.

It takes 7 manhours of unskilled labor for every meter of moat.

Berm

Berms are mounds of earth that form a barrier. These are often employed to direct or restrict the movement of enemy troops and provide cover.

Berms can be reinforced with slabs of CCC.

A berm is not an impenetrable barrier. It serves two purposes, to provide

cover for troops and slowing enemy movement.

A berm must be sufficiently steep that it is difficult for footsoldiers and land vehicles to drive over it to do so it must have an incline of over thirty degrees (30) and be at least 1 meter high. Pilots driving their land vehicles over the berm must make a piloting roll with a 20% impairment for every meter in hight over 1.3 meters. If the roll is failed they cannot get over the berm that turn.

Soldiers on foot have a 20% Impairment to movement rolls for every meter of berm hight. A Constitution roll must be passed or characters take one Physical stress point per meter of berm hight.

Infantry take one point of stress per meter of berm hight if the Impairment value is rolled under.

The following table give the time it takes to make a berm one meter long and how many Hit Points that berm has.

Soil by itself has no armor rating.

For values other than these, see the appendix Berm Calculations.

Berm Hight	Manhours per meter	HP per meter
1 meter	3	500
2 meters	9	1,500
3 meters	27	4,500
4 meter	81	13,500

For example a berm 2 meters high and 80 meters long takes 720 manhours to build. Earthmoving equipment in this book have a rating in manhours that can be used in building a berm.

Foxholes

A foxhole is a defensive position that can be quickly constructed. The term refers to a range of structures from a mildly protective lean-to to a system of tunnels and structures that are part of the firing line. This can be any structure or hole that a soldier can take cover in.

A foxhole takes one manhour to construct and provides soft cover (40% Impairment to hit). Working another two manhours gives hard cover (60% Impairment to hit). Foxholes also allow the character to use the Hide skill while in the hole.

Turret Down and Hull Down

These positions provide either soft or hard cover to vehicles. Hull down means that the vehicle can fire from its position behind cover giving soft cover (40% Impairment to hit), while Turret down means view of the vehicle is completely obstructed (60% Impairment to hit).

Casemates and Lookouts

A casemate is an armored gun position. On The Artifact this usually refers to a heavy or grenade machine gun position burrowed into a wall of a hex. Grenade machine guns can also be used from overhead air or water access tubes, but takes skill to hit a target (80% Impairment to hit). Suppressive fire can be maintained only if enemy movement is accurately reported by a Comm Officer using Triangulation or a Scout using a laser marker.

Demolition

Demolition of old structures and removal of enemy structures is the responsibility of the Engineer.

Most CCC structures are simple in their construction, using slabs to form the walls floor and ceiling. Only very large military buildings over three stories tall are frequently built of more than one slab per wall. These structures are very durable from the outside and can withstand an enormous amount of plasma and laser fire but do less well against explosive bombardment if they are not reinforced or hardened against such attacks.

Demolition of old CCC structures is different from demolishing concrete and steel, but small kicker charges positioned to push out the walls of a structure from the inside will usually flatten the structure. Demolition of hardened CCC structures is a difficult process that has yet to be fully perfected by Earth forces.

Cutting Charges

Most explosive charges give a “kick” when they explode. These are useful in flinging materials away or out of a structure. However some structures that are reinforced are tied together so that these kicker charges do not dislodge structural members. More explosives may eventually dislodge them but cutting the material that is tying the structural members together is preferable.

In some cases this can be done with bolt cutters or even particle beam cutters but this may cause a structure to fail with people inside.

In most cases it is better to cut them with fast burning explosives. These cutting explosives have a very small and hot blast which cuts reinforcing ties and then using kicker charges a split second later can quickly topple most structures.

Cutting charges are usually in the form of cord that can be wrapped around the object to be cut.

When a cutting charge is used, roll for the Structural Recognition skill. Each fractional success doubles the damage of the cutting charge.

A successful Explosives skill roll is then required to set the cutting charge and then another Explosives skill roll is required for the kicker charge.

Local Sources

Explosives may not be readily available in needed quantities because of supply chain issues. In these situations the Engineer should try and supplement their supply with locally available materials. The main source of which is LCF fuel which may be stored near vehicles.

If LCF is not available and time permits, manufacture of explosives may be possible with locally available materials. These will most likely be low grade but can still be effective.

Material Gathering

A chemistry roll is required to formulate and manufacture an explosive mixture from available material. For each fractional success the mixture does 3 points of damage for every manhour of collecting materials.

For example: To gather materials for 300 points worth of explosives a character rolls for their chemistry skill. They roll under their full column. The base time for gathering materials for explosives doing 300 points of damage is 100 hours (300/3=100). An explosives skill roll is required to package the explosive for use.

This work can be done by unskilled labor as long as the laborers are shown what to look for.

Shaped Charges

Some explosives can be shaped into a cone or wrapped around a copper core with one exposed side to concentrate more blast energy in one direction. This can also be

accomplished by piling sandbags or dirt on the charge and one side being open to the target.

Shaping an explosive increases the damage in one direction by 25% and reduces the blast range class in other directions by one letter. For example, B becomes A. If the range class is A already, the explosive is channeled in one direction.

Maintenance

Vehicles require regular maintenance or they suffer from decreased performance and given enough time, can suffer catastrophic failure. In addition vehicles that are damaged in battle require repair.

For general information on vehicle repair, see the end of the Vehicles section of The Artifact RPG page 264.

To repair the basic function or maintain a vehicle a Tech Challenge be overcome. When making the repair, the player declares how long each roll will take. Making rolls very quickly increases the hazard of some transforms.

An assistant can cut the time that it takes to effect repairs by rolling against the tech challenge themselves or can improve the safety of the repair using the helping rules on page 82.

Individual systems can be repaired by separate crews at the same time. Each task becomes a separate tech challenge.

Field Repairs

When in the field with no supply chain, spare parts are not always available. Every effort should be made to scavenge parts from disabled vehicles so there will be parts when needed. Tanks that have had their weapons damaged make good platforms for carrying large pieces of equipment once their turret and weapons are removed.

Even when taking these precautions it is possible to run out of vital parts. In some cases the loss of a vehicle can mean that a mission will be failed or loss of life unless the vehicle is fixed immediately.

When the repair of a vehicle is vital and time is restricted, the player may opt to rig the vehicle in a field repair. The CP reduced by each roll is doubled but the vehicle will only run for a short period of time.

A second Tech Challenge is generated to find out how long the vehicle will run on the field repairs. The GM rolls 1d6 to find the CP of this challenge but does not reveal the number. The mechanic can then ignore this tech challenge or work to overcome it.

The number of CP left over subtracts from the fractional successes of any piloting rolls made for this vehicle. If a piloting roll is failed, the vehicle reverts to it's condition before it was repaired. One piloting roll is required at the beginning of every hour.

Field Enhancements

In some circumstances it may be necessary to disable safety limits on vehicles and equipment to get temporary boosts in performance. This will often do damage to the vehicle or equipment and the gains may be meager.

Follow the rules for modifications as given in The Artifact RPG. In a field enhancement CP reduced by each roll is doubled but the enhancement will only function for a short period before it causes problems.

A second Tech Challenge is generated to find out how long the enhancement will keep working. The GM rolls 1d6 to find the CP of this challenge but does not reveal the number. The mechanic can then ignore this tech challenge or work to overcome it.

The number of CP left over subtracts from the fractional successes of skill rolls to use the enhanced system. Each enhancement type below lists the skill that must be rolled under. If a roll is failed, roll on the system failure chart under the enhancement. One roll is required at the beginning of every hour the vehicle runs.

Speed

Whenever the pilot fails their Pilot skill, roll on the system failure chart. In addition, at the beginning of each hour the vehicle is running, a piloting skill roll must be made.

Speed system failure chart

Roll 1d100	
1-20	No Failure
21-40	Engine damage, speed cut in half
41-60	Drive system damage, speed cut in half
61-80	Engine failure, vehicle immobile
81-100	Drive system failure, vehicle immobile

Shields

Whenever the pilot fails their Pilot skill, roll on the system failure chart. In addition, at the beginning of each hour the vehicle is running, a piloting skill roll must be made.

Shield system failure chart

Roll 1d100	
1-20	No Failure
21-40	Shield damage, one generator output half original.
41-100	Shield damage, all generator output half original.
61-80	Shield damage, single generator failure
81-100	Shield damage, all generators fail, no shields

Weapons

Whenever the pilot fails a their Artillery Operation skill, roll on the system failure chart.

Weapon system failure chart

Roll 1d100	
1-10	No Failure
11-30	Weapon fails to fire 1 time
31-60	Weapon failure, no longer fires
61-80	Small explosion, 10% of PB weapon damage to everything within 10 meters
81-100	Large explosion equal to damage of the weapon range class A

ECMs

Whenever the pilot fails a their ECM skill, roll on the system failure chart.

ECM system failure chart

Roll 1d100	
1-10	No Failure
11-30	ECM fails to initialize this turn
31-60	ECM failure, no longer operational
61-80	ECM failure, surge in vehicle's systems causes 1 critical hit on front fire arc.
81-100	ECM failure, surge in vehicle's systems causes 1d6 critical hits on front fire arc.

ECCMs

Whenever the pilot fails a their ECCM skill, roll on the system failure chart.

ECCM system failure chart

Roll 1d100	
1-10	No Failure
11-30	ECCM fails to initialize this turn
31-60	ECCM failure, no longer operational
61-80	ECCM failure, system glitch. Vehicle gains 30% Impairment to pilot
81-100	ECCM failure, system glitch. Vehicle gains 60% Impairment to pilot

Armor

Whenever the pilot fails their Pilot skill, roll on the system failure chart. In addition, at the beginning of each hour the vehicle is running, a piloting skill roll must be made.

Armor system failure chart

Roll 1d100	
1-20	No Failure
21-40	Panels fall off -10 AR to vehicle
41-60	Armor causes drive system damage, speed cut in half
61-80	Electrical short, surge in vehicle's systems causes 1 critical hit on front fire arc.
81-100	Electrical short, surge in vehicle's systems causes 1d6 critical hits on front fire arc.

Building

When taking up a building project there are two basic considerations, materials that are available and the time it takes to use those materials. Materials are collected from various local sources and then are assembled into a finished product, either by hand or by Hosent manufacturing.

The tools used to build are available by employing active Hosent or disassembling Hosent.

The Manufacturing Process

On The Artifact, manufacturing is not something that only large organizations can do. Hosent lay idle everywhere and these enable anyone to obtain raw materials and build nearly anything they desire in a matter of days or even hours. The astounding thing is, that in such abundance is that few have the engineering skills necessary to design complex systems. In a Scimrahn industry tribe, there are only handfuls that understand the design of the equipment they manufacture.

Hosent build primarily by using powdered CCC and reconstituting it. At first the CCC must be broken down by hand and then one or more Hosent will be employed to build grinding machines and crushers to pulverize blocks of CCC.

This pulverized CCC is called “Meagieken” loosely translated as “stone for making”. A second stage of sifting the carbon from the ceramic is then done by the Hosent and an electron pump breaks down the carbon nanotubes into slurry. From this slurry, the Hosent has three arms that have piezo nozzles that spray layers of ceramic until a form or mold is formed for the base of the desired part. Then layer after layer of carbon and ceramic is laid down by the piezo nozzles in a method similar to a 3D printer. Once the basic form is laid down, the ceramic mold is broken down again and the material re-used.

In a similar manner, electronic circuit boards are sprayed in place. Thin metal wiring and films are also sprayed in place, but for larger metal parts, the Hosent builds a mold and then uses an arc furnace to melt the metal into the mold.

While most parts or tools can be made out of CCC, a small amount of metal is required to build electronic components. This metal can be difficult to acquire unless it is scavenged. Any device that requires large amounts of metal will require a far more effort and resources as the prime sources of metal is the methane wastes or the core. Small quantities of heavy metals and rare elements can be found in the Filtration Hexes from millennia of extracting them from air and water.

The three elements of building on The Artifact are manpower to get materials to the Hosent, Time for the Hosent to build, and engineering skill to design.

Materials

The biggest perceived limits to construction on The Artifact, is replacing familiar materials with native materials. It’s difficult for Earthers to design without the materials they’ve become accustomed to and replace them with ones that are locally abundant.

The major construction materials are listed below.

Cement

Cement is a manufactured material made from calcium, silicon, aluminum and iron. On earth the calcium is derived from crushed limestone, which is not readily available on The Artifact except at the core, which is difficult to get to. However there are ways of extracting calcium from soil, but this requires processing a large quantity of earth or extracting it from water which usually does not produce significant amounts. Another possibility is locating an emptied reservoir, which can have several inches of mineral build

up in the bottom of the hex resulting in hundreds of tons of calcium.

Cement is produced in limited quantities by earth forces in hidden locations for use by engineers. It is most often used as mortar for cementing rubble together to build structures.

In some instances the engineer may be asked to set up a cement producing facility. This is an enormous undertaking and requires a large investment of manpower. The process for doing so is roughly as follows.

1. A quantity of raw materials must be secured either by trade or by locating local sources. It is usually best to locate local sources as there is a significant overhead to transporting materials over long distances. Portland cement ingredients are as follows. The most problematic of which is aluminum which is not readily available through Scimrahn channels and is therefore used in the lowest workable percentage.

60% to 67% Calcium

17% to 25% Silicon (from soil)

3% to 8% Aluminum

up to 6% Iron

This means, to produce 1,000 kilograms of concrete mortar (of which cement is only 12%) 120 kilograms of cement is needed. However 40% percent of the raw materials are lost in producing the cement. This means that to make 120 kilograms of cement, 200 kilograms of raw material are needed.

2. A fuel must be secured for heating the Kiln. Plasma from a conduit is often the best option, but methane, or hydrogen and oxygen using electrolysis with the electricity supplied from a Power Hex are also feasible but require more infrastructure.

3. A barrel type, rotating kiln must be constructed and mounted on a slant. In some cases, a plasma conduit is the ideal housing for this. The CCC in the Plasma conduit has a melting temperature of 3300°C degrees and the Kiln only needs to reach 1500°C so no further refractory is needed.

4. The raw materials are ground up. The grinding mechanism can be of any type, but Hosent grinders like those used for grinding CCC are acceptable. Instruction on how these are constructed is best learned from a Scimrahn industry tribe or from another engineer that has established such an operation before. Otherwise using CCC to build a wheel and table mill is the best alternative.

5. Raw materials are introduced to the kiln, their passage through the Kiln is controlled by the rotation and slope of the kiln. The material that exits the lower end of the kiln (called clinker) must be slowly cooled to a temperature that will allow it to be ground again to a fine powder. If Gypsum is available from a local source, this can be ground in at 2% of mass with the cement to enhance workability.

Mud Brick

As an alternative to concrete construction, mud brick can be used to build structures but has poor resistance to explosives and impact.

Adding sloped earth can increase the explosive resistance of these structures. This is not often a serious consideration when defending against Plasma and Laser attacks but E-Suits can do significant damage by punching the structure.

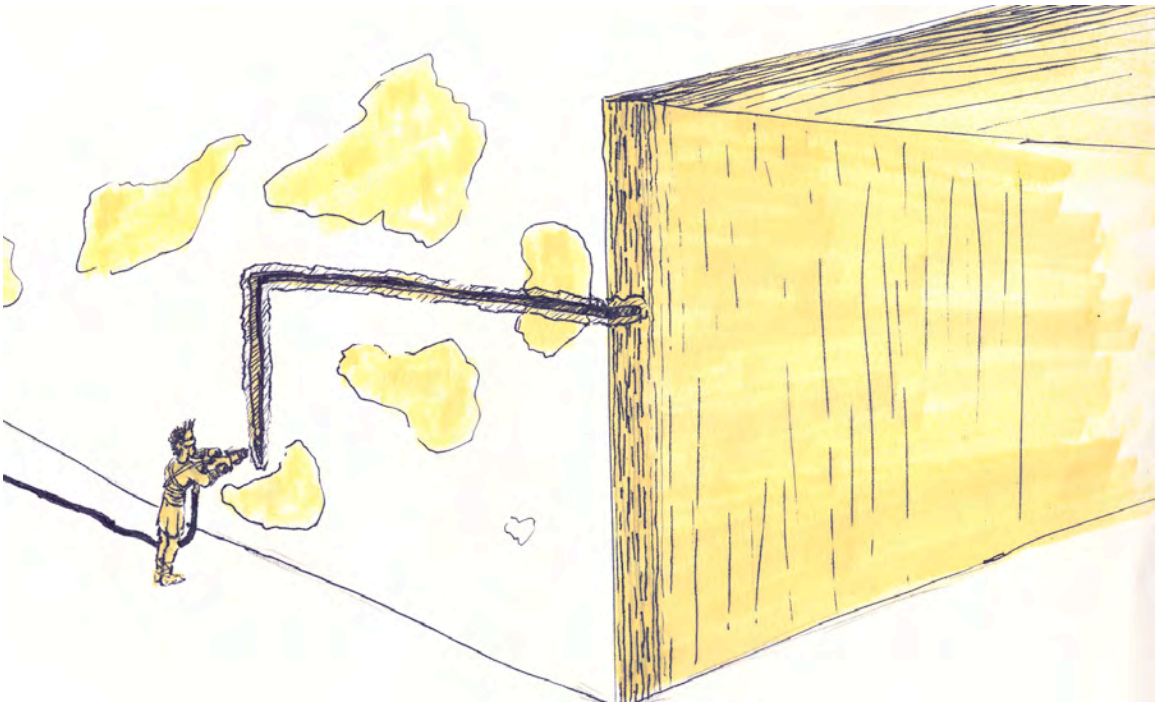
The roof of a structure cannot easily be made from mud brick and will not withstand vehicular impact attacks such as E-Suit punches. Some kind of mortar is needed to hold the bricks together.

CCC

Carbon Ceramic Composite is a difficult material to get used to working with. It does have a number of traits that make it a useful structural material but because it has a grain to it and is very hard. It can also behave in unexpected ways making many engineers reluctant to use it. In addition it has electrical properties that can have detrimental effects to radio and radar if these effects are not anticipated and designed around.

All this said, It is the most plentiful structural material on The Artifact, followed by the Carbon Foam in the structural members. Bunkers are easily made from Slabs

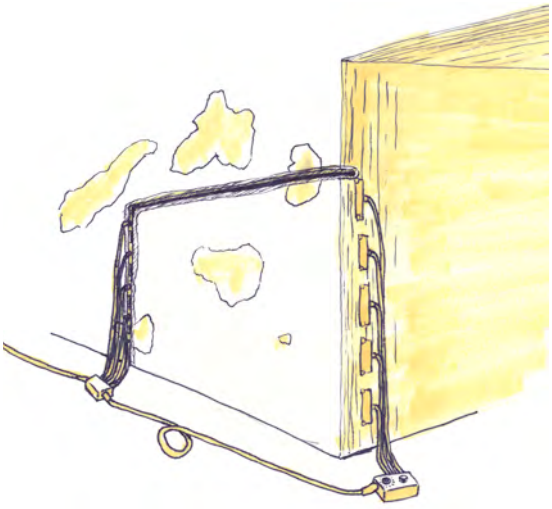
sheared from the walls of a hex which is the most common method of harvesting CCC. The process is as follows.



1. A particle cutter is used to etch a groove several inches deep into a hex wall in the desired dimensions of the slab. The cutting is unskilled labor and takes 1 manhour for every 6 meters of cut 1 cm thick or 1 meters of cut for 6 cm deep.

2. If the CCC is to be used directly in bunker construction, the Slab is braced so that it will not fall to the ground once removed. This is to prevent accidental cracking. If it is to be broken up and re used for manufacturing, this step is not required.

3. The Slab is then sheered from the hex wall. Several methods are effective in doing this quickly. The Scimrahn and Kelrath use a device that pulses electrical current through a layer of carbon thereby heating it. It then cools and the process is repeated. The cycle causes the ceramic layer to loose strength and the slab sheers off. This process takes 30 seconds to an hour dependent on the size of the slab (30 sec per square meter 1020 square meters max). Earth forces have introduced drilling small holes behind the slab and using a string of small explosive charges to quickly remove the slab (this requires an explosives skill roll).



Cloth

Cloth is useful for tarps and light structures. While not a structural material, it can provide protection from the weather and can be useful in building non-essential structures and camouflage. Cloth can be labor intensive to produce and the skill required to turn a plant like Giant Fern into fabric is non-trivial so it is advisable that cloth is obtained

from Scimrahn supplies (this would be the responsibility of a purchasing officer or the commanding officer).

Dirt

Dirt is readily available in Agricultural Hexes and although is sometimes not ideal as a primary building material.

A bulldozer or other earth moving equipment like correctly equipped E-suits or C-suits can quickly move enough earth to be a protective barrier. Dirt is especially effective against lasers and plasma weapons due to it's high melting temperature.

Some engineers have pioneered wetting down the front edge of a barrier to further absorb energy from these types of attacks, however this technique can have it's drawbacks. If a significant amount of energy is directed at a single point, the water rapidly heats and in turning to steam, can cause the barrier to explode.

Metal

Metal is a valuable material on The Artifact and not many know how to work with it. For instance, steel was nearly unknown before the arrival of earth forces.

Raw iron is the most common metal available to the Scimrahn followed by nickel. This results in the Scimrahn using nickel in many electronic circuits. Nickel is less than ideal for these purposes, but is serviceable.

Other metals such as copper, can be obtained but in very limited quantities through trading with the Kelrath through a Freetrader.

Plastic

The Scimrahn produce plastics in very limited quantities for batteries and a handful of other applications. Earth forces have been assisting them in producing plastic for other applications but distributing the information has been slow.

Build Time

The time it takes to build an item is it's primary cost. The Scimrahn don't use money and military characters who have manpower to command don't explicitly pay the soldiers that will do the work. Food supplies may be the closest thing to currency that would be required.

The first stage in building is to collect resources by foraging for it or to have others collect it and then barter for them.

The second stage in building is how long the Hosent will take to build the project and how much support they will need in manhours. This step is not needed for hand made items and structures like simple buildings.

The last stage is the time to assemble the parts that were made by hand or by the Hosent.

The total mass of the materials needed needs to be determined first before the time to build can be determined.

Materials

The simpler the engineer can keep the parts and the more common the materials, the easier and faster they can be collected.

On average, 5 Kilograms of materials can be collected per manhour.

Materials to Parts

This is the time it takes the Hosent to use the raw materials and build the parts. Simple slab buildings or tools that don't require remanufacturing by Hosent can skip this step.

A Hosent can process 10 Kilograms of materials per hour. More Hosent can be used in parallel to produce parts faster.

Parts Assembly

This is the time it takes to assemble all the parts. For items that can fit through the Hosent's door assembly is left to the Hosent. For projects larger than the Hosent's door

sub-assemblies are made by the Hosent and then must be completed by hand.

100 Kg of parts can be assembled per manhour.

An engineer can reduce the time taken on any of these steps by 5 manhours or 1 hour of Hosent manufacturing by adding 1 CP to the design challenge. The total time for any step cannot go lower than half of the original value.

Structures

Engineers will frequently be called on to construct shelters for various purposes. The main considerations are how large and how durable does the structure need to be. The need in durability can range anywhere from needing temporary protection from chilled air to withstanding enemy bombardment. Size can range between sheltering just a few men to hangers for multiple vehicles.

Follow the Rules for building construction under the Architectural skill. For each day of labor count the work as 8 manhours. For each week count the work to be done as 40 manhours.

The Hit Points of a structure are not listed in the Architectural skill and are based on the number of CP of the challenge.

Each CP of the challenge gives the building 50 HP

If the Engineer wants to build a sturdier structure, they can add more material to the structure to add hit points. This is normally done under the field quality building rate of 8 manhours per CP if the reinforcement is done with simple materials such as sandbags or otherwise sheltering the structure with earth. If the reinforcement is to be hidden by decorative elements, then the added CP take 40 manhours to complete.

To give the building an armor rating, add 2 CP to the challenge for every point of AR the building will have.

Selecting a Building Material

Some Materials work well for walls but are less suited for making roofs from. Examples of these are dirt and brick. If construction is to only consist of walls then these materials are fine, otherwise several building materials will be needed.

CCC is used by Scimrahn but some Earth engineers are reluctant to build with it because of not being familiar with it.

Fabric

For temporary shelter until more permanent structures can be built, fabric tents are the best option available to the engineer. Some kind of tent poles will be needed in most tent construction.

Fabric for tent making is usually available from any base with a teleporter. It is not normally practical to make fabric in the field.

Fabric structures offer next to no protection from attack, but they can be protected by walls of sandbags.

Dirt

Dirt or soil offers a fast and abundant resource for making protective walls. Construction can be done with unskilled labor.

Sandbags can be used to make walls of dirt. The bags can be loosely stacked or they can be sewn together with wire. Otherwise bermed dirt can be effective walls.

Fabric and dirt construction are a mainstay of field grade buildings.

Brick

Although less desirable than concrete, dried mud brick is an acceptable alternative.

Buildings with an armor rating between 1-4 are likely to be using brick for their walls.

Concrete

Although not readily available, concrete construction is desirable when possible because of it's durability and ease of use.

Buildings with an armor rating between 4-10 are likely to be using concrete for their walls.

CCC

By far the most common native building material on The Artifact. It is stronger than steel by weight.

CCC works well as a structural support and for ceilings.

Buildings with an armor rating between 10-60 are likely to be using CCC for their walls.

HDCCC

HDCCC is very hard and strong but is very difficult to produce and machine. Panels of HDCCC must be produced by Hosent.

Buildings with an armor rating between 100-250 are likely to be using HDCCC for their walls.

Steel

Steel or even iron is relatively rare on The Artifact. Most Steel for construction will be teleported in from Gadios. Although it may be possible to produce structural steel with Hosent, it is generally a very slow process that would not fit into a Field Engineer's mission time frame.

The only time Steel is likely to be used is as a structural material as the skeleton of a structure. However CCC and concrete are much easier to obtain and can work just as well or better.

Structure Location

It is generally preferable to build inside a structurally sound hex doorway as this provides a physical shelter and blocks approach in all but two directions. If manpower is low, then a small doorway should be chosen and both entrances should be monitored. If manpower is abundant then building in a large hex doorway may be an option as it provides additional evacuation avenues. All evacuation routes should be monitored.

Building deep inside the doorways is preferable if heavy firepower is available as it limits the angle that enemies can attack from. If heavy firepower is not available building near one of the ends of the doorway is preferable as it makes evacuation quicker.

In some situations it may be necessary to build protective structures other than in a doorway for use in monitoring an area.

Structure Size

The Engineer must determine how large the structure will need to be. When considering this, the use of the building is of primary importance. If a structure is only for temporary shelter, it can be far smaller than if it is for long term use or if people will need to work inside it.

For temporary shelter only, multiply the number of people housed by two (2). This is the Area in square meters the building needs to cover.

For longer term shelter or if people will work in the shelter, multiply the number of people that will use the structure by eleven (11). This is the Area in square meters the building needs to cover.

For vehicle storage multiply the length of the vehicle by the width of the vehicle multiplied by two (2) multiplied by the number of vehicles. This gives room to maneuver and for maintenance.

In almost all instances, structures that an Engineer will be called on to construct will be of single story construction as there is ample space available. The hight of the roof will need to be determined. If the structure is housing only people, a roof hight near 230 cm (2.3 m) is adequate. If the structure is housing equipment or vehicles then a minimum of 50 cm (.5 m) should be added to the largest vehicle hight.

Building Equipment

The following is a topical approach to designing and building various kinds of equipment.

Where possible the statistics for common equipment is given as a reference.

Most of the figures given are geared towards large applications rather than small mass produced items as it is unlikely that a Field Engineer would be tasked with anything other than a single instance design.

Mass produced items often perform better than the designs that the Engineer will be able to produce because they are time tested and refined.

Generating Power

In many engineering roles the need for generating power or using available

electricity is readily apparent. Pumping water, site lighting and heating are all applications that an engineer needs to be able to accomplish to establish a site. Vehicles also need power to move and operate equipment. The power units used here equal 14 HP or 10,000 Watts of power.

12v Lead Acid Battery
Total Power = 0.24
Discharge Power per Turn = .005
Output = Electric
Mass = 10 Kg
Materials = 7 Manhours
Parts Fabrication = 0.1 Hosent hours
Assembly = 0 Manhours

Energy Clip
Total Power = 100
Discharge Power per Turn = 0.5
Output = Electric
Mass = 1 Kg
Materials = 5 Manhours
Parts Fabrication = 0.1 Hosent hours
Assembly = 0 Manhours

Energy Backpack
Total Power = 500
Discharge Power per Turn = 7.2
Output = Electric
Mass = 9.7 Kg
Materials = 7 Manhours
Parts Fabrication = 1 Hosent hours
Assembly = 0 Manhours

Plasma Clip
Total Electrical Power = .1
Discharge Power per Turn = .01
Total Plasma Stored = 8.3 Cu cm
Output = Electric and Plasma
Mass = 1 Kg
Materials = 5 Manhours
Parts Fabrication = .1 Hosent hours
Assembly = 0 Manhours

10 HP 4 Stroke
Fuel: Gasoline or Ethanol
Power Output: 0.7
Piloting Impairment 50%

Total fuel: .6 liters
Capacity = 10 hours
Engine Mass Dry = 11.8 Kg
Gasoline
Engine Mass Full = 12.25 Kg
Ethanol
Engine Mass Full = 11.7 Kg
Materials = 12 Manhours
Parts Fabrication = 5.4 Hosent hours
Assembly = 0.1 Manhours

100 HP V4
Fuel: Gasoline or Ethanol
Power Output: 7
Piloting Impairment 60%

Total fuel: 15 liters
Capacity: 22 hours
Engine Mass Dry: 96 Kg
Gasoline
Engine Mass Full: 107 Kg
Ethanol
Engine Mass Full: 105.2 Kg
Materials = 41 Manhours
Parts Fabrication = 29 Hosent hours
Assembly = 1 Manhour

300 HP V8
Fuel: Gasoline or Ethanol
Power Output: 21.4
Piloting Impairment 20%

Total fuel: 26 liters
Capacity: 12 hours
Engine Mass Dry: 275 Kg
Gasoline
Engine Mass Full: 291.63 Kg
Ethanol
Engine Mass Full: 288.8 Kg
Materials = 78 Manhours
Parts Fabrication = 74 Hosent hours
Assembly = 3 Manhours

300 HP Diesel
Fuel: Diesel
Power Output: 21.4
Piloting Impairment 40%

Total fuel: 22 liters
Capacity: 12 hours
Engine Mass Dry: 275 Kg
Engine Mass Full: 291.6 Kg
Materials = 77 Manhours
Parts Fabrication = 103 Hosent hours
Assembly = 3 Manhours

1000 HP Diesel
Fuel: Diesel
Power Output: 71.4
Piloting Impairment 50%

Total fuel: 25 liters
Capacity: 3.7 hours
Engine Mass Dry: 1106.7 Kg
Engine Mass Full: 1121.8 Kg

Materials = 210 Manhours
Parts Fabrication = 707 Hosent hours
Assembly = 10.3 Manhours

TF-2394 Engine
Fuel: LCF
Power Output: 49.5
Piloting Impairment 70%

Total fuel: 4.38 liters
Capacity: 17 hours
Engine Mass Dry: 380 Kg
Engine Mass Full: 382.8 Kg
Materials = 90 Manhours
Parts Fabrication = 240 Hosent hours
Assembly = 4 Manhours

TF-2394 Extended Engine
Fuel: LCF
Power Output: 70.3
Piloting Impairment 70%

Total fuel: 4 liters
Capacity: 12 hours
Engine Mass Dry: 560 Kg
Engine Mass Full: 562.9Kg
Materials = 122 Manhours
Parts Fabrication = 280 Hosent hours
Assembly = 5.6 Manhours

TF-2394 Jet Turbines
Fuel: LCF
Power Output: 48.5
Piloting Impairment 60%

Total fuel: 4 liters
Capacity: 17 hours
Engine Mass Dry: 125 Kg
Engine Mass Full: 129.28 Kg
Materials = 40 Manhours
Parts Fabrication = 24 Hosent hours
Assembly = 1.7 Manhours

TF-2394 Generator
Converts: Mechanical to Electrical
Power Output: 19
Power Required: 26
Piloting Impairment 22%

Generator Mass: 120 Kg
Materials = 40 Manhours
Parts Fabrication = 30 Hosent hours
Assembly = 1.6 Manhours

TF-2394 Electric Motor
This electric motor only needs to power the various hydraulic drive systems in the E-suit. The rest of the systems can draw power directly off the batteries.

Fuel: Battery
Mechanical Power Output: 19
Piloting Impairment 62%

Total Power: 93,000
Capacity: 12 hours
Engine Mass: 160 Kg
Battery Mass: 464 Kg
Materials = 137 Manhours
Parts Fabrication = 111 Hosent hours
Assembly = 6 Manhours

TF-2394 Plasma Engine
Power Output: 48
Piloting Impairment 60%

Cubic cm of Plasma: 478
Capacity: 5 hours
Engine Mass: 630 Kg
Plasma Mass: 30 Kg
Materials = 137 Manhours
Parts Fabrication = 122 Hosent hours
Assembly = 6 Manhours

Speeder-15 Plasma Engine
Power Output: 36
Piloting Impairment 110%

Cubic cm of Plasma: 881
Capacity: 13 hours
Engine Mass: 690 Kg
Plasma Mass: 60 Kg
Materials = 163 Manhours
Parts Fabrication = 213 Hosent hours
Assembly = 7 Manhours

ZPE
ZPE stands for "Zero Point Energy". This is the background noise of the universe. Only the Chezbah know how to manufacture these devices, and the technology is a jealously guarded secret. Because of this any ZPE generators that the character encounters will most likely be a booster engine stolen out of a Mass Transit train car. Larger engines exact a hefty price because they are either out of a Mass Transit engine or less probably a Chezbah Cruiser.

Booster
Power = 10,000 per turn
Mass = 34,000 Kg
Piloting Modifier 20% Impairment per Generator
Cost: By negotiation only

Mass Transit Engine
Power = 170,000 per turn
Mass = 578,000 Kg

Piloting Modifier 30% Impairment per Generator
Cost: By negotiation only

Custom Power Generation

When common power supplies are inappropriate for the needed application, a custom power supply can be built.

Powerplant

A powerplant is the engine that converts stored energy in fuel into mechanical or electrical power that can be used to do work.

Developing a powerplant is a Tech Challenge. Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the powerplant design challenge but do have to follow the rules under Build Time for each powerplant produced.

Energy Types

Powerplants draw energy from one source and convert it to another type. Some power applications, such as turning a wheel require mechanical energy. Other applications such as powering a laser require electrical power.

Powerplants may draw energy from fuel of some sort or one powerplant may draw power from another powerplant type. For example, an electric motor can draw power from a battery or from a fuel cell. An internal combustion engine may transfer mechanical energy to a generator which converts the mechanical energy to electrical energy.

Each time energy is converted some power is lost to inefficiencies. Powerplants have an efficiency value. Using the efficiency value of a powerplant, convert the percentage value to a decimal value (ex 50% becomes . 50). Divide the Power Output by the efficiency decimal value to get the total amount of energy that the powerplant must consume to output the desired amount of power.

Internal Combustion

Chemical to Mechanical

An internal combustion engine (ICE) is any engine that uses chemical fuel in an enclosed cylinder and piston design regardless of configuration. Internal Combustion Engines output power through a rotating shaft.

The ICE converts chemical fuel to mechanical energy. There are four factors of any Internal Combustion engine type of fuel, desired power output per turn, mass and efficiency.

When an ICE is used to power a vehicle, the vehicle gets one 10% piloting Impairment per engine.

If the ICE is being used for stationary power, it requires a successful Repair Machinery skill roll to start. This roll gets a 50% Advantage to start out.

Power Output: Select a number of energy points the ICE needs to produce each turn. For every 10 energy point the engine will produce the build gains 1 CP

Mass: For each point of Power Output, the ICE starts with a mass of 20 Kg.

Select a chemical fuel type (see Fuel)

Efficiency: ICEs start out with an efficiency of 50%

Add 1 CP to reduce the mass of the engine by 1 Kg per Energy Point. Engine cannot weigh less than 8 Kg per Energy Point with currently available technology.

Add 1 CP to increase the efficiency of the engine by 5% between 1% and 70%. Add 1 CP to increase the efficiency 2% between 71% and 80% Efficiency cannot be increased over 80% with currently available technology.

Add 3 CP to the challenge if the ICE is designed to use an additional type of fuel.

Roll to overcome the Tech Challenge and apply it's effects.

Turbine

Chemical to Mechanical

A turbine engine is useful for creating thrust in an oxygen environment. Only half of the power generated by the turbine may be diverted to other systems or converted to electrical power. The rest is only useable to power the vehicle's thrust.

A turbine is more efficient than an ICE but they are more challenging to design.

The turbine converts chemical fuel to mechanical energy. There are four factors of any turbine engine, type of fuel, desired power output per turn, mass and efficiency.

When an turbine is used to power a vehicle, the vehicle gets one 20% piloting Impairment per engine.

If the Turbine is being used for stationary power, it requires a successful Repair Machinery skill roll to start. This roll gets a 30% Advantage to start out.

Power Output: Select a number of energy points the turbine needs to produce each turn. For every 4 energy points the engine will produce the build gains 1 CP

Mass: For each point of Power Output, the turbine starts with a mass of 5 Kg.

Select a chemical fuel type (see Fuel)

Efficiency: Turbines start out with an efficiency of 60%

Add 1 CP to reduce the mass of the engine by 1 Kg per Energy Point. Engine cannot weigh less than 1 Kg per Energy Point with currently available technology.

Add 1 CP to increase the efficiency of the engine by 5% between 1% and 70%. Add 1 CP to increase the efficiency 1% between 71% and 90% Efficiency cannot be increased over 90% with currently available technology.

Add 3 CP to the challenge if the turbine is designed to use an additional type of fuel.

Roll to overcome the Tech Challenge and apply it's effects.

Rocket

Chemical to Mechanical

A rocket engine is only useful for generating thrust. It's power generated cannot be converted by practical means.

Rocket engines must provide their own source of oxygen. Solid fuel rockets often have a chemical oxidizer combined with the fuel. Liquid fuel rockets often use liquid oxygen or another liquid oxidizer. For most fuels around three times the oxygen is required for thrust while hydrogen requires six times the oxygen as stored hydrogen.

The rocket converts chemical fuel to mechanical energy. There are four factors of any rocket engine, type of fuel, desired power output per turn, mass and efficiency.

When an rocket is used to power vehicle movement, the vehicle gets one 30% piloting Impairment per engine.

Power Output: Select a number of energy points the rocket needs to produce each turn. For each energy point the engine will produce the build gains 3 CP

Mass: For each point of Power Output, the rocket starts with a mass of 2 Kg.

Select a chemical fuel type (see Fuel). When selecting the fuel, the rocket must also be supplied with three times as much mass in oxidizer.

Efficiency: Rockets start out with an efficiency of 70%

Add 1 CP to reduce the mass of the engine by 0.5 Kg per Energy Point. Engine cannot weigh less than 0.5 Kg per Energy Point with currently available technology.

Add 1 CP to increase the efficiency of the engine by 5% between 1% and 70%. Add 1 CP to increase the efficiency 1% between 71% and 90% Efficiency cannot be increased over 90% with currently available technology.

Roll to overcome the Tech Challenge and apply it's effects.

Fuel Cell

Chemical to Electrical

Fuel cells turn chemical energy directly into electrical energy.

The Fuel Cell is manufactured to use only one type of fuel, but they can be manufactured to use most combustible gas or liquids. Hydrogen is the simplest fuel for a Fuel cell to use. Other fuels require separate stages that complicate the fuel cell and increase build time.

Gasoline
Material Acquisition time x 3
Build time x 4

Diesel
Material Acquisition time x 3
Build time x 5

Alcohol
Material Acquisition time x 3
Build time x 3

LCF
Material Acquisition time x 4
Build time x 15

Methane
Material Acquisition time x 3
Build time x 2

Hydrogen
Material Acquisition time x 3
Build time x 1

When an Fuel Cell is used to power a vehicle, the vehicle gets one 20% piloting Impairment per engine.

If the Fuel Cell is being used for stationary power, it requires a successful Repair Machinery skill roll to start. This roll gets a 20% Advantage to start out.

Power Output: Select a number of energy points the Fuel Cell needs to produce each turn. For every 2 energy point the engine will produce the build gains 1 CP

Mass: For each point of Power Output, the cell starts with a mass of 30 Kg.

Select a chemical fuel type (see Fuel)

Efficiency: Fuel Cells start out with an efficiency of 80%

Add 1 CP to reduce the mass of the engine by 1 Kg per Energy Point. The fuel cell cannot weigh less than 10 Kg per Energy Point with currently available technology.

Add 1 CP to increase the efficiency of the cell by 5% between 1% and 70%. Add 1 CP to increase the efficiency 2% between 71% and 90% Efficiency cannot be increased over 90% with currently available technology.

Add 10 CP to the challenge if the Cell is designed to use an additional type of fuel.

Roll to overcome the Tech Challenge and apply it's effects.

Electric Motor

Electrical to Mechanical

Electric motors are simple and highly efficient. They are necessary if using batteries or a fuel cell for a power supply. Electric motors convert electrical energy to mechanical energy by outputting power through a rotating shaft.

When an electric motor is used to power a vehicle, the vehicle gets one 2% piloting Impairment per motor.

If the electric motor is being used for stationary power, it requires a successful Repair Machinery skill roll to start. This roll gets a 90% Advantage to start out.

Power Output: Select a number of energy points the electric motor needs to produce each turn. For every 20 energy points the engine will produce the build gains 1 CP.

Mass: For each point of Power Output, the electric motor starts with a mass of 15 Kg.

Efficiency: Electric motors start out with an efficiency of 80%

Add 1 CP to reduce the mass of the engine by 1 Kg per Energy Point. The motor cannot weigh less than 7 Kg per Energy Point with currently available technology.

Add 1 CP to increase the efficiency of the engine by 5% between 1% and 70%. Add 1 CP to increase the efficiency 2% between 71% and 95% Efficiency cannot be increased over 95% with currently available technology.

Roll to overcome the Tech Challenge and apply it's effects.

Electric Generator

Mechanical to Electrical

Most internal combustion engines use a generator or alternator of some sort. Many vehicles require electric power to operate. This necessitates the conversion of mechanical power to electricity.

A generator is essentially an electric motor in reverse is the most common method of generating electrical power. In most cases a single motor can be used as both a motor and a generator.

Follow the rules for electric motors but instead of using electrical energy to produce mechanical energy, the generator does the opposite. The generator uses mechanical energy and produces electrical energy.

Battery Power

Chemical to Electrical

Battery power is a mainstay of mobile systems. They can be relatively easily recharged. The main weight of these systems is the battery pack itself but with this kind of power plant some weight goes into cabling, housing and power conversion inverters.

When battery power is used to power a vehicle, the vehicle gets one 1% piloting Impairment.

If the battery is being used for stationary power, it requires a successful Repair Machinery skill roll to start. This roll gets a 95% Advantage to start out.

Power Output: Select a number of energy points the system needs to produce each turn. For every 50 energy points the battery will produce the build gains 1 CP.

Mass: For every ten points of Power Output, the battery pack starts with a mass of 10 Kg. Remember to include the fuel mass of the battery pack.

Efficiency: Battery packs start out with an efficiency of 95%

Add 1 CP to reduce the mass of the battery pack by 1 Kg per 10 Energy Points. The motor cannot weigh less than 1 Kg per 10 Energy Points with currently available technology.

Add 1 CP to increase the efficiency of the pack by 5% between 1% and 70%. Add 1 CP to increase the efficiency 2% between 71% and 95% Efficiency cannot be increased over 95% with currently available technology.

Roll to overcome the Tech Challenge and apply it's effects.

Plasma Coil

Heat to Electrical and Mechanical

Plasma coils can generate mechanical energy as well as electrical power at the same time using the magnetic field of the plasma.

When a plasma coil is used to power a vehicle, the vehicle gets one 30% piloting Impairment per coil.

If the plasma coil is being used for stationary power, it requires a successful Repair Machinery skill roll to start. This roll gets a 20% Advantage to start out.

Power Output: Select a number of energy points the plasma coil needs to produce each turn. For every 5 energy points the engine will produce the build gains 1 CP.

Mass: For each point of Power Output, the plasma coil starts with a mass of 20 Kg.

Efficiency: Plasma coils start out with an efficiency of 80%

Add 1 CP to reduce the mass of the plasma coil by 1 Kg per Energy Point. The coil cannot weigh less than 5 Kg per Energy Point with currently available technology.

Add 1 CP to increase the efficiency of the coil by 5% between 1% and 70%. Add 1 CP to increase the efficiency 2% between 71% and 95% Efficiency cannot be increased over 95% with currently available technology.

Roll to overcome the Tech Challenge and apply it's effects.

Fusion Plant

Nuclear to Heat and Electrical

Fusion technology is rare on The Artifact. Usually any time large amounts of power are required the best way to obtain it is to get it from a plasma conduit.

The size of the fusion reactor usually makes it impractical for most vehicles. Fusion plants require a large amount of energy to start (usually from a plasma main).

Fusion plants require fuel in the form of hydrogen or deuterium (heavy hydrogen) but the rate that they consume their fuel is minute and so fuel is not considered to be an issue under most conditions but is considered to have a 1 month fuel supply.

Fusion plants do have an efficiency rating but it is not for fuel consumption it is for how much energy is generated as heat. This heat may be a useful byproduct in many situations. Heating water or simply using the heat to warm a complex of buildings reduces the need for a separate heating system.

When a fusion plant is used to power a vehicle, the vehicle gets five 100% piloting Impairments per plant.

If the fusion plant is being used for stationary power, it requires a successful Repair Machinery skill roll to start. This roll gets three 100% Impairments to start out.

Power Output: Select a number of energy points the fusion plant needs to produce each turn. For every 10 energy points the plant will produce the build gains 1 CP.

Fusion plants must have a total energy output of over 1000 Energy Points or they cannot sustain their fusion reaction.

Mass: For each point of Power Output, the fusion plant starts with a mass of 50 Kg.

Efficiency: Fusion plants start out with an efficiency of 70%

Add 1 CP to reduce the mass of the fusion plant by 1 Kg per Energy Point. The plant cannot weigh less than 45 Kg per Energy Point with currently available technology.

Add 1 CP to increase the efficiency of the plant by 1% between 1% and 70%. Add 2 CP to increase the efficiency 1% between 71% and 90% Efficiency cannot be increased over 90% with currently available technology.

Roll to overcome the Tech Challenge and apply it's effects.

Using the ending efficiency value, convert the percentage value to a decimal value (ex 70% becomes .70). Divide the total power by the efficiency decimal value. This is the total of the electrical energy produced and the heat energy produced. To get just the heat energy the fusion plant produces, subtract the electrical energy from the total.

Muscle Power

Mechanical to Mechanical

Sometimes muscle power is the only available option or it is preferable for some reason. Human muscle power and animal muscle power work in the same way.

For every human or animal providing muscle power add the STR attributes together and then divide by 5000 to get the EUs that muscle power puts out. To convert this energy to electricity a generator must be used.

To harness the energy and put it to use, there must be a device of some kind that converts the muscle power into mechanical energy such as pedals, oars, yolks or spoked wheel.

When muscle power is used to power a vehicle, the vehicle gets one 60% piloting Impairment per mechanism.

If the mechanism is being used for stationary power, it requires a successful Repair Machinery skill roll to start. This roll gets a 70% Advantage to start out.

Power = 1 per 5,000 STR

Mass: For each point of Power Output, the mechanism starts with a mass of 75 Kg.

Efficiency: Muscle power mechanisms start out with an efficiency of 80%

Add 1 CP to reduce the mass of the mechanism by 1 Kg per Energy Point. It cannot weigh less than 50 Kg per Energy Point with currently available technology.

Add 1 CP to increase the efficiency of the mechanism by 1% between 1% and 70%. Add 2 CP to increase the efficiency 1% between 71% and 95% Efficiency cannot be increased over 95% with currently available technology.

Roll to overcome the Tech Challenge and apply it's effects.

Wind Power

Mechanical to Mechanical

Wind power converts air movement to mechanical energy. These power systems may take the form of sails to move a vehicle to the blades of a wind turbine. These are wind energy collectors.

The faster the wind moves across the wind energy collector and the higher the Environmental Class, the more energy the collector can convert to usable energy.

To get the average wind speed in Km/h of an area, roll 3d10 if being used on the surface or 2d10 if used underground.

When wind power is used to power a vehicle, the vehicle gets two 60% piloting Impairment per mechanism.

If the mechanism is being used for stationary power, it requires a successful Repair Machinery skill roll to start. This roll gets a 50% Advantage to start out.

Efficiency: Wind power mechanisms start out with an efficiency of 60%

Collector Surface: The larger the surface of the collector (sail or turbine blades) the more energy can be collected. The collector surface is recorded in Square Meters.

Larger collector surfaces weigh more.

Power = Environmental Class x Average Wind Speed x Collector Surface x Efficiency / 250

Mass: For each point of collector surface, the mechanism starts with a mass of 25 Kg.

Add 1 CP to reduce the mass of the mechanism by 1 Kg per Energy Point. It cannot weigh less than 15 Kg per Energy Point with currently available technology.

Add 1 CP to increase the efficiency of the mechanism by 1% between 1% and 70%. Add 2 CP to increase the efficiency 1% between 71% and 95% Efficiency cannot be increased over 95% with currently available technology.

Roll to overcome the Tech Challenge and apply it's effects.

Power Plant Build Transforms

When the character rolls to design a powerplant, use the following tables. If the roll against the Tech Challenge succeeds, use the Successful Transform table. If the roll fails use the Failure Transform table.

Successful Transform

Roll 1d6

1 Increase Mass 1 Kg per Energy Point
or
Decrease Efficiency 1%

2 Increase Mass 1 Kg per Energy Point
or
Decrease power output by 1 Energy Point

3 Material collection takes 5 additional manhours per powerplant built
or
Decrease Efficiency 1%

4 Increase Piloting Impairment by 20% if being used in a vehicle, decrease the Advantage to start the powerplant by 5% if being used as stand alone power
or
Increase Mass 1 Kg per Energy Point

5 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of powerplant mass.
or
Decrease efficiency by 1%

6 Skill used in last attempt is no longer effective until 4 CP are reduced in one roll and the next attempt requires that at least 2 CP reduced to make progress.

Failure Transform

Roll 1d10

1 Increase Mass 5 Kg per Energy Point
or
Decrease Efficiency 5%

2 Increase Mass 2 Kg per Energy Point
or
Decrease power output by 2 Energy Points

3 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of powerplant mass

4 The engineer failing the roll is injured when testing the prototype (1d10 damage) if they don't make a saving Reflex roll. The character gets a 1% Advantage for every minute in game that the turn took. (e.g. a 1 hour turn gives a 60% advantage)

5 Someone else gets injured (1d10 damage) when testing the prototype if they don't make a saving Reflex roll. The character gets a 1% Advantage for every minute in game that the turn took. (e.g. a combat turn gives a 0% advantage)

6 Fire! Vehicles take 1d100 damage or 1d100 Kg of materials must be gathered and processed again.

7 An NPC involved in building the prototype takes 2d10 damage if they do not make a Reflex roll. The skill used is no longer effective.

8 Increase Piloting Impairment by 100% if being used in a vehicle, decrease the Advantage to start the powerplant by 50% if being used as stand alone power.

9 The design challenge is now immune to the skill used.

10 Messed up! The design gains 3 CP.

All transforms are suggestions. The GM can alter or introduce different transforms as they deem fit. Alternatively the Player may request a different transform or suggest their own but the GM should make sure it introduces interesting conditions to the build.

Optional Rule: For very large builds that will take dozens if not hundreds of rolls, before any rolls are made, the player can opt to reduce a number of CP for each Fractional Success but all transform effects are multiplied by the number of CP.

Example: The player decides to reduce 10 CP with each fractional success. They get a transform of "Increase Mass 1Kg per Energy Point". This becomes "Increase Mass 10 Kg per Energy Point" for this roll.

Fuel

Power generation requires power to be stored in some manner. Whatever form that is will be considered the fuel for the generator.

Using the ending efficiency value of a powerplant, convert the percentage value to a decimal value (ex 50% becomes .50). Divide the Power Output by the efficiency decimal value.

Example: The Power Output of an ICE is 10. It has an efficiency of 45%. 10 / .45 = 22.2

This is the total fuel energy consumed per turn. This value is multiplied by then time the engineer wants the power plant to run to find out how large a fuel supply will be needed. This fuel weight is important for vehicles.

Batteries

The amount of power that batteries can hold is considerable but is still less than the chemical energy in liquid carbon or gasoline. One advantage of a battery powered vehicle is that it can be recharged anywhere electrical power is available. The biggest disadvantage to batteries is that they usually require small amounts of exotic metal in their anode and cathode.

Batteries also cannot discharge their entire energy supply all at once, they can only discharge a small fraction of their total power in a turn.

Take the powerplant's fuel energy consumed per turn and divide it by 3. This is the

minimum size of the battery. If a smaller battery is used, it will not be able to put out enough power per turn.

Total Power = Battery Mass (in Kg) x 200

Discharge Power per Turn = Battery Mass x 3

Material collection difficulty: +1 CP per 30 Kg of battery.

Fuel Tank

Fuel is chemical stored energy. The primary consideration in choosing a fuel is availability and energy density. The other factor is the volume of fuel that the vehicle can carry.

Use the fuel energy consumed and multiply it by the number of turns the power plant must run. (1 hr = 360 turns) This is the total power that must be stored in the fuel.

Example: Our ICE has a fuel energy consumed of 22.2 and it needs to run for 10 hours (3600 turns). 22.2 x 3600 = 79,920

Divide the total stored power requirement by the power per liter of the fuel.

Example: The ICE is going to be powered by LCF with a power per liter of 10,000. 79,920 / 100,000 = 0.799 liters

Diesel
Power/Liter 5,500
Mass: 0.7 Kg per liter

Gasoline
Power/Liter 5,000
Mass: 0.7 Kg per liter

Liquid Carbon (LCF)
Power/Liter 100,000
Mass: 1.1 Kg per liter

Ethanol
Power/Liter 6,000
Mass: 0.8 Kg per liter

Methane
Power/Liter 4,000
Mass: 0.67 Kg per liter

Compressed Hydrogen
Power/Liter 2,500
Mass: 0.02 Kg per liter

Plasma Storage

Plasma power is easily obtainable in power hexes, it is also light. However, plasma is not a compact power source and not normally suitable for small vehicles.

Use the fuel energy consumed and multiply it by the number of turns the power plant must run. (1 hr = 360 turns) This is the total power that must be stored in the fuel.

Example: A plasma coil has a fuel energy consumed per turn of 15 and we want it to run for 5 hours (1800 turns). 15 x 1800 = 27,000

Divide the total stored power requirement by the power per cubic cm of the plasma.

Example: The coil will use 27,000 energy points over a five hour period. It requires 135 cc of fuel. 27,000 / 200 = 135

Power/Cubic CM = 200
Mass: 0.6 Kg per Cubic cm

Weapon Build Transforms

When the character rolls to design a weapon, use the following tables. If the roll against the Tech Challenge succeeds, use the Successful Transform table. If the roll fails use the Failure Transform table.

Successful Transform
Roll 1d6

1 Increase Mass 1 Kg per Energy Point
or
Decrease Intensity by 500

2 Increase Mass 1 Kg per Energy Point
or
Increase power required by 1 Energy Point

3 Material collection takes 5 additional manhours per weapon built
or
Decrease Intensity by 500

4 Increase Piloting Impairment by 10% if being used in a vehicle, Increase the Impairment to hit a target by 5% if being used as stand alone weapon
or
Increase Mass 1 Kg per Energy Point

5 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of weapon mass.
or
Decrease Intensity by 500

6 Skill used in last attempt is no longer effective until 4 CP are reduced in one roll and the next attempt requires that at least 2 CP reduced to make progress.

Failure Transform
Roll 1d10

1 Increase Mass 5 Kg per Energy Point
or
Decrease Intensity by 2,000

2 Increase Mass 2 Kg per Energy Point
or
Increase power used by 2 Energy Points

3 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of weapon mass

4 The engineer failing the roll is injured when testing the prototype (1d10 damage) if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a 1 work day turn gives a 8% advantage)

5 Someone else gets injured (1d10 damage) when testing the prototype if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a combat turn gives a 0% advantage)

6 Fire! Vehicles take 1d100 damage or 1d100 Kg of materials must be gathered and processed again.

7 An NPC involved in building the prototype takes 2d10 damage if they do not make a Reflex roll. The skill used is no longer effective.

8 Increase Piloting Impairment by 30% if being used in a vehicle, Increase the Impairment to hit a target by 10% if being used as stand alone weapon.

9 The design challenge is now immune to the skill that was just used.

10 Messed up! The design gains 3 CP.

All transforms are suggestions. The GM can alter or introduce different transforms as they deem fit. Alternatively the Player may request a different transform or suggest their own but the GM should make sure it introduces interesting conditions to the build.

Optional Rule: For very large builds that will take dozens if not hundreds of rolls, before any rolls are made, the player can opt to reduce a number of CP for each Fractional Success but all transform effects are multiplied by the number of CP.

Example: The player decides to reduce 10 CP with each fractional success. They get a transform of "Increase Mass 1Kg per Energy Point". This becomes "Increase Mass 10 Kg per Energy Point" for this roll.

Building Lasers

Lasers are rugged and relatively long ranged weapons but usually are lower yield than other weapons. While there are some notable exceptions to this on larger vehicles, the weapon is often moderately heavy. However they are simple to automate and add little complexity when added to vehicles.

Speeder 15 Laser Blaster
PB Damage 40
Energy Required: 0.17
Mass: 3.4 Kg
Range Class: D
ROF: 1
Piloting Impairment 15%
Material Collection 10 Manhours
Parts Fabrication = 1.8 Hosent hours
Assembly = 0 Manhours

TF-2394 Laser
PB Damage 300
Energy Required: 6
Mass: 122 Kg
Range Class: D
ROF: 1
Piloting Impairment 40%
Material Collection 70 Manhours
Parts Fabrication = 33 Hosent hours
Assembly = 1.2 Manhours

TF-2394 Heavy Laser
PB Damage 500
Energy Required: 17
Mass: 347 Kg
Range Class: D
ROF: 1
Piloting Impairment 65%
Material Collection 104 Manhours
Parts Fabrication = 193 Hosent hours
Assembly = 3.2 Manhours

Rall 4 Laser
PB Damage 400
Energy Required: 12
Mass: 225 Kg
Range Class: D
ROF: 1
ROF: 1
Piloting Impairment 35%
Material Collection 100 Manhours
Parts Fabrication = 67 Hosent hours
Assembly = 2.2 Manhours

Hunter Laser
PB Damage 100
Energy Required: .7
Mass: 14 Kg
Range Class: D
ROF: 1
Piloting Impairment 15%
Material Collection 35 Manhours
Parts Fabrication = 4 Hosent hours
Assembly = 0 Manhours

Demolisher Belly Laser
PB Damage 1000
Energy Required: 68
Mass: 1458 Kg
Range Class: E
ROF: 1
Piloting Impairment 25%
Material Collection 405 Manhours
Parts Fabrication = 958 Hosent hours
Assembly = 15 Manhours

Kelrath Capital Ship Laser
PB Damage 1500
Energy Required: 175
Mass: 2620 Kg
Range Class: D
ROF: 1
Piloting Impairment 85%
Material Collection 629 Manhours
Parts Fabrication = 1786 Hosent hours
Assembly = 26 Manhours

Designing Lasers

When designing a laser, the primary considerations are damage, range, energy use, mass and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the laser design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Electrical

When a laser is used in a vehicle, the vehicle gets one 5% piloting Impairment per laser.

If the laser is being used in stationary emplacement, it requires a successful Artillery Operation skill roll to hit a target. This roll gets a 0% Impairment to start out.

PB Damage: Select a number of points that the laser will do in damage at the point blank range bracket. For every 50 points of damage the laser will do the build gets 1 CP.

Intensity: Lasers have an intensity value of 8000 to start out with. This effects how much energy is required to do the desired points of damage.

Energy Required: The energy the laser requires to do increasing amounts of damage increases dramatically. Use the formula below to get the number of energy units that are required to power the laser.

PB Damage x PB Damage / Intensity

Multiply the Point Blank Damage you chose earlier by the Point Blank Damage (again) and then divide by the laser's Intensity value.

Mass: For each point of Energy Required, the laser starts with a mass of 20 Kg.

Range Class: Lasers start with a range class of C.

Rate of Fire: Lasers normally fire continuously throughout the turn so their rate of fire is considered to be 1. Add 10 CP to add 1 to the laser's rate of fire and multiply the Energy Required by the ROF.

Add 1 CP to reduce the mass of the laser by 1 Kg per Energy Required. The laser cannot weigh less than 15 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Intensity value by 500.

Add 3 CP to increase the range class of the laser each letter class up to E. Add 9 CP to increase the range class each letter past this up to G. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 30 CP to the challenge.

Subtract 4 CP to reduce the range class of the laser by one letter.

Roll to overcome the Tech Challenge and apply it's effects.

Calculating Range Bracket Damage

The damage that a laser does at various ranges is based on it's Point Blank (PB) Damage. Take the PB Damage and multiply it by the following numbers.

Short (S) x1

Medium (Med) x 0.5

Long (L) x 0.25

Extreme (Ex) x 0.1

Building Plasma Weapons

Plasma weapons are medium range weapons and carry a good punch for their energy needs. Plasma weapons use a supply of superheated gas (between 10 thousand and 15 thousand degrees) that has a strong electrical charge. An electrical charge is passed through the air and the plasma is guided down it.

TF-2394 Plasma Blaster
PB Damage: 25
Energy Required: 0.58
Mass: 140 Kg
Range Class: B
Rate of Fire: 30
Payload: 200
Piloting Impairment 10%
Material Collection 76.5 Manhours
Parts Fabrication = 24 Hosent hours
Assembly = 1.6 Manhours

TF-2394 Plasma Gun
PB Damage: 400
Energy Required: 4
Mass: 330 Kg
Range Class: C
Rate of Fire: 1
Payload: 7
Piloting Impairment 30%
Material Collection 83 Manhours
Parts Fabrication = 36 Hosent hours
Assembly = 2.6 Manhours

TF-2394 Plasma Cannon
PB Damage: 600
Energy Required: 9
Mass: 940 Kg
Range Class: C
Rate of Fire: 1
Payload: 10

Rall 4 Plasma Cannon
PB Damage: 200
Energy Required: 2
Mass: 351 Kg
Range Class: C
Rate of Fire: 2
Payload: 20

Hunter Plasma Cannon
PB Damage: 200
Energy Required: 3
Mass: 190 Kg
Range Class: C
Rate of Fire: 3
Payload: 10

Designing Plasma Weapons

When designing a plasma weapon, the primary considerations are damage, range, energy use, mass, rate of fire, payload and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the plasma weapon design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Electrical

Ammunition Required: Plasma Payload

When a plasma weapon is used in a vehicle, the vehicle gets one 10% piloting Impairment per plasma weapon.

If the plasma weapon is being used in stationary emplacement, it requires a successful Artillery Operation skill roll to hit a target. This roll gets a 0% Impairment to start out.

PB Damage: Select a number of points that the plasma weapon will do in damage at the point blank range bracket. For every 100 points of damage the plasma weapon will do the build gets 1 CP.

Intensity: Plasma weapons have an intensity value of 40,000 to start out with. This effects how much energy is required to do the desired points of damage.

Energy Required: The energy the plasma weapon requires to do increasing amounts of damage. Use the formula below to get the number of energy units that are required to power the plasma weapon.

PB Damage x PB Damage / Intensity

Multiply the Point Blank Damage you chose earlier by the Point Blank Damage (again) and

then divide by the plasma weapon's Intensity value.

Mass: For each point of Energy Required, the plasma weapon starts with a mass of 40 Kg.

Range Class: Plasma weapons start with a range class of A.

Rate of Fire: The massive magnetic fields that build up on the plasma weapon take time to cycle. This means that most Plasma weapons have a ROF of 1. It is inefficient to make a plasma weapon fire more than one pulse during a turn.

Add 1 CP for every EU used to fire the weapon to add 1 to the plasma weapon's rate of fire and multiply the Energy Required by the ROF to get the total energy required to fire a full burst. Recalculate the weapon's mass based on this new Energy Required.

Add 1 CP to reduce the mass of the plasma weapon by 1 Kg per Energy Required. The plasma weapon cannot weigh less than 30 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Intensity value by 1000.

Add 3 CP to increase the range class of the plasma weapon each letter class up to C. Add 9 CP to increase the range class each letter past this up to E. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 30 CP to the challenge.

Subtract 4 CP to reduce the range class of the plasma weapon by one letter.

Roll to overcome the Tech Challenge and apply it's effects.

Payload

The payload that is stored in the weapon has a small mass however the powerful magnets that hold the plasma in place are very heavy.

Determine a number of rounds that the plasma weapon should store. This is the Payload of the weapon. Add the result of the following formula to the mass of the weapon.

Payload x PB Damage / 10 = Mass of Payload in Kg

Example: A plasma cannon with a Point Blank Damage of 200 and a payload of 10 has the following mass. 10 x 200 /10 = 100 Kg

Add 1 CP to reduce the mass of the plasma storage to 90% of it's current mass. This can be done up to ten times.

Calculating Damage

The damage that a plasma weapon does at various ranges is based on it's Point Blank (PB) Damage. Take the PB Damage and multiply it by the following numbers.

Short (S) x1

Medium (Med) x 0.75

Long (L) x 0.5

Extreme (Ex) x 0.13

Building Particle Beam Weapons

Particle Beam weapons generate a large quantity of particles, usually electrons, but sometimes neutrons, or in rare instances alpha particles and accelerate them at a target. These beams can melt solid matter rapidly at close ranges, but the beam disperses rapidly over distance. Because of the raw energy that the weapon handles the system usually requires time to charge and then cool, this results in a lower rate of fire than most other weapons.

TF-2394 Particle Cannon
PB Damage 4500
Energy Required: 49
Mass: 1898 Kg
Range Class: B
ROF: 1
Piloting Impairment 80%
Material Collection 421 Manhours
Parts Fabrication = 545 Hosent hours
Assembly = 18 Manhours

Deliverance Particle Cannon
PB Damage 5000
Energy Required: 85
Mass: 3460 Kg
Range Class: C
ROF: 1/2
Piloting Impairment 55%
Material Collection 717 Manhours
Parts Fabrication = 1,221 Hosent hours
Assembly = 34 Manhours

Chezbah Cruiser Particle Cannon
PB Damage 9500
Energy Required: 300

Mass: 9,025 Kg
Range Class: C
ROF: 1/2
Piloting Impairment 80%
Material Collection 1,934 Manhours
Parts Fabrication = 3,771 Hosent hours
Assembly = 93 Manhours

Flying Fortress Super Particle Cannon

PB Damage 80,000
Energy Required: 21,000
Mass: 640,000 Kg
Range Class: E
ROF: 1/2
Piloting Impairment 195%
Material Collection 139,765 Manhours
Parts Fabrication = 320,000 Hosent hours
Assembly = 6,976 Manhours

Designing Particle Weapons

When designing a particle weapon, the primary considerations are damage, range, energy use, mass and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the particle weapon design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Electrical

When a particle weapon is used in a vehicle, the vehicle gets one 10% piloting Impairment per particle weapon.

If the particle weapon is being used in stationary emplacement, it requires a successful Artillery Operation skill roll to hit a target. This roll gets a 0% Impairment to start out.

PB Damage: Select a number of points that the particle weapon will do in damage at the point blank range bracket. For every 1000 points of damage the particle weapon will do the build gets 1 CP.

Intensity: Particle weapons have an intensity value of 300,000 to start out with. This effects how much energy is required to do the desired points of damage.

Energy Required: The energy the particle weapon requires to do increasing amounts of damage increases dramatically. Use the formula below to get the number of energy units that are required to power the particle weapon.

PB Damage x PB Damage / Intensity

Multiply the Point Blank Damage you chose earlier by the Point Blank Damage (again) and then divide by the particle weapon's Intensity value.

Mass: For each point of Energy Required, the particle weapon starts with a mass of 50 Kg.

Range Class: Particle weapons start with a range class of A.

Rate of Fire: Particle weapons normally fire once in a turn so their rate of fire is 1. Add 50 CP to add 1 to the particle weapon's rate of fire and multiply the Energy Required by the ROF.

Add 1 CP to reduce the mass of the particle weapon by 1 Kg per Energy Required. The particle weapon cannot weigh less than 30 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Intensity value by 10,000.

Add 3 CP to increase the range class of the particle weapon each letter class up to B. Add 9 CP to increase the range class each letter past this up to C. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 30 CP to the challenge.

Subtract 4 CP to reduce the range class of the particle weapon by one letter.

Roll to overcome the Tech Challenge and apply it's effects.

Calculating Damage

The damage that a Particle Weapon does at various ranges is based on it's Point Blank (PB) Damage. Take the PB Damage and multiply it by the following numbers.

Short (S) x 0.88

Medium (Med) x 0.4

Long (L) x 0.08

Extreme (Ex) x 0.008

Building Meta Atom Weapons

Meta Atom weapons are long range weapons. The damage they do remains very close to their point blank damage even at the end of their range.

TF-2394 Meta Cannon
PB Damage 400
Energy Required: 17.5
Mass: 1898 Kg
Range Class: E
ROF: 1
Piloting Impairment 50%
Material Collection 450 Manhours
Parts Fabrication = 426 Hosent hours
Assembly = 19.7 Manhours

Designing Meta Atom Weapons

When designing a meta gun, the primary considerations are damage, range, energy use, mass and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the meta gun design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Electrical

When a meta gun is used in a vehicle, the vehicle gets one 5% piloting Impairment per meta gun.

If the meta gun is being used in stationary emplacement, it requires a successful Artillery Operation skill roll to hit a target. This roll gets a 0% Impairment to start out.

PB Damage: Select a number of points that the meta gun will do in damage at the point blank range bracket. For every 60 points of damage the meta gun will do the build gets 1 CP.

Intensity: Meta Guns have an intensity value of 10,000 to start out with. This effects how much energy is required to do the desired points of damage.

Energy Required: The energy the meta gun requires to do increasing amounts of damage increases dramatically. Use the formula below to get the number of energy units that are required to power the meta gun.

PB Damage x PB Damage / Intensity

Multiply the Point Blank Damage you chose earlier by the Point Blank Damage (again) and then divide by the meta gun's Intensity value.

Mass: For each point of Energy Required, the meta gun starts with a mass of 250 Kg.

Range Class: Meta Guns start with a range class of D.

Rate of Fire: Meta Guns normally fire once per turn so their rate of fire is 1. Add 15 CP to add 1 to the meta gun's rate of fire and multiply the Energy Required by the ROF.

Add 1 CP to reduce the mass of the meta gun by 10 Kg per Energy Required. The meta gun cannot weigh less than 100 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Intensity value by 500.

Add 3 CP to increase the range class of the meta gun each letter class up to F. Add 9 CP to increase the range class each letter past this up to H. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 30 CP to the challenge.

Subtract 4 CP to reduce the range class of the meta gun by one letter.

Roll to overcome the Tech Challenge and apply it's effects.

Calculating Damage

The damage that a meta atom does at various ranges is based on it's Point Blank (PB) Damage. Take the PB Damage and multiply it by the following numbers.

Short (S) x1

Medium (Med) x 0.88

Long (L) x 0.88

Extreme (Ex) x 0.5

Building Projectile Weapons

Gas powered Weapons do not require a significant amount of energy to operate as their energy is in the ammunition. The main performance impact of a traditional projectile weapon is the mass of the weapon and its ammunition which can be considerable.

Below are two variations on projectile weapons use electrical power. These are EMP guns (Electro-Magnetic Pulse) that use coils or rails to create a magnetic field that accelerate the projectile from the barrel, or to concentrate the expanding gas from a gas propelled shell.

TF-2394 Projectile Cannon
PB Damage 500
Mass: 1,367.9 Kg
Range Class: D
Payload: 4
ROF: 1
Piloting Impairment 75%
Material Collection 308 Manhours
Parts Fabrication = 276 Hosent hours
Assembly = 14 Manhours

GRX Storm Main Cannon
PB Damage 900
Mass: 3,252 Kg
Range Class: D
Payload: 50
ROF: 1
Piloting Impairment 60%
Material Collection 679 Manhours
Parts Fabrication = 1411 Hosent hours
Assembly = 31 Manhours

Designing Projectile Weapons

When designing a projectile weapon, the primary considerations are damage, range, mass, rate of fire, payload and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the projectile weapon design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Chemical

Ammunition Required: Projectile Payload

When a projectile weapon is used in a vehicle, the vehicle gets one 20% piloting Impairment per projectile weapon.

If the projectile weapon is being used in stationary emplacement, it requires a successful Artillery Operation skill roll to hit a target. This roll gets a 10% Impairment to start out.

PB Damage: Select a number of points that the projectile weapon will do in damage at the point blank range bracket. For every 200 points of damage the projectile weapon will do the build gets 1 CP.

Intensity: Projectile weapons have an intensity value of 6,000 to start out with. This effects the mass of ammunition required to do the desired points of damage.

Energy Required: Projectile weapons do not normally require any external energy. All the energy the weapon needs is contained in the shell casings. This does not mean the weapon doesn't use energy.

PB Damage x PB Damage / Intensity

Multiply the Point Blank Damage you chose earlier by the Point Blank Damage (again) and then divide by the projectile weapon's Intensity value.

Mass: For each point of Energy Required, the projectile weapon starts with a mass of 40 Kg per Energy Required.

Range Class: Projectile weapons start with a range class of B.

Rate of Fire: Projectile weapons have a ROF of 1 to start. Add 1 CP to add 1 to the projectile weapon's rate of fire.

Add 1 CP to reduce the mass of the projectile weapon by 1 Kg per Energy Required. The projectile weapon cannot weigh less than 15 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Intensity value by 500.

Add 3 CP to increase the range class of the projectile weapon each letter class up to D. Add 9 CP to increase the range class each letter past this up to E. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 30 CP to the challenge.

Subtract 4 CP to reduce the range class of the projectile weapon by one letter.

Roll to overcome the Tech Challenge and apply it's effects.

Payload

Determine a number of rounds that the projectile weapon should store. This is the Payload of the weapon. Add the result of the following formula to the mass of the weapon.

Payload x PB Damage x 60 / Intensity = Mass of Payload in Kg

Example: A projectile cannon with a Point Blank Damage of 200, an Intensity of 6,000 and a payload of 10 has the following mass. 10 x 200 x 60 / 6,000 = 20 Kg

Calculating Damage

The damage that a projectile does at various ranges is based on it's Point Blank (PB) Damage. Take the PB Damage and multiply it by the following numbers.

Short (S) x1

Medium (Med) x 0.9

Long (L) x 0.8

Extreme (Ex) x 0.5

Building Mechanical Projectile Weapons

Projectile weapons such as catapults use stored mechanical energy to launch a projectile on a ballistic trajectory. These weapons take less time to collect materials for and are simpler to construct. Often, rubble can be used as the projectiles making any local source of material usable ammunition.

Unlike chemically powered projectile weapons, mechanical powered weapons require an external energy source, in most cases to reset them to a ready firing state. This energy can be provided by human or animal muscle power or by another source like an internal combustion engine. However these weapons are usually designed to be set to fire by using very little power that is stored up over time. For instance a catapult that does 50 points of damage can be reset over twenty minutes by two men putting out only 0.006 EU each.

Designing Mechanical Projectile Weapons

When designing a projectile weapon, the primary considerations are damage, range, mass, rate of fire, payload and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the projectile weapon design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Mechanical

Ammunition Required: Projectile Payload

When a projectile weapon is used in a vehicle, the vehicle gets one 40% piloting Impairment per projectile weapon.

If the projectile weapon is being used in stationary emplacement, it requires a successful Artillery Operation skill roll to hit a target. This roll gets a 20% Impairment to start out.

PB Damage: Select a number of points that the projectile weapon will do in damage at the point blank range bracket. For every 50 points of damage the projectile weapon will do the build gets 1 CP.

Intensity: Projectile weapons have an intensity value of 2,000 to start out with. This effects the mass of ammunition required to do the desired points of damage.

Energy Required: Mechanical projectile require external power to launch a projectile or to reset. However mechanical projectile weapons often store energy in springs, torsion mechanisms or in weights over a period of minutes so not all of the energy is needed at once.

PB Damage x PB Damage / Intensity

Multiply the Point Blank Damage you chose earlier by the Point Blank Damage (again) and then divide by the projectile weapon's Intensity value.

Mass: For each point of Energy Required, the projectile weapon starts with a mass of 80 Kg per Energy Required.

Range Class: Mechanical projectile weapons start with a range class of A.

Rate of Fire: Projectile weapons have a ROF of 1 to start. Add 10 CP to add 1 to the projectile weapon's rate of fire. Multiply the energy required by the ROF.

Add 1 CP to reduce the mass of the projectile weapon by 1 Kg per Energy Required. The projectile weapon cannot weigh less than 15 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Intensity value by 500.

Add 3 CP to increase the range class of the projectile weapon each letter class up to C. Add 9 CP to increase the range class each letter past this up to D. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 30 CP to the challenge.

Subtract 4 CP to reduce the range class of the projectile weapon by one letter.

Roll to overcome the Tech Challenge and apply it's effects.

Payload

Determine a number of rounds that the projectile weapon should store. This is the Payload of the weapon. Add the result of the following formula to the mass of the weapon.

Payload x PB Damage x PB Damage / Intensity = Mass of Payload in Kg

Calculating Damage

The damage that a projectile does at various ranges is based on it's Point Blank (PB) Damage. Take the PB Damage and multiply it by the following numbers.

Short (S) x1

Medium (Med) x 0.9

Long (L) x 0.8

Extreme (Ex) x 0.5

Building Electro-Thermal Chemical Weapons

ETC guns use chemical charge to accelerate a shell down a barrel like a regular chemical powered weapon, but unlike a regular gas powered gun, the ETC uses a powerful electrical field to keep the expanding gas in a column behind the shell even after it has left the barrel. This allows the shell to be pushed further and harder than a traditional gas powered weapon.

KS-10 Main Cannon

PB Damage 500
Mass: 1564 Kg
Range Class: D
Energy Required: 5
Payload: 50
ROF: 1
Piloting Impairment 40%
Material Collection 364 Manhours
Parts Fabrication = 628 Hosent hours
Assembly = 16 Manhours

Designing Electro-Thermal Chemical Weapons

When designing a ETC weapon, the primary considerations are damage, range, energy use, mass, rate of fire, payload and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the ETC weapon design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Electrical

Ammunition Required: Projectile Payload

When a ETC weapon is used in a vehicle, the vehicle gets one 30% piloting Impairment per ETC weapon.

If the ETC weapon is being used in stationary emplacement, it requires a successful Artillery Operation skill roll to hit a target. This roll gets a 0% Impairment to start out.

PB Damage: Select a number of points that the ETC weapon will do in damage at the point blank range bracket. For every 50 points of damage the ETC weapon will do the build gets 1 CP.

Intensity: ETC weapons have an intensity value of 3,000 to start out with. This effects how much energy is required to do the desired points of damage.

Energy Required: The energy the ETC weapon requires is partly supplied by the chemical propellant in the shell and partly electrical to power electromagnets in the barrel. Use the formula below to get the number of energy units that are required to power the ETC weapon.

PB Damage x PB Damage / Intensity

Multiply the Point Blank Damage you chose earlier by the Point Blank Damage (again) and then divide by the ETC weapon's Intensity value. This is the total energy use by the weapon.

The electromagnets in the barrel of the ETC weapon use one tenth of the total energy.

Total Energy Required /10 = Electrical Energy Required.

Mass: For each point of Energy Required, the ETC weapon starts with a mass of 40 Kg.

Range Class: ETC weapons start with a range class of C.

Rate of Fire: The massive magnetic fields that build up on the ETC weapon take time to cycle. This means that most ETC weapons have a ROF of 1. It is less efficient to make a

ETC weapon fire more than one pulse during a turn. Add 4 CP to add 1 to the ETC weapon's rate of fire and multiply the Electrical Energy Required by the ROF.

Add 1 CP to reduce the mass of the ETC weapon by 1 Kg per Energy Required. The ETC weapon cannot weigh less than 30 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Intensity value by 500.

Add 3 CP to increase the range class of the ETC weapon each letter class up to E. Add 9 CP to increase the range class each letter past this up to F. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 30 CP to the challenge.

Subtract 4 CP to reduce the range class of the ETC weapon by one letter.

Roll to overcome the Tech Challenge and apply it's effects.

Payload

The payload that is stored in the weapon has a slightly smaller mass than traditional gas powered projectiles.

Determine a number of rounds that the ETC weapon should store. This is the Payload of the weapon. Add the result of the following formula to the mass of the weapon.

Payload x PB Damage x 50 / Intensity = Mass of Payload in Kg

Example: A ETC cannon with a Point Blank Damage of 500, an Intensity of 3,000 and a payload of 50 has the following mass. 50 x 500 x 50 / 3,000 = 417 Kg

Calculating Damage

The damage that a projectile does at various ranges is based on it's Point Blank (PB) Damage. Take the PB Damage and multiply it by the following numbers.

Short (S) x1

Medium (Med) x 0.9

Long (L) x 0.85

Extreme (Ex) x 0.5

Building Electro-Magnetic Weapons

Electro-Magnetic Projectile launchers can use several different principles to accelerate a projectile. These can include rail guns, coil guns, or pulse guns. Although each uses very different principles to operate but the effect is similar, a projectile is accelerated to ballistic velocities using a magnetic field.

Designing Electro-Magnetic Projectile Weapons

When designing an Electromagnetic weapon, the primary considerations are damage, range, energy use, mass, rate of fire, payload and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the Electromagnetic weapon design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Electrical

Ammunition Required: Projectile Payload

When a Electromagnetic weapon is used in a vehicle, the vehicle gets one 30% piloting Impairment per Electromagnetic weapon.

If the Electromagnetic weapon is being used in stationary emplacement, it requires a successful Artillery Operation skill roll to hit a target. This roll gets a 0% Impairment to start out.

PB Damage: Select a number of points that the Electromagnetic weapon will do in damage at the point blank range bracket. For every 50 points of damage the Electromagnetic weapon will do, the build gets 1 CP.

Intensity: Electromagnetic weapons have an intensity value of 6,000 to start out with. This effects how much energy is required to do the desired points of damage.

Energy Required: The energy the Electromagnetic weapon requires is electrical to power electromagnets in the barrel. Use the formula below to get the number of energy units that are required to power the Electromagnetic weapon.

PB Damage x PB Damage / Intensity

Multiply the Point Blank Damage you chose earlier by the Point Blank Damage (again) and

then divide by the Electromagnetic weapon's Intensity value. This is the total energy use by the weapon.

Mass: For each point of Energy Required, the Electromagnetic weapon starts with a mass of 50 Kg.

Range Class: Electromagnetic weapons start with a range class of C.

Rate of Fire: The massive magnetic fields that build up on the Electromagnetic weapon take time to cycle. This means that most Electromagnetic weapons have a ROF of 1. It is less efficient to make a Electromagnetic weapon fire more than one pulse during a turn. Add 4 CP to add 1 to the Electromagnetic weapon's rate of fire and multiply the Energy Required by the ROF.

Add 1 CP to reduce the mass of the Electromagnetic weapon by 1 Kg per Energy Required. The Electromagnetic weapon cannot weigh less than 20 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Intensity value by 500.

Add 3 CP to increase the range class of the Electromagnetic weapon each letter class up to F. Add 9 CP to increase the range class each letter past this up to G. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 30 CP to the challenge.

Subtract 4 CP to reduce the range class of the Electromagnetic weapon by one letter.

Roll to overcome the Tech Challenge and apply it's effects.

Payload

The payload that is stored in the weapon has a smaller mass than traditional gas powered projectiles.

Determine a number of rounds that the Electromagnetic weapon should store. This is the Payload of the weapon. Add the result of the following formula to the mass of the weapon.

Payload x PB Damage / Intensity = Mass of Payload in Kg

Example: A Electromagnetic cannon with a Point Blank Damage of 500, an Intensity of 5,000 and a payload of 500 has the following mass. 500 x 500 / 5,000 = 50 Kg

Calculating Damage

The damage that a projectile does at various ranges is based on it's Point Blank (PB) Damage. Take the PB Damage and multiply it by the following numbers.

Short (S) x1

Medium (Med) x 0.9

Long (L) x 0.85

Extreme (Ex) x 0.5

Building Missile Launchers

Missiles are different from most other weapon systems because the weapons mass consists primarily of ammunition. Because the missile provides the thrust with little impact on the vehicle, the bulky reinforcements that withstand the stresses of a projectile weapon firing are not needed. This makes the payload the missile can deliver much higher.

KS-10 Missile Launcher

PB Damage 2,000
Mass: 1403 Kg
Range Class: E
Blast Range Class: B
Payload: 5
ROF: 1-5
Fire Arcs: 4
Piloting Impairment 90%
Material Collection 325 Manhours
Parts Fabrication = 356 Hosent hours
Assembly = 12 Manhours

Vanguard Missile Launcher

PB Damage 1,000
Mass: 734.7 Kg
Range Class: C
Blast Range Class: B
Payload: 20
ROF: 5-20
Fire Arcs: 1
Piloting Impairment 230%
Material Collection 252 Manhours
Parts Fabrication = 106 Hosent hours
Assembly = 7 Manhours

Designing Missile Launchers

When designing a missile launcher, the primary considerations are damage, range, blast range, mass, payload and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the missile launcher design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Chemical

Ammunition Required: Missile Payload

When a missile launcher is used in a vehicle, the vehicle gets one 10% piloting Impairment per missile launcher.

If the missile launcher is being used in stationary emplacement, it requires a successful Artillery Operation skill roll to hit a target. This roll gets a 10% Impairment to start out.

PB Damage: Select a number of points that the missile launcher will do in damage at the point blank range bracket. For every 200 points of damage the missile launcher will do the build gets 1 CP.

Intensity: Missile Launchers have an intensity value of 15,000 to start out with. This effects the mass of ammunition required to do the desired points of damage.

Energy Required: Missile Launchers do not normally require any external energy. All the energy the weapon needs is contained in the missile itself. This does not mean the weapon doesn't use energy, the energy value here is in the propellant and warhead.

PB Damage x PB Damage / Intensity

Multiply the Point Blank Damage you chose earlier by the Point Blank Damage (again) and then divide by the missile launcher's Intensity value.

Mass: For each point of Energy Required, the missile launcher starts with a mass of 2 Kg per Energy Required.

Range Class: Missile Launchers start with a range class of C.

Blast Range Class: Missile Launchers start with a blast range class of A.

Rate of Fire: Missile Launchers have a ROF of 1 to start. Add 1 CP to add 1 to the missile launcher's rate of fire.

Add 1 CP to reduce the mass of the missile launcher by 1 Kg per Energy Required. The missile launcher cannot weigh less than 1 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Intensity value by 500.

Add 3 CP to increase the range class of the missile launcher each letter class up to E. Add 9 CP to increase the range class each letter past this up to F. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 30 CP to the challenge.

Add 5 CP to increase the blast range class of the missile launcher each letter class up to B. Add 15 CP to increase the range class each letter past this up to C. Any range class increases past this should be specifically be okayed by the GM because they require technology that is not commonly available and add 50 CP to the challenge.

Subtract 4 CP to reduce the range class of the missile launcher by one letter.

Missiles can redirect themselves if designed to do so. Add one CP to the design challenge for each fire arc the missiles can fire into from their mounted position.

Roll to overcome the Tech Challenge and apply it's effects.

Payload

Determine a number of rounds that the missile launcher should store. This is the Payload of the weapon. Add the result of the following formula to the mass of the weapon.

Payload x Energy Required = Mass of Payload in Kg

Example: A missile launcher with a Point Blank Damage of 2000, an Intensity of 15,000 and a payload of 5 has the following mass. 10 x 2000 x 2000 / 15,000 = 1,333 Kg

Calculating Damage

The damage that an explosive missile does is based on it's PB Damage. The numbers given below are for the Blast Range Class.

Short (S) x1

Medium (Med) x 0.9

Long (L) x 0.85

Extreme (Ex) x 0.5

Shields

There are two types of force fields or shields that are in use on The Artifact. The most common is the ion cascade barrier in which a powerful magnetic field envelops the vehicle and a curtain of ionized gas or plasma that deflects projectiles or disperses energy.

The second kind is much less common and there is only one design. The Kerdi use a field that dampens and absorbs energy. Very little is understood about this type of shield and removing them from a Kerdi takes great skill as they are highly integrated into the Kerdi's systems.

Ion Cascade Shields

Ion cascade shields are the standard shields used on The Artifact. They use a powerful magnetic field to accelerate a curtain of ionized gas (usually from the air in an atmosphere) around a building or vehicle. This curtain diffuses laser light and has enough force to deflect plasma and even projectiles.

100 pt Shield

Hit Points: 100
Energy Required: 10
Mass:18 Kg
Piloting Impairment 30%
Sensor Impairment 10%
ECM Impairment 20%
Material Collection 43.6 Manhours
Parts Fabrication = 4 Hosent hours
Assembly = .2 Manhour

TF-2394 Shield

Hit Points: 200
Energy Required: 4.47
Mass:72.6 Kg
Piloting Impairment 35%
Sensor Impairment 20%
ECM Impairment 26%
Material Collection 58 Manhours
Parts Fabrication = 9 Hosent hours
Assembly = 1 Manhour

Rall 4 Shield

Hit Points: 260
Energy Required: 9.55
Mass:176 Kg
Piloting Impairment 30%
Sensor Impairment 21%
ECM Impairment 45%
Material Collection 55 Manhours
Parts Fabrication = 38 Hosent hours
Assembly = 1.7 Manhours

Delta Shield

Hit Points: 400
Energy Required: 19
Mass:282 Kg
Piloting Impairment 35%
Sensor Impairment 10%
ECM Impairment 20%
Material Collection 128 Manhours
Parts Fabrication = 79 Hosent hours
Assembly = 3.4 Manhours

Kelrath Freighter Shield

Hit Points: 500
Energy Required: 26
Mass:558.7 Kg
Piloting Impairment 35%
Sensor Impairment 0%
ECM Impairment 8%
Material Collection 558 Manhours
Parts Fabrication = 281 Hosent hours
Assembly = 5.5 Manhours

When designing a Ion Cascade Shield, the primary considerations are Hit Points,, energy use and mass.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the ICS design challenge but do have to follow the rules under Build Time for each weapon produced.

Input Power Required: Electrical

When a ICS is used in a vehicle, the vehicle gets one 20% piloting Impairment per shield.

If the shield is being used in stationary emplacement, it requires a successful Electrical Repair skill roll to activate. This roll gets a 50% Advantage to start out.

ICS are electromagnetically noisy. In some situations this may not matter to a designer but an ICS starts out reducing local sensor's effectiveness by reducing their skill Advantage by 10% and reduce an ECM's skill Advantage by 20% for each shield.

Hit Points: Select a number of points that the ICS will protect from. For every 50 points of damage the ICS deflects a turn the build gets 1 CP.

Efficiency: Each ICS has an Efficiency rating that effects it's power consumption.

This rating starts at 20% when protecting light vehicles or anything smaller than 5 meters to a side.

Efficiency starts at 15% for medium vehicles or anything smaller than 10 meters to a side.

Heavy vehicles or anything larger than 15 meters start with an efficiency of 10%.

Super Heavy vehicles and anything larger than 20 meters to a side start with an efficiency of 5%

Energy Required: The energy the ICS requires to protect against damage increases dramatically as the damage goes up. Use the formula below to get the number of energy units that are required to power the shield.

HP x HP / Efficiency / 40,000 = Energy Required

Multiply the Hit Points you chose earlier by the Hit Points (again), then divide by the ICS decimal Efficiency value and then divide by 40,000.

Mass: For each point of Energy Required, the ICS starts with a mass of 20 Kg.

Add 1 CP to reduce the mass of the ICS by 1 Kg per Energy Required. The ICS cannot weigh less than 18 Kg per Energy Required with currently available technology.

Add 1 CP to increase the Efficiency value by 5%. The maximum Efficiency value for an ICS is 25% with currently available technology.

Add 1 CP to decrease the electromagnetic noise generated by the shield 5% against Sensor and ECM Advantages.

Roll to overcome the Tech Challenge and apply it's effects.

When the character rolls to design a force field, use the following tables. If the roll against the Tech Challenge succeeds, use the Successful Transform table. If the roll fails use the Failure Transform table.

Successful Transform
Roll 1d6

1 Increase Mass 1 Kg per Energy Point
or
Decrease Efficiency by 1%

2 Increase Mass 1 Kg per Energy Point
or
Increase power required by 1 Energy Point

3 Material collection takes 20 additional manhours per weapon built
or
Decrease local sensors and ECMs by 5% more

4 Increase Piloting Impairment by 10% if being used in a vehicle, Decrease the advantage to start 5% if being used as stand alone shield
or
Increase Mass 1 Kg per Energy Point

5 Decrease sensors and ECMs by 5% more
or
Decrease Efficiency by 1%

6 Skill used in last attempt is no longer effective until 4 CP are reduced in one roll and the next attempt requires that at least 2 CP reduced to make progress.

Failure Transform
Roll 1d10

1 Increase Mass 5 Kg per Energy Point
or
Decrease Efficiency by 5%

2 Increase Mass 5 Kg per Energy Point
or
Increase power used by 5 Energy Points

3 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of weapon mass

4 The engineer failing the roll is injured when testing the prototype (1d10 damage) if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a 1 work day turn gives a 8% advantage)

5 Someone else gets injured (1d10 damage) when testing the prototype if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a combat turn gives a 0% advantage)

6 Fire! 1d100 Kg of materials must be gathered and processed again.

7 An NPC involved in building the prototype takes 2d10 damage if they do not make a Reflex roll. The skill used is no longer effective.

8 Increase Piloting Impairment by 30% if being used in a vehicle, Decrease the advantage to start 20% if being used as stand alone shield

9 The design challenge is now immune to the skill that was just used.

10 Messed up! The design gains 3 CP.

All transforms are suggestions. The GM can alter or introduce different transforms as they deem fit. Alternatively the Player may request a different transform or suggest their own but the GM should make sure it introduces interesting conditions to the build.

Optional Rule: For very large builds that will take dozens if not hundreds of rolls, before any rolls are made, the player can opt to reduce a number of CP for each Fractional Success but all transform effects are multiplied by the number of CP.

Example: The player decides to reduce 10 CP with each fractional success. They get a transform of "Increase Mass 1Kg per Energy Point". This becomes "Increase Mass 10 Kg per Energy Point" for this roll.

Kerdi Shields

Kerdi Shields are omnidirectional shields but can only absorb energy from all fire arcs. They are ineffective against projectile weapons and cannot be combined with Ion Cascade Shields.

Kerdi Shields also give a camouflage bonus in dark conditions and from sensors.

HP	Energy	Mass
400	+1 per HP absorbed	1200 Kg

ECM Advantage 60%
Camouflage Advantage 60%

Removing a Kerdi's shields from the robot is a 40 CP tech challenge and it disables the robot

Sensors and Countermeasures

Sensors are used to enhance a person's ability to perceive the world. In this section sensors refer to a cluster of devices such as radar, sonar, infrared cameras, laser range finders and optical cameras.

Electromagnetic Countermeasures are used to foil sensors. They are systems for obscuring sensors technology like radar. ECMs often make use of powerful radio transmitters to confuse radar readings and lasers used to blind cameras and infrared sensors.

When the character rolls to design a sensor system, use the following tables. If the roll against the Tech Challenge succeeds, use the Successful Transform table. If the roll fails use the Failure Transform table.

Successful Transform
Roll 1d6

1 Increase Mass 1 Kg per Energy Point
or
Decrease Efficiency 1%

2 Increase Mass 1 Kg per Energy Point
or
Increase power required by 1 Energy Point

3 Material collection takes 20 additional manhours per system built
or
Decrease skill Advantage by 5%

4 Increase Piloting Impairment by 10% if being used in a vehicle, Decrease skill Advantage by 5%
or
Increase Mass 1 Kg per Energy Point

5 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of weapon mass.
or
Decrease skill Advantage by 5%

6 Skill used in last attempt is no longer effective until 4 CP are reduced in one roll and the next attempt requires that at least 2 CP reduced to make progress.

Failure Transform

Roll 1d10

1 Increase Mass 5 Kg per Energy Point
or
Decrease skill Advantage by 30%

2 Increase Mass 2 Kg per Energy Point
or
Decrease Efficiency 5%

3 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of system mass

4 The engineer failing the roll is injured when testing the prototype (1d10 damage) if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a 1 work day turn gives a 8% advantage)

5 Someone else gets injured (1d10 damage) when testing the prototype if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a combat turn gives a 0% advantage)

6 Fire! Vehicles take 1d100 damage or 1d100 Kg of materials must be gathered and processed again.

7 An NPC involved in building the prototype takes 2d10 damage if they do not make a Reflex roll. The skill used is no longer effective.

8 Increase Piloting Impairment by 30% if being used in a vehicle, Decrease the skill Advantage 30% if being used as stand alone system.

9 The design challenge is now immune to the skill that was just used.

10 Messed up! The design gains 3 CP.

All transforms are suggestions. The GM can alter or introduce different transforms as they deem fit. Alternatively the Player may request a different transform or suggest their own but the GM should make sure it introduces interesting conditions to the build.

Optional Rule: For very large builds that will take dozens if not hundreds of rolls, before any rolls are made, the player can opt to reduce a number of CP for each Fractional Success but all transform effects are multiplied by the number of CP.

Example: The player decides to reduce 10 CP with each fractional success. They get a transform of "Increase Mass 1Kg per Energy Point". This becomes "Increase Mass 10 Kg per Energy Point" for this roll.

Sensors

The statistics below are for sensor clusters that include radar, low light, infrared, ultraviolet, spotlights, parabolic microphones and sonar.

TF-2394 Sensor Suite

Sensor Advantage 100%
Range Class D
Energy Required: 10.4
Mass: 221 Kg
Piloting Impairment 20%
Material Collection 194 Manhours
Parts Fabrication = 22 Hosent hours
Assembly = 2.2 Manhours

Designing Sensors

When designing a system of sensors, the primary considerations are range, energy use, mass and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the design challenge but do have to follow the rules under Build Time for each system produced.

Input Power Required: Electrical

When sensors are used in a vehicle, the vehicle gets one 20% piloting Impairment to start out with.

Select a percent value for the sensor's skill Advantage. This is their ease of use and gives an Advantage roll to the character while using the sensors. Select a value between 0% and 80%. For every 10% of skill Advantage add 1 CP to the design challenge.

Range Class: Select a range class and note it's Extreme range bracket in Kilometers. Range class A equals 0.03, B equals .3 C equals 1 etc. The design gets 1 CP for every range class (A=1, B=2 C=3 etc.).

Efficiency: Sensors have an Efficiency rating that effects it's power consumption. This rating starts at 80%

Energy Required: The energy the sensor system requires is based on range and skill Advantage. Use the formula below to get the number of energy units that are required to power the sensors.

Ex Range x Skill Advantage / Efficiency = Energy Required

Multiply the sensor's extreme range bracket (in Kilometers) you chose earlier by the decimal value of the Skill Advantage divided by the Efficiency decimal value. If the skill advantage is 0% use the value 0.005.

Mass: For each point of Energy Required, the Sensors start with a mass of 30 Kg.

Add 1 CP to reduce the mass of the sensor system by 1 Kg per Energy Required. The sensors cannot weigh less than 20 Kg per Energy Required with currently available technology.

Add 1 CP to increase the sensor's Efficiency by 1%.

Roll to overcome the Tech Challenge and apply it's effects.

Turrets and Sensors

Visual sensors are only pointed in one fire arc unless they are mounted on a turret like the head of an E-Suit.

Electro-Magnetic Counter Measures

Electromagnetic counter measures include flares, chaff, optics sensor blinding lasers, radio jammer and sound dampeners. ECMs are used to fool enemy sensors by making false sensor readings, make the system with the ECM disappear or make the system seem to jump around erratically. These systems are designed to prevent sensors from locking onto the system with the ECM.

TF-2394 ECMs
ECM Advantage 100%
Range Class C
Energy Required: 1.3
Mass: 30.7 Kg
Piloting Impairment 20%
Material Collection 146 Manhours
Parts Fabrication = 3.1 Hosent hours
Assembly = 0.3 Manhours

Kelrath Freighter ECMs
ECM Advantage 56%
Range Class D
Energy Required: 215
Mass: 5253 Kg
Piloting Impairment 20%
Material Collection 1120.8 Manhours
Parts Fabrication = 1394 Hosent hours
Assembly = 52 Manhours

Designing ECMs

When designing ECMs, the primary considerations are range, energy use, mass and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the sensor design challenge but do have to follow the rules under Build Time for each system produced.

Input Power Required: Electrical

When ECMs are used in a vehicle, the vehicle gets one 20% piloting Impairment to start out with.

Select a percent value for the ECM skill Advantage. This is their ease of use and gives an Advantage roll to the character while using the ECM. Select a value between 0% and 80%. For every 10% of skill Advantage add 1 CP to the design challenge.

Range Class: Select a range class and note it's Extreme range bracket in Kilometers. Range class A equals 0.03, B equals .3 C equals 1 etc. The build gets 1 CP for every range class (A=1, B=2 C=3 etc.).

Efficiency: ECMs have an Efficiency rating that effects it's power consumption.

This rating starts at 60% when protecting light vehicles or anything smaller than 5 meters to a side.

Efficiency starts at 40% for medium vehicles or anything smaller than 10 meters to a side.

Heavy vehicles or anything larger than 15 meters start with an efficiency of 20%.

Super Heavy vehicles and anything larger than 20 meters to a side start with an efficiency of 10%

Energy Required: The energy the ECM system requires is based on range and skill Advantage. Use the formula below to get the number of energy units that are required to power the ECMs.

Ex Range x Ex Range x Skill Advantage / Efficiency = Energy Required

Multiply the ECM's extreme range bracket (in Kilometers) you chose earlier by the extreme range bracket by the decimal value of the Skill Advantage divided by the Efficiency decimal value. If the skill advantage is 0% use the value 0.005.

Mass: For each point of Energy Required, the ECMs start with a mass of 160 Kg.

Add 1 CP to reduce the mass of the sensor system by 1 Kg per Energy Required. The ECMs cannot weigh less than 80 Kg per Energy Required with currently available technology.

Add 1 CP to increase the ECM's Efficiency by 1%.

Roll to overcome the Tech Challenge and apply it's effects.

Electro-Magnetic Counter Counter Measures

ECCMs consist of radar boosters, software to filter through ECM interference, sidelobe comparison antenna and radar jammer location systems.

TF-2394 ECCMs

ECCM Advantage 20%
Range Class B
Energy Required: 0.08
Mass: 2.6 Kg
Piloting Impairment 20%
Material Collection 150 Manhours
Parts Fabrication = 0.5 Hosent hours
Assembly = 0 Manhours

Kelrath Freighter ECCMs

ECCM Advantage 50%
Range Class C
Energy Required: 4.6
Mass: 165 Kg
Piloting Impairment 20%
Material Collection 113 Manhours
Parts Fabrication = 22 Hosent hours
Assembly = 1.6 Manhours

Designing ECCMs

When designing ECCMs, the primary considerations are range, energy use, mass and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the design challenge but do have to follow the rules under Build Time for each system produced.

Input Power Required: Electrical

When ECCMs are used in a vehicle, the vehicle gets one 20% piloting Impairment to start out with.

Select a percent value for the ECCM skill Advantage. This is their ease of use and gives an Advantage roll to the character while using the ECCM. Select a value between 0% and 80%. For every 5% of skill Advantage add 1 CP to the design challenge.

Range Class: Select a range class and note it's Extreme range bracket in Kilometers. Range class A equals 0.03, B equals .3 C equals 1 etc. The build gets 1 CP for every range class (A=1, B=2 C=3 etc.).

Efficiency: ECCMs have an Efficiency rating that effects it's power consumption. This rating starts at 60%

Energy Required: The energy the ECCM system requires is based on range and skill Advantage. Use the formula below to get the number of energy units that are required to power the ECCMs.

Ex Range x Ex Range x Skill Advantage / Efficiency = Energy Required

Multiply the ECCM's extreme range bracket (in Kilometers) you chose earlier by the extreme range bracket by the decimal value of the Skill Advantage divided by the Efficiency decimal value. If the skill advantage is 0% use the value 0.005.

Mass: For each point of Energy Required, the ECCMs start with a mass of 40 Kg.

Add 1 CP to reduce the mass of the sensor system by 1 Kg per Energy Required. The ECCMs cannot weigh less than 20 Kg per Energy Required with currently available technology.

Add 1 CP to increase the ECCM's Efficiency by 1%.

Roll to overcome the Tech Challenge and apply it's effects.

Illumination

In locations where lighting has failed either because of a lack of power or because the lighting systems have failed, it is important to provide lighting for movement and to illuminate living areas. This can often involve lighting large areas.

Lighting is an aid to human vision but illumination can also be an aid to various sensor systems. Things like infrared illuminators, tone generators for sonar and radar signal boosters also fall under this category.

Illumination adds an Advantage to the use of a sensor. This includes human vision (Range Class D).

Designing Illumination

When designing Illumination, the primary considerations are what kind of sensor the illuminators aid (such as lighting for vision and cameras), range, energy use, mass and ease of use.

Once the design is completed, the engineer can produce as many of that design as is needed. They do not have to roll again for the design challenge but do have to follow the rules under Build Time for each system produced.

Input Power Required: Electrical

When Illuminators are used in a vehicle, the vehicle gets one 5% piloting Impairment to start out with.

Select a percent value for the Illumination Advantage. This is the intensity of the illumination. Select a value between 10% and 100%. For every 10% of Advantage add 1 CP to the design challenge.

Range Class: Select a range class and note it's Extreme range bracket in Kilometers. Range class A equals 0.03, B equals .3 C equals 1 etc. The design gets 1 CP for every range class (A=1, B=2 C=3 etc.).

Efficiency: ECMs have an Efficiency rating that effects it's power consumption. This rating starts at 50%

Energy Required: The energy the Illumination system requires is based on range Efficiency and Advantage. Use the formula below to get the number of energy units that are required to power the Illuminators.

Ex Range x Ex Range x Advantage / Efficiency = Energy Required

Multiply the illuminator's extreme range bracket (in Kilometers) you chose earlier by the extreme range bracket by the decimal value of the Skill Advantage then divide by the decimal value of the Efficiency.

Mass: For each point of Energy Required, the Illuminators start with a mass of 100 Kg.

Add 1 CP to reduce the mass of the illuminator system by 1 Kg per Energy Required. The Illuminator cannot weigh less than 50 Kg per Energy Required with currently available technology.

Add 1 CP to increase the illumination's Efficiency by 1%.

Roll to overcome the Tech Challenge and apply it's effects.

Directional Illuminators

An illuminator that is pointed in only one direction uses less power. A reflector bounces any illumination that would have gone in other directions in a cone.

Divide the power required by 4 if an illuminator is directional.

Light For Growing

To produce enough light to grow plants, an illuminator must provide 100-200 times the light that is required for a human to see. Multiply the Energy Required by 100. The Advantage can now be applied to Agricultural skills for growing plants.

Other Items

The following items do not fall under other categories.

Life Support

Some vehicles and structures require life support systems. Even if a vehicle doesn't require a life support system, if it is to travel in environmental classes lower than 4, it is advisable to have some life support built in.

Unpowered Life Support

Life support usually consists of oxygen tanks that are supplemented by a CO2 scrubber or re-breather. In addition a supply of water equal to twice the available oxygen supply since water is more often needed for survival.

Mass = 5Kg x People Supported x Hours

Powered Life Support

When people must be supported for long periods of time and there is adequate power, recycling systems can be built to provide water. If power is available, producing oxygen from available water can extend oxygen supplies and CO2 scrubbers can operate for much longer.

By using energy and additional equipment the length of time life can be supported is increased.

Energy Required: A vehicle uses 1 EU per person.

Mass: For each point of energy required the life support system weighs 100 Kg

Turrets

A turret is an armored mount point for a weapon or sensor the turret adds protection to a weapon, but adds mass and complexity. The more firing arcs it can move through the larger the mechanism must be.

Heads on E-Suits are considered turrets.

Turrets count as a critical hit location on vehicles.

Designing Turrets

Input Energy Required: Mechanical

Add all the mass of the equipment that will be mounted on the turret. This value is the Equipment Mass.

Mass = Equipment mass x Fire Arcs / 4

Targeting Impairment: Choose an Impairment percent that will either go to a piloting impairment for vehicles or a skill Impairment for turrets built as stand alone emplacements. Lower Impairment values will require more power.

Energy Required: The greater the mass of the turret and it's equipment, the more power that is required to move the turret quickly. Follow the formula to determine the energy required.

Equipment Mass + Turret Mass = Total Mass

Total Mass / Targeting Impairment / 10,000 = Energy Required

First add Equipment Mass and the Turret Mass together giving the Total Mass of the assembly. Now divide Total Mass by the decimal value of the Targeting Impairment and then divide by 10,000 to get the Energy Required to operate the Turret.

For each point of Energy Required, the design gains 1 CP

Roll For the design challenge. Use the standard Tech Challenge story transforms for this challenge.

Arms

Arms are used to manipulate objects, they require power to function. The more power that is put into them the faster and stronger they are. The design of the Arm and hand determines how dexterous it is. Arms can be used as a mount point for weapons.

Arms count as a critical hit location on vehicles.

Hosent Arms

STR: 8000
Punch Damage: 320

Piloting Impairment: 50%
Length: 145 m
Mass: 6,182.5 Kg
Energy Required: 37.8
Hosent arms are abundantly available. They normally would be collected from ones available. The following collection times are examples for if one was being made from scratch but there would be little reason to do this. If a character is going to use Hosent arms, use just the material collection time.
Material Collection 1301 Manhours
Parts Fabrication = 7419 Hosent hours
Assembly = 62 Manhours

TF-2394 Arm

STR: 800
Punch Damage: 80
Piloting Impairment: 20%
Length: 1.72 m
Mass: 219 Kg
Energy Required: 6.7
Material Collection 54 Manhours
Parts Fabrication = 98.7 Hosent hours
Assembly = 2.2 Manhours

Rall 4 Arms

STR: 600
Punch Damage: 60
Piloting Impairment: 20%
Length: 2.279 m
Mass: 274.3 Kg
Energy Required: 5.7
Material Collection 69 Manhours
Parts Fabrication = 109.8 Hosent hours
Assembly = 2.7 Manhours

Designing Arms

The total power put into each arm is split between making the arm faster and making the arm stronger. The engineer decides how much power to put into either purpose. A slow arm can be very strong but will be difficult to handle and not have much punch damage. A weaker arm that is fast will be more dexterous.

Energy Required: Mechanical or Electrical

STR: Select a strength attribute for the arm or arms. The Strength attribute of multiple arms is one figure that encompasses the strength of all of them together. The design challenge gets 1 CP for every 200 points of STR.

Impairment: Choose an Impairment percent that will either go to a piloting impairment for vehicles or a skill Impairment for arms built as as a stationary industrial robot. Lower Impairment values will require more power because the arm is more dexterous and moves faster. Impairments cannot be lower than 1%. The design challenge gets 1 CP for every 10% the impairment is lower than 100%. (e.g. 20% Impairment would get 8 CP.)

Efficiency: Arms have an Efficiency rating that effects their power consumption. This rating starts at 80%.

Energy Required: The greater the Strength of the Arms and the lower the Impairment, the more power that is required to move the arms. Follow the formula to determine the energy required.

Str /Impairment / Efficiency / 700 = Energy Required

Divide STR by the decimal value of the Impairment, divide by the decimal value of Efficiency and then divide by 700 to get the Energy Required to operate the Arms.

Punch Damage: The higher the strength and the lower the impairment (faster motion), the more damage an arm can do when punching

Str / Impairment / 50 = Punch Damage

Length: The length of the arm determines it's reach from it's mount point. A longer arm is heavier than a shorter arm. An E-suit arm is normally 43% it's total hight. Determine the length of the arm in meters.

Mass: The length in meters of the arm and the Energy Required are used to determine the mass of the arm.

(Energy Required + Length) x 25 = Mass

Add Energy Required to Length in meters and multiply by 40. The result is the mass of the arm or arms.

Add 1 CP to increase the arm's Efficiency by 5%.

Roll to overcome the Tech Challenge and apply it's effects.

When the character rolls to design an arm, use the following tables. If the roll against the Tech Challenge succeeds, use the Successful Transform table. If the roll fails use the Failure Transform table.

Successful Transform

Roll 1d6

1 Increase Mass 10 Kg per Energy Point
or
Decrease Efficiency 5%

2 Increase Mass 10 Kg per Energy Point
or
Increase power required by 1 Energy Point

3 Material collection takes 5 additional manhours per system built
or
Increase Impairment by 5%

4 Decrease Efficiency 5%
or
Increase Mass 10 Kg per Energy Point

5 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of weapon mass.
or
Increase Impairment by 5%

6 Skill used in last attempt is no longer effective until 4 CP are reduced in one roll and the next attempt requires that at least 2 CP reduced to make progress.

Failure Transform
Roll 1d10

1 Increase Mass 200 Kg per Energy Point
or
Increase Impairment by 30%

2 Increase Mass 80 Kg per Energy Point
or
Decrease Efficiency 25%

3 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of system mass

4 The engineer failing the roll is injured when testing the prototype (1d10 damage) if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a 1 work day turn gives a 8% advantage)

5 Someone else gets injured (1d10 damage) when testing the prototype if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a combat turn gives a 0% advantage)

6 Fire! 1d100 Kg of materials must be gathered and processed again.

7 An NPC involved in building the prototype takes 2d10 damage if they do not make a Reflex roll. The skill used is no longer effective.

8 Increase Impairment by 30%

9 The design challenge is now immune to the skill that was just used.

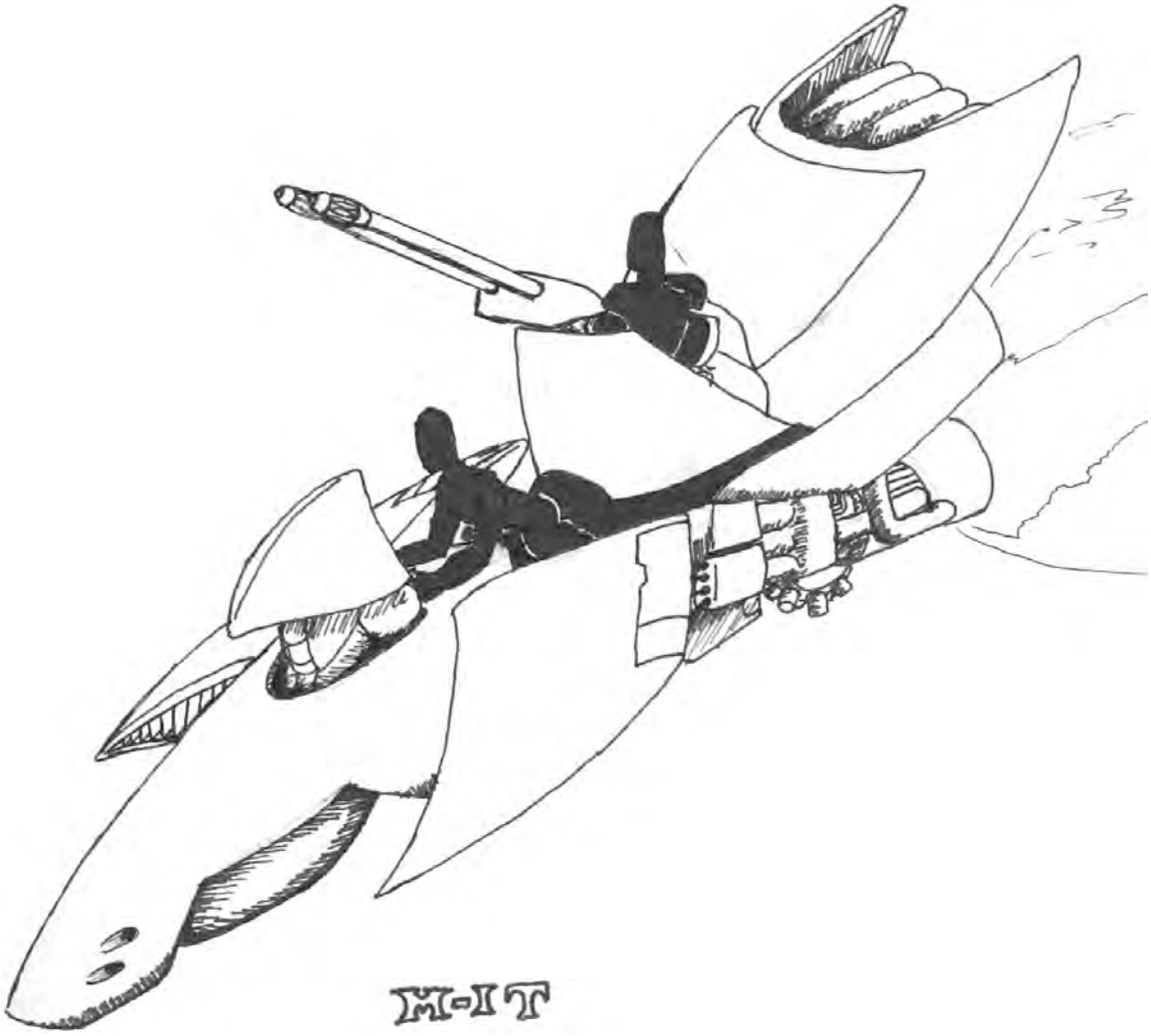
10 Messed up! The design gains 3 CP.

All transforms are suggestions. The GM can alter or introduce different transforms as they deem fit. Alternatively the Player may request a different transform or suggest their own but the GM should make sure it introduces interesting conditions to the build.

Optional Rule: For very large builds that will take dozens if not hundreds of rolls, before any rolls are made, the player can opt to reduce a number of CP for each Fractional Success but all transform effects are multiplied by the number of CP.

Example: The player decides to reduce 10 CP with each fractional success. They get a transform of "Increase Mass 40Kg per Energy Point". This becomes "Increase Mass 400 Kg per Energy Point" for this roll.

Building Vehicles



Build Track

To start building a vehicle the following build track is used. This gives the proper order to follow.

1. Choose a vehicle class, Light, Medium, Heavy or Super Heavy. Larger classes take longer to build and take more energy to move but can carry more equipment.
2. Get all the equipment you want to build into the vehicle and add up all the mass and power requirements. Remember to include sensors, countermeasures, weapons, life support and any other devices that would help the vehicle achieve it's purpose for being built. See: Equipment and Building Sections and Control Systems.
3. Choose a powerplant and fuel type. If the powerplant is a custom solution, resolve it's design challenge first. Note it's power output, mass and piloting Impairment. Add the mass to the mass of all the equipment in the last step.
4. Choose a drive type or types (wheeled, tracked, articulated, thrusters, etc.)
5. Choose the hull material and strength. Apply the hull calculations to see how much mass is left for equipment.
6. Enter the mass of the vehicle and power into the vehicle ratings and get the design's CP.
7. Roll to resolve the design challenge and apply it's effects.

Some stages of designing the vehicle will add Challenge Points to the design challenge while others won't directly but their added mass to the whole vehicle will add to the design challenge in the end.

Vehicle Ratings

All Vehicles have a size rating. This is used to classify their performance. Given the same engine, a vehicle given a Light classification will be faster than a vehicle given a Medium classification, and faster still than a Heavy vehicle. The closer a vehicle is to the upper range of its size rating the more performance penalties it must take.

Vehicles that have a mass less than or equal to 5,000 Kilograms of mass are considered light vehicles.

Vehicles that have a mass more than 5,000 Kilograms Full Mass but less than or equal to 10,000 Kilograms Full Mass are considered Medium vehicles.

Vehicles that have a mass more than 10,000 Kilograms but less than or equal to 50,000 Kilograms are considered Heavy vehicles.

Vehicles that have a mass greater than 50,000 Kilograms Full Mass are considered Super Heavy vehicles.

This step, of deciding on the vehicle class is put first so that there will be a goal that the engineer can build to. The ending mass of the vehicle may be higher or lower than what the designer intended but as long as it falls inside the class that the vehicle was designed for the vehicle will perform more or less as expected.

If a design's goal is to fall right on the border of two classes, it's suggested to select the larger of the two classes. If the design ends up in the smaller class because of it's total mass, then it the engineer can add some mass to match the desired class or recalculate it's performance for the smaller class.

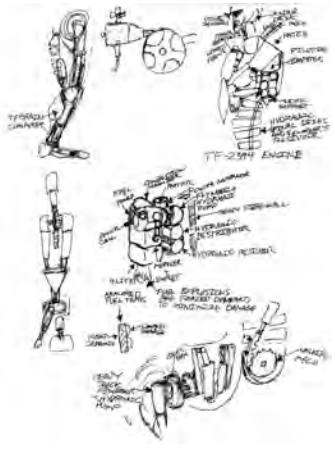
Light Vehicles

A light vehicle could be anything from a pair of roller skates to a large pickup truck. E-suits normally fall in this category.

Examine the power requirements to move a light vehicle at the desired speed to get an idea of how much power will be needed from the vehicle's powerplant.

Speed

After the amount of energy that will drive the vehicle is determined and the effects of efficiency and drive system power loss is taken into consideration, the amount of energy remaining is consulted on this chart. The speed listed is the speed the vehicle could travel without any performance penalties.



Speed Index	Horse Power	Speed in Km/h
1	14	60
2	28	85
3	42	104
4	56	120
5	70	134
6	84	147
7	98	159
8	112	170
9	126	180
10	140	190
15	210	232
20	280	268
25	350	300
30	420	329
35	490	355
40	560	379
45	630	402
50	700	424
55	770	445
60	840	465
65	910	484
70	980	502
75	1050	520
80	1120	537
85	1190	553
90	1260	569
95	1330	585
100	1400	600

For values other than those given here see the Appendix: Light Vehicle Speed Calculations.

Fire Arcs

Light vehicles have 4 fire arcs, front, right, back and left.

Vehicle Design Challenge

For every 1,000 Kilograms of vehicle mass, the design challenge gains one Challenge Point. Each roll against the Design Challenge requires 40 manhours just for the design work.

If the design work is rushed, for every 8 hours cut off the time requirement gives a 20% Impairment to the design rolls.

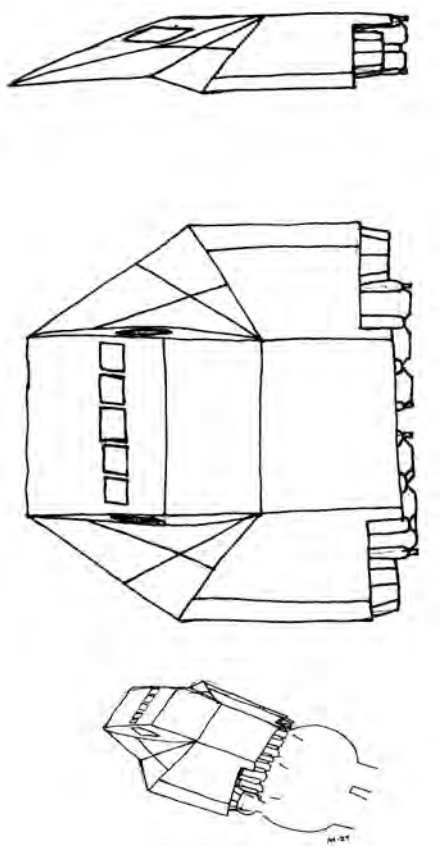
Medium Vehicles

Examples of medium vehicles are anything between a commercial delivery truck to a city bus.

Examine the power requirements to move a medium vehicle at the desired speed to get an idea of how much power will be needed from the vehicle's powerplant.

Speed

After the amount of energy that will drive the vehicle is determined and the effects of efficiency and drive system power loss is taken into consideration, the amount of energy remaining is consulted on this chart. The speed listed is the speed the vehicle could travel without any performance penalties.



Speed Index	Horse Power	Speed in Km/h
1	14	50
5	70	112
10	140	158
15	210	194
20	280	224
25	350	250
30	420	274
35	490	296
40	560	316
45	630	335
50	700	354
55	770	371
60	840	387
65	910	403
70	980	418
75	1050	433
80	1120	447
85	1190	461
90	1260	474
100	1400	500
110	1540	524
120	1680	548
130	1820	570
150	2100	612
160	2240	632
170	2380	652
180	2520	671
190	2660	689
200	2800	707

For values other than those given here see the Appendix: Medium Vehicle Speed Calculations.

Fire Arcs

Medium vehicles have 8 fire arcs.

Vehicle Design Challenge

For every 1,200 Kilograms of vehicle mass, the design challenge gains one Challenge Point. Each roll against the Design Challenge requires 80 manhours just for the design work.

If the design work is rushed, for every 16 hours cut off the time requirement gives a 20% Impairment to the design rolls.

Heavy Vehicles

Examples of heavy vehicles are large commercial trucks to large bulldozers.

Examine the power requirements to move a heavy vehicle at the desired speed to get an idea of how much power will be needed from the vehicle's powerplant.

Speed

After the amount of energy that will drive the vehicle is determined and the effects of efficiency and drive system power loss is taken into consideration, the amount of energy remaining is consulted on this chart. The speed listed is the speed the vehicle could travel without any Performance Penalties.

Speed Index	Horse Power	Speed in Km/h
1	14	30
5	70	67
10	140	95
15	210	116
20	280	134
25	350	150
30	420	164
35	490	177
40	560	190
45	630	201
50	700	212
55	770	222
60	840	232
65	910	242
70	980	251
75	1,050	260
80	1,120	268
85	1,190	277
90	1,260	285
100	1,400	300
110	1,540	315
120	1,680	329
130	1,820	342
140	1,960	355
150	2,100	367
160	2,240	379
170	2,380	391
180	2,520	402
190	2,660	414
200	2,800	424

For values other than those given here see the Appendix: Heavy Vehicle Speed Calculations.

Fire Arcs

Heavy vehicles have 8 fire arcs.

Vehicle Design Challenge

For every 3,000 Kilograms of vehicle mass, the design challenge gains one Challenge Point. Each roll against the Design Challenge requires 120 manhours just for the design work.

If the design work is rushed, for every 24 hours cut off the time requirement gives a 20% Impairment to the design rolls.

Super Heavy Vehicles

Super Heavy vehicles cover a range of vehicles from heavy construction equipment to super tankers. The Chezbah Cruiser and the Kelrath Freighter fall in this category. Designing a super heavy vehicle is time consuming and constructing one is even more time consuming. These should normally be outside the reach of an engineer unless a very high power campaign is desired.

Examine the power requirements to move a super heavy vehicle at the desired speed to get an idea of how much power will be needed from the vehicle's powerplant.

Speed

After the amount of energy that will drive the vehicle is determined and the effects of efficiency and drive system power loss is

taken into consideration, the amount of energy remaining is consulted on this chart. The speed listed is the speed the vehicle could travel without any Performance Penalties.

Speed Index	Horse Power	Speed in Km/h
1	14	10
10	140	32
20	280	45
30	420	55
40	560	63
50	700	71
60	840	77
70	980	84
80	1,120	89
90	1,260	95
100	1,400	100
150	2,100	122
200	2,800	141
250	3,500	158
300	4,200	173
350	4,900	187
400	5,600	200
450	6,300	212
500	7,000	224
600	8,400	245
700	9,800	265
800	11,200	283
900	12,600	300
1,000	14,000	316
1,500	21,000	387
2,000	28,000	447
2,500	35,000	500
3,000	42,000	548
3,500	49,000	592
4,000	56,000	632
4,500	63,000	671
5,000	70,000	707
6,000	84,000	775
7,000	98,000	837
8,000	112,000	894
9,000	126,000	949
10,000	140,000	1,000

For values other than those given here see the Appendix: Super Heavy Vehicle Speed Calculations.

Fire Arcs

Super Heavy vehicles have 8 fire arcs.

Vehicle Design Challenge

For every 10,000 Kilograms of vehicle mass, the design challenge gains one Challenge Point. Each roll against the Design Challenge requires 240 manhours just for the design work.

If the design work is rushed, for every 40 hours cut off the time requirement gives a 20% Impairment to the design rolls.

Control Systems

Control systems are all the systems that allow a vehicle to be piloted.

Control systems negate the piloting Impairments that come from trying to integrate all the equipment and systems that have been built into the vehicle.

For each point of Piloting Modifier the control system eliminates 1% of Piloting Impairment and if any is left over after the vehicle is completed, give a Piloting Advantage of 1% per point up to 100%.

Add the mass of the control systems to the total mass of the vehicle.

Cockpit

A cockpit usually is a small 1-3 person control system that allows a vehicle to be piloted.

Select a number of Crew from 1 and 3 that will man the cockpit.

Piloting Modifier = 200 x crew

To increase the Piloting Modifier more than 100 per crew, add 1 CP to the vehicle design challenge for every 10 points per crew added.

Mass: 210 Kg x Crew

Bridge

A bridge is a room with 4 or more (sometimes much more) crew that control the vehicle.

Select a number of Crew of 4 or more that will man the cockpit.

Piloting Modifier = 160 x crew

To increase the Piloting Modifier more than 20 per crew, add 1 CP to the vehicle design challenge for every 10 points per crew added.

Mass: 150 Kg x Crew (min 4 crew)

Gyroscope

A Gyroscope can be used to maintain orientation for vehicles.

Piloting Modifier = 40

Mass: 10 Kg

Engine Room

The engine room is like a bridge that focuses on controlling power to the vehicle and systems integrity. Because of this a vehicle with an engine room is more resistant to systems being damaged.

Piloting Modifier = 80 x Crew

The engine room makes systems less likely to fail because of damage. This reduces the Critical Hit Location Percent on one hit location by 10% for every 4 crew in the engine room.

Computers

Quantum Liquid Computer (QLC)

Quantum Liquid Computers are the main type of computers used on the artifact. Many vehicles use these QLCs to manage piloting tasks and regulate difficult to control systems.

QLCs must be programmed to handle the vehicle they are being installed in. This adds Challenge Points to the vehicle design challenge but at an increasing cost as the programming grows more complex.

The program for controlling the vehicle has no protection against hacking to start out.

Add 1 CP to the vehicle build for every 3 Barrier Points. Multiply the CP by the number of computers used to control the vehicle.

Personal QLC

These are the processors for the Scimrahn Comm/Comp.

Piloting Modifier
6 for 1 CP
12 for 2 CP
18 for 4 CP
Mass: 200 g
Cost: ¥2,000

Small QLC

Two of these computers manage the terrain handling and balance of the TF-2394 E-Suit.
Piloting Modifier
16 for 1 CP
32 for 2 CP
48 for 4 CP
Mass: 50 Kg
Cost: ¥6,000

Medium QLC

One of these computers handles the operation of each TF-2394.
Piloting Modifier
40 for 1 CP
80 for 2 CP
120 for 4 CP
Mass: 200 Kg
Cost: ¥8,000

Large QLC

Piloting Modifier
80 for 1 CP
160 for 2 CP
240 for 4 CP
Mass: 600 Kg
Cost: ¥12,000

Hex Mainframe QLC

Hex Mainframes are massive QLCs that maintain each hex. They are bulky for the amount of computing power they offer but are freely available.

For each Hex Mainframe used in a vehicle, reduce the material collection challenge by 10 CP.

Piloting Modifier
50 for 1 CP
100 for 2 CP
150 for 4 CP
Mass: 480 Kg
Cost: ¥4,000

Hosent Brain

The QLCs used in Hosent are widely available in industry hexes and are used for a large variety of functions where the size of the processor is not an issue. The Hosent Brain is a cube measuring 120 cm on a side. Hosent

Brains that are for sale are usually just covering the labor costs of removing and transporting the processor.

For each Hosent Brain used in a vehicle, reduce the material collection challenge by 15 CP.

Piloting Modifier
160 for 1 CP
320 for 2 CP
480 for 4 CP
640 for 8 CP
Mass: 2,000 Kg
Cost: ¥4,000

Kerdi Brain
The Kelrath manufacture and sell the QLC that is used in Kerdi robots. They are sold without the control instructions that the Kerdi function by.

Piloting Modifier
130 for 1 CP
260 for 2 CP
390 for 4 CP
520 for 8 CP
Mass: 500 Kg
Cost: ¥10,000,000

Passengers

Open Compartment

In an open passenger compartment, the passengers are exposed on the outside of the craft. This makes for a lighter vehicle but does not protect the passengers like an enclosed crew compartment would. Passengers in an open compartment have soft cover.

Mass = Number of Passengers x 60
The passenger compartment adds a critical hit location to the vehicle with a Critical Percentage of 70%.

Enclosed Compartment

In and enclosed passenger compartment the vehicle fully protects the passengers. Passengers cannot be attacked directly.

Mass = Number of Passengers x 110
The passenger compartment adds a critical hit location to the vehicle with a Critical Percentage of 30%.

Cargo

When a vehicle carries cargo, there is the mass of the cargo itself and then there is the material mass that is used to support the cargo in the vehicle. This is the superstructure mass.

A vehicle has a mass when it is empty of all cargo and passengers. This is the dry mass. The mass of the vehicle when it is full of cargo, passengers and crew is called the full mass.

When calculating the cargo capacity of a vehicle, the weight of the cargo is added to the full mass where the superstructure required to transport the cargo is added to the dry mass.

Open Compartment

Open cargo compartments offer a lighter vehicle mass but does not protect the cargo from weather or attack.

Added Vehicle Mass= Cargo Capacity x Cargo Capacity / 300

The cargo compartment adds a critical hit location to the vehicle with a Critical Percentage of 30%.

Enclosed Compartment

Enclosed cargo compartments protect the cargo being carried but make the vehicle bulkier.

Added Vehicle Mass= Cargo Capacity x Cargo Capacity / 400

Drive Types

Vehicles have at least one drive type but some have more than one type of movement, and some, such as the Scimrahn Freighter and the Chezbah Demolisher act as hybrids.

If more than one drive type is used each will have their own speed. If the drive

types are not used at the same time, the power to the drive can be switched from one to the other.

In some cases it may be useful to use two drive types, one that delivers the energy to forward movement and one that holds the vehicle up. For example, a jet turbine engine may be used for forward movement while wheels hold the vehicle up. Another example would be a vehicle that uses an anti-grav drive to hold the vehicle up and articulated legs to move the vehicle.

Each drive system counts as a critical hit location on vehicles.

Drive types all have an piloting Impairment, Efficiency rating and a Movement Energy rating. Movement Energy is the power that moves the vehicle forward like the thrust from a turbine or the mechanical energy that turns wheels.

Drive systems usually have to hold the vehicle up. Some drive systems use the structure of the vehicle to do this as with wheeled vehicles and some use energy from the powerplant to hold the vehicle up such as the blades of a helicopter. In either case, the drive system's capability to hold up the vehicle has a maximum mass that it can sustain.

Articulated

Articulated vehicles are not very energy efficient but are very flexible in the types of terrain they can travel over.

The mass of an articulated drive is only for the drive mechanism (or legs) not for any arms that the vehicle might have.

The first thing an Articulated vehicle must be able to do is to hold itself up. Some hybrids do this with AG but a majority uses the strength of legs to hold them up.

Unless the vehicle is going to use another drive type to stay up the legs must be strong enough to hold the vehicle up. The leg strength of the vehicle must be at least enough to carry the mass of the vehicle.

Some of the engine power must go into this and determines the maximum vehicle mass. If the total vehicle mass ends up being greater than this, then power needs to be taken away from movement and added to strength.

Designing Articulated Drive Systems

Input Power Required: Electrical or Mechanical

Articulated vehicles start out with 4 60% piloting Impairments.

Efficiency: Articulated vehicles start off with an Efficiency rating of 30%.

Movement Energy: Select a number of EU from the powerplant that will go into moving the vehicle forward. Higher power levels will move the vehicle faster. The amount of power selected cannot exceed the total power generation of the vehicle's powerplant.

Efficiency x Movement Energy = Speed Index

Multiply the decimal value of the Efficiency by the Energy Units being put into moving the vehicle to get the Speed Index. Look up the speed index under the vehicle class to get the vehicle's base speed.

Maximum Vehicle Mass: The maximum vehicle mass is determined by the power that used to hold the vehicle up.

Articulated vehicles rely partly on their structure (the legs) and partly on energy expended to keep the structure balanced. It does not matter how many legs are in the articulated design, just how strong the total system is.

Efficiency x Energy Units x 800 = Max Vehicle Mass (Kg)

Multiply the decimal value of the Efficiency by the Energy Units used to hold the vehicle up and then multiply by 800 to get the maximum mass the legs can hold up.

Energy Required: Add the energy points put into movement with the energy used to hold the vehicle up. This is the Energy Required.

Drive Mass: The Drive system starts with a mass of 40 Kg for every point of Energy Required.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 5%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 5%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 1 Kg per Energy Required. The drive cannot weigh less than 30 Kg per Energy Required with currently available technology.

Land

Land vehicles are wheeled, or tracked vehicles. While these are comparatively simple vehicles, they cannot easily move vertically between floors. Land vehicles have static support systems that do not require power to support the vehicle, only to move it.

Designing Land Drive Systems

Input Power Required: Mechanical

Land vehicles start out with a 20% piloting Impairment.

Efficiency: Land vehicles start off with an Efficiency rating of 80%.

Movement Energy: Select a number of EU from the powerplant that will go into moving the vehicle forward. Higher power levels will move the vehicle faster. The amount of power selected cannot exceed the total power generation of the vehicle's powerplant.

Efficiency x Movement Energy = Speed Index

Multiply the decimal value of the Efficiency by the Energy Units being put into moving the vehicle to get the Speed Index. Look up the speed index under the vehicle class to get the vehicle's base speed.

Energy Required: The Energy Required is the energy points put into movement.

Drive Mass: The Drive system starts with a mass of 30 Kg for every point of Energy Required.

Maximum Vehicle Mass: The maximum vehicle mass is determined by the structure of the drive system.

It does not matter if the vehicle is wheeled or tracked, just how strong the total system is.

Drive Mass x 10 = Maximum Vehicle Mass

The designer may increase the mass of the drive to allow for a heavier vehicle.

Critical Hit Location: The Drive system counts as a critical hit location and adds 30% to the standard critical percentage for the vehicle on that hit location.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 1%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 5%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 1 Kg per Energy Required. The drive cannot weigh less than 15 Kg per Energy Required with currently available technology.

Add 1 CP to the vehicle design challenge to reduce the Critical Percentage of the drive system by 5%. The Critical Percentage cannot go below 10%.

Water

Water vehicles are buoyant and the hull is supported by water.

Designing Surface Water Drive Systems

Input Power Required: Mechanical

Water vehicles start out with a 60% piloting Impairment.

Efficiency: Water vehicles start off with an Efficiency rating of 60%.

Movement Energy: Select a number of EU from the powerplant that will go into moving the vehicle forward. Higher power levels will move the vehicle faster. The amount of power selected cannot exceed the total power generation of the vehicle's powerplant.

Efficiency x Movement Energy = Speed Index

Multiply the decimal value of the Efficiency by the Energy Units being put into moving the vehicle to get the Speed Index. Look up the speed index under the vehicle class to get the vehicle's base speed.

Energy Required: The Energy Required is the energy points put into movement.

Drive Mass: The Drive system starts with a mass of 10 Kg for every point of Energy Required.

Maximum Vehicle Mass: The maximum vehicle mass is determined by hull and not the drive system.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 1%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 1%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 1 Kg per Energy Required. The drive cannot weigh less than 5 Kg per Energy Required with currently available technology.

Designing Submersible Drive Systems

Input Power Required: Mechanical

A submersible vehicle is designed to move underneath the water. The hulls of these vehicles must have a mix of high Armor Rating and thick hull to resist the crushing force of water. In addition the vehicle must counteract it's natural buoyancy with heavy ballast.

The drive system only includes the buoyancy control system and the forward drive. It does not include life support.

Water vehicles start out with a 60% piloting Impairment.

Efficiency: Submersible water vehicles start off with an Efficiency rating of 30%.

Movement Energy: Select a number of EU from the powerplant that will go into moving the vehicle forward. Higher power levels will move the vehicle faster. The amount of power selected cannot exceed the total power generation of the vehicle's powerplant.

Efficiency x Movement Energy = Speed Index

Multiply the decimal value of the Efficiency by the Energy Units being put into moving the vehicle to get the Speed Index. Look up the speed index under the vehicle class to get the vehicle's base speed.

Energy Required: The Energy Required is the energy points put into movement.

Drive Mass: The Drive system starts with a mass of 120 Kg for every point of Energy Required.

Maximum Vehicle Mass: The maximum vehicle mass is determined by the structure of the drive system.

Drive Mass x 4 = Maximum Vehicle Mass

The designer may increase the mass of the drive to allow for a heavier vehicle.

Critical Hit Location: The Drive system adds 30% to the standard critical percentage for the vehicle on hit locations that contain crew or passenger compartments.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 1%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 5%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 1 Kg per Energy Required. The drive cannot weigh less than 100 Kg per Energy Required with currently available technology.

Add 1 CP to the vehicle design challenge to reduce the Critical Percentage of the drive system by 5%. The Critical Percentage cannot go below 10%.

Flying

Flying vehicles have two types of propulsion, thrust and lift. Thrust Is used to move a vehicle. Lift is what keeps a air vehicle in the air. Because of this, the lift of the vehicle determines the maximum vehicle mass.

Designing Anti-Grav Drive Systems

Input Power Required: Electrical

Anti-Grav engines use a large crystal (or core) made of nano layers of embedded materials suspended in a magnetic field and spun up to hundreds of thousands of RPM. The core would fly out of it's housing if it were not held in place by a powerful magnetic field. The force of the core lifting is transferred by the magnetic field to the engine housing and the housing is securely mounted to the hull of the vehicle. The core lifts against gravity and once at speed creates a force that is opposite of whatever gravity well it is in.

Anti-Grav engines are exacting to manufacture and require 20 times the normal build time for its mass.

Anti-Grav engines can be used for lift and thrust; however, they are much better at lifting.

Anti-grav vehicles start out with 2 60% piloting Impairments.

Efficiency: Anti-grav vehicles start off with an Efficiency rating of 60%.

Maximum Vehicle Mass: The maximum vehicle mass is determined by the power that used to hold the vehicle up.

The anti-grav engine uses energy expended to keep the vehicle up. It does not

matter how many anti-grav cores are in the design, just how strong the total system is.

Efficiency x Energy Units x 450 = Max Vehicle Mass (Kg)

Multiply the decimal value of the Efficiency by the Energy Units used to hold the vehicle up and then multiply by 450 to get the maximum mass the drive can hold up.

Movement Energy: The anti-grav drive has a limit on how much power can go to moving the vehicle forward. The maximum movement energy is 50% the power that went into lifting the vehicle when determining maximum vehicle mass.

Select a number of EU from the powerplant that will go into moving the vehicle forward that is below the maximum. Higher power levels will move the vehicle faster.

Efficiency x Movement Energy = Speed Index

Multiply the decimal value of the Efficiency by the Energy Units being put into moving the vehicle to get the Speed Index. Look up the speed index under the vehicle class to get the vehicle's base speed.

Energy Required: Add the energy points put into movement with the energy used to lift the vehicle. This is the Energy Required.

The amount of power selected cannot exceed the total power generation of the vehicle's powerplant.

Drive Mass: The Drive system starts with a mass of 40 Kg for every point of Energy Required.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 5%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 5%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 1 Kg per Energy Required. The drive cannot weigh less than 35 Kg per Energy Required with currently available technology.

Designing Thruster Drive Systems

There are many different designs for thrusters, for simplicity they are put into one category. Thrusters use jet engine or rocket powerplants to produce thrust and lift.

Input Power Required: Mechanical

Thuster drive vehicles start out with 4 60% piloting Impairments.

Efficiency: Thruster drive vehicles start off with an Efficiency rating of 50%.

Movement Energy: Select a number of EU from the powerplant that will go into moving the vehicle forward. Higher power levels will move the vehicle faster. The amount of power selected cannot exceed the total power generation of the vehicle's powerplant.

Efficiency x Movement Energy = Speed Index

Multiply the decimal value of the Efficiency by the Energy Units being put into moving the vehicle to get the Speed Index. Look up the speed index under the vehicle class to get the vehicle's base speed.

Maximum Vehicle Mass: The maximum vehicle mass is determined by the power that used to hold the vehicle up.

Thruster drive vehicles uses energy expended to keep the vehicle up. It does not matter how many thrusters are in the design, just how strong the total system is.

Efficiency x Energy Units x 400 = Max Vehicle Mass (Kg)

Multiply the decimal value of the Efficiency by the Energy Units used to hold the vehicle up and then multiply by 400 to get the maximum mass the drive can hold up.

Energy Required: Add the energy points put into movement with the energy used to hold the vehicle up. This is the Energy Required.

Drive Mass: The Drive system starts with a mass of 1 Kg for every point of Energy Required.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 5%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 5%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 0.5 Kg per Energy Required. The drive cannot weigh less than 0.5 Kg per Energy Required with currently available technology.

Designing Fixed Wing Drive Systems

Fixed wings are useful for converting thrust into lift. They operate poorly at low speed and thin atmospheres. The larger the wing the more lift it provides, but also weighs more.

Fixed wings only determine the maximum mass of the vehicle.

Input Power Required: Mechanical

Thuster drive vehicles start out with 1 60% piloting Impairment.

Efficiency: Fixed wing drive vehicles start off with an Efficiency rating of 70%.

Maximum Vehicle Mass: The maximum vehicle mass is determined by the size of the wings their efficiency and the speed of the vehicle.

Fixed wing vehicles converts forward momentum to lift. It does not matter how many wings are in the design, just how strong the total system is.

Efficiency x Speed x Square meters of wing = Max Vehicle Mass (Kg)

Multiply the decimal value of the Efficiency by the speed the vehicle will be traveling at and then multiply by how many square meters of wing surface to get the maximum mass the drive can hold up.

Drive Mass: The Drive system starts with a mass of 40 Kg for every square meter of wing.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 5%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 5%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 1 Kg per Energy Required. The drive cannot weigh less than 20 Kg square meter with currently available technology.

Designing Rotor Wing (Helicopter) Drive Systems

Input Power Required: Mechanical

A rotor wing vehicle uses a wing that is spun by a shaft to create lift. In most instances the rotor or body of the vehicle is tilted to move some of the energy behind the center of gravity and thus causes it to move forward. This for game purposes is considered thrust.

Rotor wing drives can be used for lift and thrust but are unable to travel much faster than 400 Km/h.

Rotor wing vehicles start out with 2 40% piloting Impairments.

Efficiency: Rotor wing vehicles start off with an Efficiency rating of 50%.

Rotor Disc: The rotor disc is the size of the sweep of all the blades. The number of blades is not important for this number, only the total sweep of the blade. The Rotor Disc value is in square Meters.

Smaller rotor wings have a rotor disc of 100-200 square Meters where heavy lift vehicles have a disc area of 500+ square meters. The larger the disc diameter the more the vehicle's maximum mass will be but the drive system will weigh more.

Maximum Vehicle Mass: The maximum vehicle mass is determined by the power that used to hold the vehicle up.

The rotor wing uses energy expended to keep the vehicle up. It does not matter how many rotors are in the design, just how strong the total system is.

Efficiency x Energy Units x Rotor Disc = Max Vehicle Mass (Kg)

Multiply the decimal value of the Efficiency by the Energy Units used to hold the vehicle up and then multiply by how many square meters of wing surface to get the maximum mass the drive can hold up.

Movement Energy: The rotor wing drive has a limit on how fast the vehicle can travel. Rotor wing drives cannot travel faster than 400 Km/h.

Select a number of EU from the powerplant that will go into moving the vehicle forward that is below the maximum. Higher power levels will move the vehicle faster.

Efficiency x Movement Energy = Speed Index

Multiply the decimal value of the Efficiency by the Energy Units being put into moving the vehicle to get the Speed Index. Look up the speed index under the vehicle class to get the vehicle's base speed.

Energy Required: Add the energy points put into movement with the energy used to lift the vehicle. This is the Energy Required.

The amount of power selected cannot exceed the total power generation of the vehicle's powerplant.

Drive Mass: The drive system starts with a mass of 5 Kg for every square meter of Rotor Disc.

Critical Hit Location: The Drive system counts as a critical hit location and adds 50% to the standard critical percentage for the vehicle on that hit location.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 5%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 5%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 1 Kg per Energy Required. The drive cannot weigh less than 3 Kg per Energy Required with currently available technology.

Lighter Than Air

A lighter than air vehicle is one that uses a gas such as helium or less preferably hydrogen in one or many gas bags to lift the vehicle. Three kilograms of helium and its lift bags can lift one kilogram of vehicle.

Lighter than air systems can only provide minimal movement by pitching the vehicle and usually rely on atmospheric wind for movement or some other form of thrust.

Lighter than air vehicles start out with 2 60% piloting Impairments.

Efficiency: Lighter than air vehicles start off with an Efficiency rating of 30%.

Maximum Vehicle Mass: The maximum vehicle mass is determined by the size of the gas bag.

Lighter than air vehicles use the buoyancy of the gas bag to lift the vehicle. It does not matter how many gas bags or their shape, just how strong the total system is.

These drive systems are very large. For every one Kg of vehicle the drive must lift three Kg of helium is needed. This means the engineer chooses a drive size an then has to keep all the equipment, other drive systems and hull weight under the mass that the drive can lift.

Equipment Mass x 5 = Max Vehicle Mass (Kg)

Multiply the mass of all the equipment and drives to get the maximum mass the drive can hold up.

Movement Energy: Lighter than air drives do not use energy and cannot be effectively used to move the vehicle.

However, because of the size of the drive system, any other drives used to move the vehicle have a harder time because of wind resistance.

Other Drive's Speed Index x Efficiency = Speed Index

Multiply the Speed Index of drive systems producing forward movement by the decimal value of the efficiency percentage. The result is the new speed index for the drive.

Energy Required: Lighter than air drives do not use energy.

Drive Mass: The Drive system starts with a mass of 5 Kg for every Kg of equipment, other drive systems and hull.

Critical Hit Location: The Drive system counts as a critical hit location and adds 50% to the standard critical percentage for the vehicle on that hit location.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 5%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 1%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 1 Kg of equipment mass. The drive cannot weigh less than 4 Kg of equipment mass.

Orbital

Orbital vehicles do not need to produce lift as they are in free fall around a planet.

Designing Orbital Drive Systems

There are many different designs for thrusters, for simplicity they are put into one category. Orbital drive systems use rocket powerplants to produce thrust.

Input Power Required: Mechanical

Orbital drive vehicles start out with 5 80% piloting Impairments.

Efficiency: Orbital drive vehicles start off with an Efficiency rating of 60%.

Movement Energy: Select a number of EU from the powerplant that will go into moving the vehicle forward. Higher power levels will move the vehicle faster. The amount of power selected cannot exceed the total power generation of the vehicle's powerplant.

Efficiency x Movement Energy = Speed Index

Multiply the decimal value of the Efficiency by the Energy Units being put into moving the vehicle to get the Speed Index.

Look up the speed index under the vehicle class to get the vehicle's base speed.

Maximum Vehicle Mass: Because the vehicle is in free fall, there is no maximum vehicle mass.

Energy Required: The energy used to move the vehicle is the Energy Required.

Drive Mass: The Drive system starts with a mass of 1 Kg for every point of Energy Required.

Add 1 CP to the vehicle design challenge to reduce one of the drive system's Impairments by 5%.

Add 1 CP to the vehicle design challenge to increase the Efficiency of the drive system by 5%.

Add 1 CP to the vehicle design challenge to reduce the mass of the drive by 0.5 Kg per Energy Required. The drive cannot weigh less than 0.5 Kg per Energy Required with currently available technology.

Hull

The hull of a vehicle is it's outer skin and the structure that supports the mass of the vehicle.

The hull of the vehicle counts as a critical hit location on vehicles.

Hull Material

Hull material is an important factor in vehicle design. It affects the weight of the vehicle, it's hit points, armor rating and the time that it takes to build the vehicle.

The player can pick an AR in the range of the material they have chosen but choosing the highest value may not always be the best choice since it will increase the mass of the vehicle.

CCC

By far the most common native building material on The Artifact. It is stronger than steel by weight.

Select an Armor Rating between 10-60. For every 20 points of AR add one CP to the vehicle build.

AR x Hull Thickness in CM / 70 = Hull Multiplier

Multiply Armor Rating by the thickness of the hull material and then divide by 70 to get the Hull Multiplier.

HDCCC

HDCCC is very hard and strong but is very difficult to produce and machine. The time to make parts from raw materials is five times longer than normal.

Select an Armor Rating between 100-250. For every 5 points of AR add one CP to the vehicle build.

AR x Hull Thickness in CM / 50 = Hull Multiplier

Multiply Armor Rating by the thickness of the hull material and then divide by 50 to get the Hull Multiplier.

Steel

Steel or even iron is relatively rare on The Artifact but it can be obtained and Hosent have the ability to smelt it.

The time it takes to collect materials for a steel hull is five times longer than normal, unless the engineer is using scrap that is already available. This may be the case if there are a large number of wrecked earth vehicles or equipment that can be salvaged.

Select an Armor Rating between 5-70. For every 30 points of AR add one CP to the vehicle build.

AR x Hull Thickness in CM / 35 = Hull Multiplier

Multiply Armor Rating by the thickness of the hull material and then divide by 35 to get the Hull Multiplier.

Chobam

An engineered armor that was developed in the 1960's and has gradually been improved upon. It consists of layers of materials that offer different resistances to a penetrating attack and thus diffuse the attack.

The time it takes to collect materials for a Chobam hull is fifteen times longer than normal unless the engineer is using scrap that is already available. This may be the case if there are a large number of wrecked Earth tanks that can be salvaged.

The time to make parts from raw materials is five times longer than normal.

Select an Armor Rating between 40-100. For every 10 points of AR add one CP to the vehicle build.

AR x Hull Thickness in CM / 60 = Hull Multiplier

Multiply Armor Rating by the thickness of the hull material and then divide by 60 to get the Hull Multiplier.

Reactive

Reactive armor uses shaped charge explosives to deflect an attack away from the vehicle. It is not effective against lasers, although the greater mass of the material may give some protection.

It is relatively heavy for the protection it gives.

2 Kg = 1 HP vs plasma and projectiles

Protecting Critical Hit Locations

To reduce the critical hit chance on a hit location add 5% (0.05) to the Hull Multiplier. This will reduce the Critical Hit Location Percent on one hit location by 10%. Each time this is done, add one CP to the design challenge.

To reduce the mass of the hull, the Critical Hit Location Percent on one or more hit locations can be increased. For every 10% the percentage is increased, the Hull Multiplier is reduced 5%.

Hull Mass

The mass of a vehicle hull a percent of all the equipment powerplant and drive weight that goes into the vehicle. This percent is called the Hull Multiplier. The mass of all the equipment plus the drive systems plus the powerplants are added together.

Equipment and Drive Mass = Equipment Mass + Drive Mass

Hull Mass = Hull Multiplier x Equipment and Drive Mass

Final Mass Calculations

Determine Total Mass

Total Mass is the mass of all equipment plus the drive system of the vehicle plus the hull mass.

Total Mass = Equipment Mass + Drive Mass + Hull Mass

Hit Points

All the material in a vehicle and the strength of that material contributes to the Hit Points the vehicle will have.

Integrity: The Integrity value of a vehicle is a measure of how well all the components of a vehicle are tied together. This value starts out at 750 with low values being better.

Good design can strengthen a hull. For every 1 CP added to the design challenge, reduce the Integrity by 50 points. The lowest the Integrity value can go is 400.

Total Mass x AR / Integrity = HP

To determine the total HP of the Vehicle, add the total mass and multiply by the Armor Rating (AR) then divide by the Integrity value.

Power Demands

Once the power requirements of the vehicle have been added together, if the total power required is greater than the power that the powerplant provides, the vehicle can still operate but at a penalty.

This represents the power being actively switched from one system to another when they are required to operate.

For every Energy Unit the vehicle requires more than the power output of the powerplant, add 1 CP to the vehicle build.

For every Energy Unit the vehicle requires more than the power output of the powerplant, add 1 10% Piloting Impairment.

Vehicle Design Transforms

After adding all the Challenge Points for a vehicle build together, the player with the engineer character rolls to reduce the CP. The player makes choices that are available according to the transforms and then record the effects of each transform.

When the character rolls to design a sensor system, use the following tables. If the roll against the Tech Challenge succeeds, use the Successful Transform table. If the roll fails use the Failure Transform table.

Successful Transform

Roll 1d6

1 Speed Index -1
or
+1% critical percentage to 1 critical location

2 Piloting Impairment +5%
or
Integrity plus 20

3 Drive Efficiency -5%
or
Build Time +1 hour per ten kilograms of vehicle mass.

4 Integrity plus 20
or
Speed Index -1

5 Armor Rating -1
or
Drive Efficiency -5%

6 Skill used in last attempt is no longer effective until 4 CP are reduced in one roll and the next attempt requires that at least 2 CP reduced to make progress.

Failure Transform

Roll 1d10

1 Speed Index -5
or
Piloting Impairment +10%

2 +1% critical percentage to 1 critical location
or
Drive Efficiency -10%

3 Parts construction takes longer because of complex parts. Hosents take one additional hour to build parts for every ten Kilograms of vehicle mass

4 The engineer failing the roll is injured when testing the prototype (1d10 damage) if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a 1 work day turn gives a 8% advantage)

5 Someone else gets injured (1d10 damage) when testing the prototype if they don't make a saving Reflex roll. The character gets a 1% Advantage for every hour in game that the turn took. (e.g. a combat turn gives a 0% advantage)

6 Fire! Vehicle takes 1d100 damage or 1d100 Kg of materials must be gathered and processed again.

7 An NPC involved in building the prototype takes 2d10 damage if they do not make a Reflex roll. The skill used is no longer effective.

8 Integrity plus 100

9 The design challenge is now immune to the skill that was just used.

10 Messed up! The design gains 3 CP.

All transforms are suggestions. The GM can alter or introduce different transforms as they deem fit. Alternatively the Player may request a different transform or suggest their own but the GM should make sure it introduces interesting conditions to the build.

Optional Rule: For very large builds that will take dozens if not hundreds of rolls, before any rolls are made, the player can opt to reduce a number of CP for each Fractional Success but all transform effects are multiplied by the number of CP.

Example: The player decides to reduce 10 CP with each fractional success. They get a transform of "Speed Index -1". This becomes "Speed Index -10" for this roll.

Critical Hit Locations

Critical hit locations are definable segments of the vehicle. They are used to better determine what systems would be effected by damage before a vehicle has lost all it's hit points.

Simple Critical Hits

If a detailed critical hit location table is not needed, the player may opt to use the generic critical hit location table. As a vehicle using this chart effectively have only one critical hit location, only the highest critical hit percentage is used.

Roll 1d10	
1-2	Drive Hit: Speed cut in half
3-4	Passengers Hit: Loss of passengers equal to damage/100
5-6	Systems: Loss of one of the following systems. If the vehicle does not have the system rolled for, roll again.
	Roll 1d10
	1-2 ECMs
	3-4 Sensors
	5-6 Shields
	7-8 Communication
	9-10 Weapon
7-8	Control: The vehicle gets a 20% Impairment to pilot for every 50 points of damage done by the attack
9-10	Fuel: Cut the fuel capacity of the vehicle in half.

Full Critical Hit Location Table

To generate a full critical hit table, there are three steps.

1. Generate the hit location chart.
2. Assign Critical Percentages to hit locations.
3. Determine the effect of each critical effect.

Step 1: Hit Locations

Hit locations on a vehicle include main structures of the vehicle. These are things like the drive systems, the hull of the vehicle, arms and turrets. Medium, Heavy and Super Heavy vehicles have more than one critical location for the hull.

No vehicle should have more than 10 hit locations. If a vehicle does have more than 10, the player should pick 10 locations that would be the largest structures on the vehicle or they may combine similar hit locations until there are only 10 remaining.

The main purpose of this chart is to determine what hit locations can be hit from the vehicle's fire arcs. Thinking about what hit locations should be visible from each fire arc can be helpful in generating the table.

The location that is hit depends on the direction that the attack is coming from and thus involves the vehicle's fire arcs. Light vehicles have only four (4) fire arcs but medium and larger vehicles have eight (8) fire arcs making the chart twice as complex.

For each fire arc, only certain Critical Hit Locations are in line of sight. For example, light vehicles have only one hull Critical Hit Location and that hull is visible from all fire arcs. Medium and larger vehicles have two or more Critical Hit Locations, usually these are designated front and back (although they do not have to be). In that case the front hull would not be visible from fire arc 6 and the back hull hit location would not be visible from fire arc 2.

Light Vehicle Hit Locations

For light vehicles, there is only one hull hit location but it must be visible from all four fire arcs. All other Critical Hit Locations need to be visible from three consecutive fire arcs.

A turret or arm that can fire into a fire arc must be visible from that fire arc.

Light vehicles have four fire arcs, their chart with only the visibility of the hit locations noted looks like this.

Example

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
Visible	Visible	Visible	Visible	Hull
	Visible	Visible	Visible	Drive
Visible	Visible		Visible	Drive 2
Visible	Visible		Visible	Turret

Add up the number of hit locations visible in each fire arc and divide by ten. Then round to the nearest whole number.

Example

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
Visible	Visible	Visible	Visible	Hull
	Visible	Visible	Visible	Drive
Visible	Visible		Visible	Drive 2
Visible	Visible		Visible	Turret
10 / 3 = 3.33	10 / 4 =2.5	10 / 2 =5	10 / 4 =2.5	
Round 3	Round 3	Round 5	Round 3	

This number is used to determine how many digits each hit location should take up on a 1D10 roll. For instance if the number is two (2), the first critical hit location would take up 1-2 on a 1D10 roll. The next hit location would take 3-4 on the 1D10 roll and so on.

It is likely that the number generated will not equal ten when the Critical Hit Locations are added up. If the number is less than ten, add one to one of the hull Critical Hit Locations. If the number is more than ten, subtract one from the hit location with the least amount of equipment in it.

Example

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-4	1-3	1-5	1-3	Hull
	4-5	6-10	4-5	Drive
5-7	6-7		6-7	Drive 2
8-10	8-10		8-10	Turret

In this example Arc 1 had to have one added to it's hull. Arc 2 and 4 had to have one subtracted from both drive systems since they would have the fewest systems.

Medium, Heavy and Super Heavy Vehicle Hit Locations

Medium vehicles have two hull hit locations and for example, could be designated front and back. Heavy vehicles have three and super heavy vehicles have four.

Medium and larger vehicles have eight fire arcs. For medium vehicles and larger, each Critical Hit Location must be visible from five consecutive fire arcs.

A turret or arm that can fire into a fire arc must be visible from that fire arc.

An example of a Medium vehicle's chart with only the visibility of the hit locations noted looks like this.

Example

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
Visible	Visible	Visible	Visible	Front Hull
			Visible	Back Hull
Visible	Visible	Visible	Visible	Drive
			Visible	Drive 2
Visible	Visible	Visible	Visible	Turret

Arc 5	Arc 6	Arc 7	Arc 8	Hit Location
			Visible	Front Hull
Visible	Visible	Visible	Visible	Back Hull
			Visible	Drive
Visible	Visible	Visible	Visible	Drive 2
Visible	Visible	Visible	Visible	Turret

Add up the number of hit locations visible in each fire arc and divide by ten. Then round to the nearest whole number. See examples under light vehicles.

This number is used to determine how many digits each hit location should take up on a 1D10 roll. For instance if the number is two (2), the first critical hit location would take up 1-2 on a 1D10 roll. The next hit location would take 3-4 on the 1D10 roll and so on.

It is likely that the number generated will not equal ten when the Critical Hit Locations are added up. If the number is less than ten, add one to one of the hull Critical Hit Locations. If the number is more than ten, subtract one from the hit location with the least amount of equipment in it.

Example

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-4	1-4	1-4	1-2	Front Hull
			3-4	Back Hull
5-7	5-7	5-7	5-6	Drive
			7-8	Drive 2
8-10	8-10	8-10	9-10	Turret

Arc 5	Arc 6	Arc 7	Arc 8	Hit Location
			1-2	Front Hull
1-4	1-4	1-4	3-4	Back Hull

			5-6	Drive
5-7	5-7	5-7	7-8	Drive 2
8-10	8-10	8-10	9-10	Turret

Step 2: Assign Critical Percentages

Each Critical Hit Location has a percent likelihood that it will take a critical hit. This is by default a standard number for the vehicle but can be modified by making the hull thicker in certain locations or by adding an engineering room as described previously. The percentages should be recorded with their Critical Hit Location.

Light Vehicle Critical Percentages

Light vehicles have a base 40% chance of a critical hit for all their critical locations. This number is modified by adding protective hull panels over sensitive vehicle systems. Some drive systems have modifiers to this percentage.

Medium Vehicle Critical Percentages

Medium vehicles have a base 30% chance of a critical hit for all their critical locations. This number is modified by adding protective hull panels over sensitive vehicle systems. Some drive systems have modifiers to this percentage.

Heavy and Super Heavy Vehicle Critical Percentages

Heavy and Super Heavy vehicles have a base 20% chance of a critical hit for all their critical locations. This number is modified by adding protective hull panels over sensitive vehicle systems. Some drive systems have modifiers to this percentage.

Step 3: Critical Effect

Now that you have the chart of Critical Hit Locations you will need to determine what Critical Hit effects are in those locations.

Critical Effects are used to simulate the effect of systems failure on a vehicle before it has lost all it's hit points.Any device or system installed on a vehicle can be made eligible for a Critical Hit.

Three systems must be chosen for each Critical Hit Location but no more than ten to be used as Critical Hits. The Chosen systems must make sense for that hit location. The three systems chosen should be the three systems with the most mass, unless the GM approves a smaller system being selected. Remember to include the power generation equipment, it's fuel supply, drive equipment and arms in the list that are eligible as Critical Hits.

It is possible, even likely, that some critical hit locations will have fewer than three systems in them. If this is the case, only the systems that are logically in them should be listed. This may mean that there will not always be three Critical Hits in a hit location but there always should be at least one.

Example

Articulated Drive 40%

- Leg
- Terrain computer
- Shield Generator

To determine the chance of hitting a Critical Hit on a Critical Hit Location, add the mass of all the chosen systems together. Then divide by ten (10) this number is the Mass Ratio.

Combined mass of chosen systems / 10 = Mass Ratio

Example: The drive system weighs 1200 Kg the terrain computer weighs 200 Kg and the shield generator weighs 100 Kg. The total is 1500 Kg. The Mass Ratio of the equipment equals 1500 /10 or 150.

Then for each system, divide it's mass by the Mass Ratio and round to the nearest whole number or if it is too low, record a one (1). Record this number for each system. The number indicates the likelihood of a system being hit in that Critical Hit Location.

Likelihood = System mass / Mass Ratio

Round the Likelihood number to the nearest whole number and record it.

Example: The Likelihood of the example systems are as follows.

Legs

1200 Kg / 150 = 8

Terrain Computers

200 Kg / 150 = 1.33 round to 1

Shield Generator

100 Kg / 150 = 0.66 round to 1

Add all three Likelihood numbers together. If they add up to ten (10) move on to the next step. If they are higher than ten (>10), subtract one (1) from the largest Likelihood number until ten (10) is reached. If they add up to less than ten (<10) add one (1)

to the largest system until ten (10) is reached. Record the adjusted Likelihood numbers.

The Likelihood number recorded for each number is used to determine how many digits it should take up on a 1D10 roll. For instance if the Likelihood number is five (5) for a system it could take up 1-5 on a 1D10 roll. If the next system has a Likelihood number of 3 it could take up 6-8 on a 1D10 roll. When done the three systems should occupy all the digits of a rolled 1D10. Record these table results.

Critical Effect

To determine the effect of the critical hit, roll on the table below. Remember that unless the Critical Effect is "Catastrophic Failure" the effect is only on the system that is damaged, not the whole vehicle.

Roll 1d10	
1-2	Quarter Failure
3-4	Half Failure
5-8	Total Failure
9-10	Catastrophic Failure

Quarter Failure: Whatever the system does, it has lost one quarter of it's capacity. The GM should agree on the result of this effect.

Half Failure: The system looses one half of it's capacity to function.

Total Failure: The system has completely failed, it no longer functions.

Catastrophic Failure: The destruction of this system causes a catastrophic failure of other systems until the vehicle is completely disabled.

Equipment Compendium

The equipment in this book is not always available to those outside of Gadios and the Game Master should make it difficult to acquire any of the items listed here unless there are special circumstances. In addition to this, the high cost of transporting material to The Artifact make importing these goods prohibitively expensive. As a result, nearly all of the goods listed here are manufactured in or near Gadios by corporations that are setting up shop on the Artifact.

Survival Gear

AC Power Inverters

An inverter converts DC power such as that produced by a vehicle's alternator or from a battery to alternating current that is used to power most devices.
Mass: 2 kg
Cost: ¥3,080

Acoustic Amplifier

These are listening devices that amplify faint sounds by 35-40 decibels so that they can be more readily heard. Background sound is also amplified.

These devices often have a simple microphone attached, but their performance is greatly enhanced by using a quality external microphone. A headset can be used to monitor the output of the amplifier, or it can be plugged into almost any other device that has a sound input.
INT 30% Advantage
Mass: 600 g
Cost: ¥2,000

Acoustic Ablation

Acoustic ablation systems take ambient noise and broadcast the opposite waveform to cancel out (or ablate) sound. The system is only effective at ablating relatively quiet noises such as heartbeats, footsteps, and breathing (sounds that are less than 50 db).

This ECM is only effective at blocking detection that would use sound.
ECM Range Class: A
Mass: 800 g
Cost: ¥3,000

Acoustic Ear Protection

When near sources of loud noises, it is beneficial to have hearing protection. These hearing protectors lower the decibel level of sound reaching the ears by 35 db.
Protects from 5 Mental and 5 Physical stress per hour in loud sound environments.
INT 20% Impairment
Mass: 200 g
Cost: ¥600

Acoustic Ear Protection / Amplification

Similar to normal ear protectors, but these incorporate a sound amplification system. When near sources of loud noises greater than 82 db (gunshots, loud equipment, etc. will trip the system) these hearing protectors lower the decibel level of sound reaching the ears by 35 db. When not in the presence of loud noises, other noises are amplified by 15 db enabling the user to hear faint and normally inaudible sounds easily.
Protects from 5 Mental and 5 Physical stress per hour in loud sound environments.
INT 20% Advantage
Mass: 200 g
Cost: ¥3,200

Air Mattress

Tired of sleeping on the cold hard ground? An air mattress can help keep you more comfortable and warm. However if the ground is warmer than the air the mattress will actually make you colder.
Sleep and rest relive 1 extra stress point per 8 hours while using the air mattress.
Mass: 500 g
Cost: ¥2,000

Aireocapsules

Aireocapsules are nanometer diameter spheres that hold reactively high concentrations of oxygen. They are ingested or injected and travel through the blood stream. The Aireocapsules start absorbing CO_2 and releasing oxygen. This gives the user the ability to maintain very high levels of activity in thin atmospheres or to hold their breath for very long periods of time.

Aireocapsules are designed to detect a rise in CO_2 in the bloodstream maintaining a normal blood-oxygen level and can remain in the bloodstream for hours until activated. The Aireocapsules begin to release oxygen and

absorb CO2 immediately. This enhances the physical stamina of the user.

Effects: The user can hold his or her breath for the effective duration of the dose. If the user engages in strenuous physical activity they get a 80% Advantage to Con and a 10% Advantage to Str for the duration of the dose. As long as the user can breath normally and they are not engaged in strenuous activity, the Aireocapsules shut down and remain in the blood stream extending the duration of the dose until CO2 levels increase again.
Injection dose: 2 hours
Ingestion dose: 15 minutes
Cost: ¥2,000 per dose

ASO Operations Manual

The information in the ASO operations manual can be very useful for defining how to proceed in most common situations. It includes some rudimentary Scimrahn and Kelrath. Includes tips for handling social and combat interactions in the different cultures. It also includes a good amount of information on how to find food, electricity and water.

For game purposes the manual has similar information to what is in the first 27 pages of this book but would also contain detailed procedures on how to accomplish tasks. Aids the Foraging skill (10% Advantage) and a Scimrahn, Kelrath and Chezbah Culture skill (10% Advantage). Takes ten minutes of reading each time the character wants to use the advantage.
Mass: 100 g
Cost: free

Bicycle

Bicycles are lightweight and very quiet. They are also very small making them ideal in cramped spaces.

Str Roll
Speed in Km/h

	Fail	Full	1/2	1/4	1/8
Speed:	15	20	24	27	30

Mass: 8-15 kg
Cost: ¥6,000-12,000

Chain Hoist

A chain hoist is a heavy-duty chain that is wrapped around one or a number of pulleys. When attached to an overhead surface capable of bearing the weight, the hoist can lift up to 6 tons off the ground. Chain hoists are often operated by hand although some use electric motors. Because of the pulleys involved, the lifting process is slow. Often it takes upwards of one minute to raise an object one meter.
Mass: 50 Kg
Cost: ¥10,000

Chain Saw

A chain saw is useful for cutting through unarmored obstructions at a rapid rate. However armored objects will quickly dull the blade.
Damage: 20
Parry: -10
Mass: 2-5 Kg
Cost: ¥6,000-10,000

Chemical Suit

Prevents toxic chemicals from touching the skin, also masks human sent, useful for keeping Seeters away.
30% Advantage to camouflage rolls against animals.
Mass: 1 Kg
Cost: ¥400

Cot

Cots are collapsible beds made of canvas stretched over a frame.
Sleep and rest relive 1 extra stress point per 8 hours while using the cot.
Mass: 6.7 Kg
Cost: ¥800

Collapsible Chair

A very nice item to have. By staying off the ground a chair can keep you dryer and relatively warmer.
Rest relives 1 in 10 extra stress points per 15 minutes.
Mass: 2.1 Kg
Cost: ¥200

Collapsible Table

A wonderful invention for keeping items off the ground, such as food or cards.
Mass: 9 Kg
Cost: ¥1,000

Communication Wire

Often, when given enough time, military forces will set up their own communication networks to protect against eavesdropping. The two most common media for setting up such a network are copper and fiber optics.

Copper

Copper communication wire is cheap and relatively easy to work with. However the wire can be tapped without much effort if the cable is found.

Copper wire requires a signal booster (repeater) every five hundred meters
Mass: 2 Kg per 100 meters
Cost: ¥400 per 100 meters

Fiber optic

Fiber optic cable is more expensive than copper but it has several advantages. It is very hard to tap a fiber optic line without making the user aware that something is going on. Fiber optic cable carries more information than a copper pair. It also can send a signal greater distances without a signal booster.

Fiber optic lines require a signal booster every 12 Km.
Mass: 6 Kg per 500 meters
Cost: ¥6,000 per 500 meters

Compass

It was originally thought that a compass would be useless in the Artifact, however the magnetic plasma conduits will draw the magnetic needle to alignment with it giving a local direction marker.
Mass: 50-175 g
Cost: ¥600-4,000

Compression Sack

Compression Sacks are like duffel bags with special reinforcements that allow the bag to ratchet down on its contents and reduce their total volume. This is very useful for clothing and other fabric items as it forces the load to take up less volume.
Mass: 120 g
Cost: ¥400

Cooler

These thermally insulated containers can keep food cold for about 30 hours if they are replenished with a coolant. This is usually ice, but sometimes coolers have electricity-powered refrigerants.
Mass Empty: 1 Kg
Mass Full: 15-20 Kg
Cost: ¥800
Powered Cost: ¥2,000

Diving Fins

Used for faster swimming in water.
Effect: 20% Advantage to Swimming skill.
Mass: 190 g
Cost: ¥600

200 Liter Drums

Good for holding water, fuel, oil or other goods. It is a bad idea to change what liquids a barrel is holding, for instance, a barrel that once held fuel should never be used to store drinking water.
Mass: 15 Kg
Cost: ¥1,000

Duct Tape

Invented to hold metal ductwork together, Duct Tape has become a must have for temporary fixes of all sorts.
10% Advantage to Repair skill rolls
Cost: ¥30 per 10 meter roll

100 mph tape

Very similar in appearance to Duct Tape, 100 mile per hour tape gets it's name from it's intended function of sealing bullet holes in airplanes. It now sees a great deal of use by the NACSP military forces as a temporary repair tool.
15% Advantage to Repair skill rolls
Mass: 550 g
Cost: ¥40 per 10 meter roll

Electrical Power Converter

The electrical power that is used in The Artifact's incremental cities is over five hundred volts AC and operates at 14 kilohertz. In other words if you plugged any conventional device that was developed on earth it would very likely melt. To make the commonly available electrical power usable, a power converter is needed.

The converter can output electricity at 120 volts ac at 50 or 60 hertz, or 12 volts DC. Some units also can output 220 volts AC.
Mass: 60 Kg
Cost: ¥6, 240

Electrical Wire

Electrical wire is very useful for setting up camps and distributing electrical power. They allow electric lights to be distributed for better illumination. Electrical wire is also very useful for powering communication equipment and sensor systems.
Mass: 2 Kg per 10 meters
Cost: ¥300 per 10 meters

Gas Mask

Gas masks are not often seen since Vac Suits do a better job of protecting from

hostile environments. However gas masks are easier and quicker to put on in an emergency.
Mass: 709 g
Cost: ¥400

Generator

A small internal combustion engine that turns a pre-specified fuel into electricity. The fuel can be gasoline, diesel, methane, hydrogen, or alcohol.

Runs for 5 hours on a refill.
Mass: 30 Kg
Cost: ¥10,000
Refill Cost: ¥100

Ghillie Suit

3d camouflage suit used for hiding in foliage. 30% Advantage to Camouflage skill when hiding in foliage.
Mass: 2.27 Kg
Cost: ¥1,000

Handcuffs

Useful for restraining people from using their hands.
Mass: 340 g
Cost: ¥350

Head Lamp

Hands free flashlight.
Mass: 40 g
Cost: ¥200

Heater (Electric)

Uses either 12vDC from a vehicle or 110v AC from a power converter.
When in an enclosure such as a vehicle or tent, protects from 5 Physical and Functional stress per hour due to cold.
Mass: 3.17 Kg
Cost: ¥600

Heater (Fuel)

These heaters use some form of pre-determined fuel to heat a room or tent. The fuel used can be propane, methane, hydrogen, alcohol or gasoline.
When in an enclosure such as a vehicle or tent, protects from 10 Physical and Functional stress per hour due to cold.
Runs for 3 hour on a refill.
Mass: 3.17 Kg
Cost: ¥2,000
Fuel Refill Cost: ¥40

Heads Up Display (HUD)

HUDs were originally implemented widely in combat vehicles in the late 20th century. They displayed targeting information and allowed the pilot to keep his or her head up while accessing this information. This is the reason for the name "Heads Up Display". The HUD projects an image either on to a pane that lies directly in front of the user's eye, or it is projected directly into the user's retina. Although originally adapted to increase piloting performance, the HUD's usefulness does not end there. The HUD's function is limited only by the imagination of developers.

The biggest limitation to the HUD was the display quality. Resolution was one problem, but brightness and opacity was another. It wasn't until the 2020's that these technical hurdles were cleared and personal HUDs came into widespread acceptance.

HUDs are usually combined with some form of headphone(s) to allow for sound and video to be delivered in the same package.
Mass: 50-250 g
Cost: ¥2,000-10,000

Human Scent Remover

This is a chemical spray that neutralizes the odors of the human body. Many find it useful for keeping Seeter from smelling you.
10% Advantage to camouflage rolls against animals.
Mass: 560
Cost: ¥200

Hydraulic Jack

Hydraulic jacks are useful for lifting things temporarily off the ground, or separating two items provided the jack can be inserted into a gap.

5 ton capacity

Good for lifting light to medium sized vehicles such as transports or trucks
Mass: 20 Kg
Cost: ¥3,000

10 ton

Good for lifting large trucks, light APCs and shifting small boulders.
Mass: 25 Kg
Cost: ¥4,000

20 ton

Good for lifting APCs and shifting medium sized boulders.
Mass: 35 Kg
Cost: ¥6,000

30 ton

Good for lifting armored vehicles, light tanks and shifting large boulders
Mass: 50 Kg
Cost: ¥10,000

Inflatable Raft

An inflatable raft can be carried inside a large backpack. When needed, compressed air canisters or an air compressor can quickly inflate the flotation device.
Mass: 30 Kg
Cost: ¥4000

Anchor

Mass: 5 Kg
Cost: ¥600

Infrared Camera

These digital cameras are designed to pick up the infrared spectrum. They transmit motion video to any common display and/or storage device.
Datarate/hour: 6 gigabytes
Mass: 190 g
Cost: ¥16,000

Laser Pointer

A small convenient solid state laser. Can be fixed to a key chain, and can be seen in most day light equivalent conditions up to a hundred yards away. Uses four watch batteries.
Mass: 5 g
Cost: ¥200

Laser Communicator

Laser Communicators require a direct line of site to operate and can be difficult to align properly. Some laser communicators are mounted on vehicles but portable units often use a miniature tripod to stay on target.

A laser communicator requires a Dexterity roll to align. The Impairments for range bracket apply to this alignment roll.
Range Class: D
Mass: 500 g
Cost: ¥4,000

Leak Stop Aerosol Can

Good for stopping minor leaks in tires temporarily.
10% Advantage to Repair Machinery rolls on wheeled vehicles.
Mass: 250 g
Cost: ¥100

Legged Support Systems

These are semi-autonomous systems that are used to carry material over difficult terrain. They are quadruped or hexapod robots designed to carry heavy loads while following after a person on foot. They can take simple verbal instructions such as “Move to the left.” or “Come this way.”

There are both military and civilian versions of these load bearing systems. They are often used in disaster recovery situations where normal vehicles are unable to travel.

Legged support systems use radio transmitter badges that they use to follow a person on foot. The person carries or wears the badge which can also be used as a remote control for the robot.

When not in use, a Legged Support System will lay down for easier transport by a vehicle such as a pickup truck.

Packmule (Civilian Variant)
Length 2.5 m
Hight 2.2 m
Width 1.3 m
Mass 862 Kg

Power plant type:	Internal combustion
Optional power plant:	Fuel cell
Total fuel capacity:	8 hours
Fuel type:	Gasoline/alcohol

Attributes

	Full	1/2	1/4	1/8
Con	100	50	25	13
Str	100	50	25	13
Ref	20	10	5	3
Agi	10	5	3	2
Dex	0	0	0	0
Bty	15	8	4	2
Cha	5	3	2	1
Int	5	3	2	1
IQ	5	3	2	1
Psy	10	5	3	2
BP	5			
HP	40			

Defenses: Armor (AR 5)

Special Abilities
The Packmule can communicate via radio.

Movement
Walking Speed: 45 meters/turn
Vertical Jump: 1 meter

Horizontal Jump: 1 meter

Cargo Capacity: 200 Kg
Complete system Cost: ¥8,000,000
Fuel cell variant: + ¥1,500,000

Warhorse (Military Variant)
Length 2.8 m
Hight 2.3 m
Width 1.5 m
Mass 1,340 Kg

Power plant type: Fuel cell
Total fuel capacity: 8 hours
Fuel type: Gasoline/alcohol

Attributes

	Full	1/2	1/4	1/8
Con	150	75	38	19
Str	200	100	50	25
Ref	25	13	7	4
Agi	60	30	15	8
Dex	0	0	0	0
Bty	10	5	3	2
Cha	1	1	1	1
Int	5	3	2	1
IQ	5	3	2	1
Psy	10	5	3	2
BP	10			
HP	80			

Attacks: Optional Machine gun mount that can be fired by the robot with operator permission. Any machine gun designed for vehicle mounting may be used.
Defenses: Armor (AR 15)

Special Abilities
The Warhorse can communicate via radio (BP 30). Can be controlled via a Comm Officer's communications backpack.

Movement
Walking Speed: 50 meters/turn
Vertical Jump: 0.5 meters
Horizontal Jump: 0.8 meters

Cargo Capacity: 400 Kg
Complete system Cost: ¥23,000,000

Life Vest
With a life vest a person can float in water almost indefinitely.
Character takes no stress from swimming distances.
Mass: 1 Kg
Cost: ¥600

Metal Detector
Used to detect small and/or buried metal that can indicate mines or valuables among other things.
Mass: 1 Kg
Cost: ¥3,000

Microphone Directional
A microphone that is primarily designed to detect sounds emanating from a single direction. These microphones are often used for high fidelity recording.
This microphone increases the sensitivity of a device by five decibels (5 db).
Mass: 200 g
Cost: ¥2,500

Microphone Parabolic
This type of microphone uses a parabolic dish and a directional microphone to detect faint sounds even at a distance. Because of the parabolic dish, the microphone can pick up very faint background noises.
This microphone increases the sensitivity of a device by fifteen decibels (15 db).
Mass: 300 g
Cost: ¥5,000

Microphone Omnidirectional
Omnidirectional microphones detect sounds coming from all directions around it. The sound quality is not as good as a directional microphone.
This microphone increases the sensitivity of a device by two decibels (2 db).
Mass: 200 g
Cost: ¥ 2,000

Mirror (angled dentist)
Useful for a wide verity of tasks such as looking into machine parts and looking around corners without exposing oneself. The mirror is very small so large objects that are close by are hard to recognize (40 Impairment to Int).
5% Advantage to Repair rolls
Mass: 20 g
Cost: ¥100

Moisture Absorbent Packets
Protects guns knives papers books and clothing from moisture accumulating in storage. Will not absorb any significant quantity of standing water.
Mass: 2 g

Cost: ¥60

Motion Detector

Motion detectors use infrared beams to detect objects moving into their field of view. Crossing a single beam can trip the detector. The motion detector can be used to activate devices, sound alarms, turn on lights or cameras.
Every turn that an object is moving through the detector's field of view there is a ninety percent (90%) chance of detection. Range Class Impairment affect this chance.
Range Class: A
Mass: 100 g
Cost: ¥200

Multi-function pocket tool

An expansion on the concept of a pocket knife, these tools often include needle nose pliers, wire cutters, wire strippers, a straight and phillips head screwdriver, a can opener, a bottle opener, a small knife, and an assortment of other small tools. These multi-purpose tools do not function as well as the single purpose tools they emulate, but are much easier to carry and function adequately for quick jobs.
10% Advantage to Repair rolls
Mass: 100 g
Cost: ¥ 600

Parachute

A parachute can be useful when a character is on the upper floors of a Hex or flying a vehicle and suddenly needs to get down to the ground.

Using a parachute successfully requires and Agility attribute check plus any Parachute skill the character might have.

Modern parachutes consist of a main chute, and a backup chute. The main chute has only a 1 in 1000 chance of failing because of an equipment failure. Backup chute failure is even rarer.
Mass: 15 Kg
Cost: ¥60,000

PDA (Personal Digital Assistant.)

Personal Digital assistants often are small handheld computers that can perform a smaller verity of tasks than a full sized computer. While many PDAs have powerful processors, they are often limited to using non-volatile memory for storage instead of caterpillar or quantum storage. Because of this they can only hold five to six hours of uncompressed video, or the equivalent. While the front of a PDA is often a small menu screen, a HUD is used as the main display.
Processor Points: 3
Storage: 100 Gigabytes
Mass: 125 g
Cost: ¥ 4,000

Pots and pans

Pots and pans are indispensable for preparing food. While they are bulky they are allow the character to prepare fresh foods instead of pre-packaged meals such as MREs.

Small assortment of pans
Mass: 20 Kg
Cost: ¥3,000

Large assortment of pans
Mass: 40 kg
Cost: ¥8,000

Camping set of pans
Mass: 1.5 Kg
Cost: ¥800

Pocket Chain Saw

This tool is a chain saw blade that has handles attached to either end of the chain. The chain is wrapped around the object being cut and drawn back and forth to perform the cutting action. While the trees on The Artifact are usually small and have poor quality wood, they are still useful for fuel.
Mass: 50 g
Cost: ¥600

Ratcheting tie downs

These tie downs are excellent for securing heavy loads so they do not shift during transport.
Mass: 100 g
Cost: ¥100

Ratcheting Winch 6 ton

These hand-powered winches attach by hooks to lift or pull two items together.
Mass: 2 Kg
Cost: ¥800

RF Scanner

A RF (Radio Frequency) Scanner monitors the entire RF spectrum for activity and tunes to the active frequency allowing the user to intercept radio transmissions. The Scanner also operates as a radio transmitter.
40% Advantage to Radio skill rolls
Mass: 100 g
Cost: ¥600

Sandbags

Sandbags are used to build temporary walls with materials that are readily available. The bags are nylon or some other resilient material. The Sandbag is filled with sand, dirt, rocks or any other heavy fill. The bags are stacked up to create a temporary but resilient barrier.
For every 100 sandbags the character gets a 60% Advantage to Construction shelter, a 30% Advantage to Architecture when building field grade buildings and a 20% Advantage to Construction Bunker.
Mass: 100 g
Cost: ¥600

Shovel (folding)

Also referred to as E-Tools or entrenching tools. These small but sturdy shovels are useful for digging trenches or foxholes for protection from enemy fire.
30% Advantage to Construction skill rolls
Mass: 1 Kg
Cost: ¥300

SOLAS Food Pack

SOLAS (for Saving Of Life At Sea) food packs are high calorie food bars. They were formulated to sustain the lives of those lost at sea, but have come into high demand among corporate scouts. Each pack contains nine (9) food bars. Each bar is equivalent to a half meal. The only other difficulty is finding water.

SOLAS packs have a five year shelf life.
Mass: 600 g
Cost: ¥200

Spot Light

Hand held rechargeable 5 million-candlepower lamp. The beam can illuminate a spot greater than two hundred (200) meters away.
Mass: 5 Kg
Cost: ¥800

Spray Lubricant

The petroleum based lubricant is useful for getting rid of squeaks in rubbing parts, lengthens the operational life of mechanical parts, can help loosen stuck fasteners etc. 10 Advantage to Repair Machinery.
Mass: 170 g
Cost: ¥15

Stove (portable)

The portable stove is a propane or methane burning device that has a single burner. A bottle of fuel is screwed into an inlet valve. The Stove can be used for cooking or heating small spaces.
Burn Time: 1 hour per bottle
Mass: 500 g
Cost: ¥800

Fuel Bottle
Mass: 700 g
Cost: ¥200
Refill Cost: ¥80

Steel Toe Boots

Steel toe boots have a protective steel shield guarding the toes of the wearer. These boots are resilient and provide good protection for the feet. Contrary to popular belief steel toe boots effectiveness as weapons is dubious at best.
Mass: 700g
Cost: ¥800

Sunglasses

Sunglasses are useful on the surface where the suns are constantly shining.
Mass: 50g
Cost: ¥40-2000

Surgical Table (Folding)

This collapsible surgical table is useful for setting up temporary field hospitals. The table is mechanically adjustable to multiple surgical positions and folds into a box 80x100x120cm.
Mass: 200kg
Cost: ¥260,000

Thermos

A bottle that is thermally insulated by a vacuum. Used to store warm liquids for several hours.
Mass: 200 g
Cost: ¥200

Tactical Robot

Law enforcement and military organizations use tactical robots for situations where human survivability is low. These robots (also called tactical idiots and bricks because of their low intelligence) are used to remove bombs and mines from out of harms way.

They are heavily armored to withstand explosive blasts.

The tactical robot is controlled by remote and can use radio or wire (where radio is not expected to penetrate) to receive orders. They are capable of some autonomy, but this is extremely limited.

If contact with its control system is lost, the robot will attempt to follow the path it took back to the control system. This is one of the things that has earned the robots reputation for being tactical idiots, the robots are rarely successful in finding their way back. The brick nickname comes from operators saying that throwing a brick at an explosive device would be as effective as these robots.

These units are often sold with a transport and control vehicle that contains all the radio and control equipment necessary to operate the robot.

Length 1.8 m
Mass 567 Kg

Attributes

	Full	1/2	1/4	1/8
Con	100	50	25	13
Str	150	75	38	19
Ref	10	5	3	2
Agi	10	5	3	2
Dex	40	20	10	5
Bty	10	5	3	2
Cha	1	1	1	1
Int	5	3	2	1
IQ	5	3	2	1
Psy	10	5	3	2
BP	10			
HP	100			

Damage Punch - 2 (punch damage is low due to the slow speed of the robot)
Crush - 20
Defenses: Armor (AR 30)

Special Abilities
The tactical robot can communicate via radio.

Movement
Walking Speed: 5 meters/turn
Vertical Jump: 0 meters
Horizontal Jump: 0 meters

Control Vehicle
Type Truck
Model Varies
Overall height 1.65 m
Overall width 2.3 m
Overall length 3.8 m
Dry Mass 2253.6 kg
Full Mass 3687 kg
Power plant type: Internal combustion

Movement
top speed 120 Km/h
Total fuel capacity: 16 hours
Fuel type: Gasoline
Armor Rating: 10
Hit Points: 110
Crew: 1
Passengers: 2
Cargo Capacity: 1000 Kg
Piloting Modifier: 0

The control vehicle contains the following.
1 Tactical Robot
Robot transport harness
One ton lift gate.
Robot control cabin (built into the vehicle).
Radio transmitter range: 1 km
Communications Cable: 400 M
Cable AR: 8
Cable HP: 5
Complete system Cost: ¥5,000,000

Ultraviolet Camera

These digital cameras are designed to pick up the ultraviolet spectrum. This is useful for detecting high energy applications such as lasers, and force fields. They transmit motion video to any common display and/or storage device.
Mass: 190 g
Cost: ¥32,000

Video Camera (analog)

Because of the lack of resources on Earth, many old technologies are back in use. Analog video cameras record information on magnetic tapes or disks. They are more popular among poor and developing nations because of their low cost.
Maximum Recording Time: 2 hours
Mass: 500 g
Cost: ¥800

Video Camera (digital)

Digital video cameras record information on flash memory disks or in high-end systems, caterpillar drives. They provide very high quality video and many can automatically correct for low light conditions and shaky camera handling.
Datarate/hour: 8 gigabytes
Mass: 400 g
Cost: ¥16,000

Video Mini Cams

These are Digital video cameras used mainly as computer input or in surveillance. Mini Cams do not provide the best quality images but are lightweight and unobtrusive. Mini Cams often do not store data but continually output to another device such as a dedicated recorder, computer, or video monitor. Mini Cams are useful as security cameras.
Datarate/hour: 2 gigabytes
Mass: 50 g
Cost: ¥500

Winch (Powered)

Powered winches are a made up of a engine or motor that winds a steel cable around a spool. Winches are useful for removing light obstructions, getting vehicles, animals, or people out of conditions that they normally would not be able to get out of by themselves.

Electrical winches can be attached to a vehicle or strapped to a sturdy enough object. Although not strong enough to pull a heavy vehicle, a winch can apply enough force to aid the vehicle in traversing obstructions.
Mass: 30 Kg
Cost: ¥2,000

Scientific Hardware

Animal Tracking Tags

When studying the behavior of animals it is useful to monitor their movement over long periods of time. Animal tracking tags allow the animal to be located and identified by a broadcast radio signal with a distinctive pattern. Tags are similar in size and thickness to a credit card and are flexible so that they may be bent. On one side of the card is a battery of solar cells and on the other is a dielectric that when touching the skin of the subject animal will produce low level electric current. Tags can either be glued on to small or smooth skinned animals, or they can be mechanically fastened to an animal's ear. Tags are designed to have a long life span rather than a powerful signal so the biologist tracking the animal must often get within one kilometer of the study subject to pick up the radio signal.

20% Advantage to Biology skill.

Battery life: 6 months
Mass: 100 g
Cost: ¥2,000

Atmospheric Instrumentation

This suite of devices gives accurate data on the atmospheric conditions in the local area.

Wind Speed Meter
Gives the average wind speed along with the gust speed.

Precipitation Gauge
Measures the hourly precipitation by taking a ten minute sample and then extrapolating the total.

Barometer
Measures the atmospheric pressure.

Thermometer
Measures the local temperature.

Hygrometer
Measures the relative humidity of the air.

Mass: 800 g
Cost: ¥6,000

Centrifuge

A centrifuge is a device that uses centrifugal force to separate solids suspended in liquid media into it's component parts.

30% Advantage to Chemistry, Biology and Botany skills.

Mass: 2.1 Kg
Cost: ¥24,000

Electron Microscope

The electron microscope bounces electrons off an object to create an image. The electron microscope is able to image objects that are far too small to be small to be seen with a traditional microscope because the wavelength of light is larger than the subject being observed. Multiple magnetic mirror electron microscopes have allowed the imaging of individual atoms and can observe molecule by molecule atomic reactions.
Mass: 600 Kg
Cost: ¥240,000,000

Gas Chromatograph / Mass Spectrometer

The GC/MS is a device that can determine the molecular composition of most materials. From that composition, a database of materials can be referenced and unknown materials can be identified. The GC/MS can also be used to test the purity of air and water with very high precision.

A Gas Chromatograph is a device that separates a sample of gaseous or liquid material, into its component gases. A mass spectrometer then measures the mass of the sample and bombards the sample with ions. It is then able to determine what the chemical composition of the materials that is in the sample.

Solids can be processed through a gas chromatograph by dissolving a material in a known solution. The solution is then negated from the results and what is left is the solid matter.

The resulting chemical composition is then compared against a database that can identify the material by chemical composition and the quantities of the chemicals in the sample.

The GC/MS requires a sample of gas or liquid to be at least three microliters or a solid to be one half gram to one gram in mass. The process takes at least one hour but may take more for very complex substances.

60% Advantage to Chemistry skill.

Mass: 16 Kg
Cost: ¥640,000

Interference Microscope

The interference microscope is a microscope that uses fast phase variations in two beams of light. The resolution limit of a normal microscope is due to the wavelength of light being larger than the object being observed. The fast phase variation of the interfering beams of light allows measurements that are impossible for normal light. The interference microscope can see at much higher resolution (on the nanometer scale) than an optical microscope because it uses an interference pattern of two light beams to measure the subject.

30% Advantage to Chemistry, Biology and Botany skills.

Mass: 13 Kg
Cost: ¥30,340,000

Isolating Glove Station

These shatterproof glass boxes have integrated coated neoprene gloves that can be used to manipulate an object inside the box. The box is sealed so as to be air tight and coated to reduce heavy particle radiation. Most biohazards can be safely manipulated inside the glove station.

Mass: 15 Kg
Cost: ¥50,000

Laser Ablation Spectrometer

The Laser Ablation Spectrometer functions much as the Gas Chromatograph / Mass Spectrometer but needs far less of a sample to perform an analysis. The Laser Ablation Spectrometer uses a pulsed laser to vaporize a tiny portion of the sample without prior preparation. The sample can be gas liquid or solid. Even very hard solids will usually emit some form of gas in minuscule amounts. The Laser Ablation Spectrometer is easier to use with solids than a traditional GC/MS because solids do not need to be dissolved and therefore the dilution media does not need to be subtracted from the results.

The resulting chemical composition is then compared against a database that can identify the material by chemical composition and the quantities of the chemicals in the sample. The Laser Ablation Spectrometer requires a sample of gas or liquid to be at least one hundred picoliters or a solid to be one tenth of a gram. The process takes at least one hour but may take more for very complex substances.

60% Advantage to Chemistry skill.

Mass: 18 Kg
Cost: ¥1,230,000

Oscilloscope

Oscilloscopes are used to observe electrical waveforms, their frequency and amplitude. The Oscilloscope can be used to observe most waveforms by connecting it to a device that generates an electrical signal from the wave. For example a microphone can be connected to an Oscilloscope and the sound wave can be observed.

30% Advantage to Repair Electronics and Electronics Engineering.

Mass: 8 Kg
Cost: ¥6, 680

Portable X-ray gun

Used for looking inside an object without having to open it. The X-ray image shows the relative density and reflectivity of objects inside. Can be used as a medical device or to examine mechanical or electronic devices without disturbing them among other things.
20% Advantage to General Medicine and Surgery skill rolls.
Mass: 5 Kg
Cost: ¥50,000

Protein Expression Analyzer

This device samples a large array of biological tissues and tests for the expression of proteins such as DNA and RNA. The device can simultaneously study the effects of DNA damage, oxidative stress, and various metabolic inhibitors on gene expression. The device can obtain an expression profile of your target gene and gain insight into how it may function. This can enable the production of medicines to block viral and bacteriological pathogens or to develop treatments for genetic diseases.
20% Advantage to General Medicine and Biology skill rolls.

Mass: 23 Kg
Cost: ¥560,000,000

Variable Electrical Power Supply

At times, when studying electronic devices it is useful to be able to apply electrical current to only a portion of a device to determine its function. In other instances, the normal power supply of a device might not be available. This lab quality power supply can generate DC power from the millivolt range up to approximately 12,000 volts from the Artifact power grid. It can also generate AC current in the same range and can vary the frequency of the output.

The power supply does not generate electrical power, it merely conditions it to meet the need of the electrical device being studied. The power supply is designed to take input from The Artifact's power grid but alternately can be supplied by an AC generator.

Mass: 65 Kg
Cost: ¥31, 760

Defensive Systems

Anti-Plasma Fence

These are actually a row of electromagnetic posts that are erected around a semi-permanent or permanent camp. Developed by the I-CA, these barriers create an electromagnetic field that draws plasma fire. The posts are armored to withstand the punishment of drawing the plasma. Since plasma weapons use magnetic fields to deliver their destructive payloads, the Anti-Plasma fence disrupts that field which attracts and dissipates the plasma.

This fence system draws a large amount of power and requires it to be connected to the Artifact's power grid.

Posts are most effective when placed two meters apart. The barrier is operational until at least two consecutive posts have been destroyed. This opens a corridor for plasma fire, but does not disable the entire fence. Only destroying all of the posts or cutting the power supply will completely nullify the fence.

The I-CA sells these fences to Corporations and the Scimrahn. The ASO has copied the design and is deploying their own version which is nearly identical.

AR: 30
HP: 150 per post
Height: 4 m
Diameter: 20cm
Mass: 100 Kg per post
Cost: ¥1000 per post

Anti-plasma Infrared Guided Micro Missile Launcher

Infrared guided micro missiles are armed with a low yield explosive warhead. An infrared heat seeking guidance system controls them. There is no user intervention other than deploying the missile. The micro missiles automatically target the most powerful plasma stream in its current fire arc.

The launcher is most often mounted on E-suits, but there have been a number of these units mounted on Scimrahn Deltas.

Guidance System
Percent to hit: 75%
Effect: Disrupts 1D10 x70 points of plasma damage per missile on a successful intercept.

	PB	S	Med	L	Ex
Damage	40	20	10	5	1

Blast Range Class: A
Range Class: C
Payload: 10
Mass: 280.3 Kg
Rocket Mass: 5.1 Kg
Cost: ¥1,500,000
Missile Cost: ¥826,000

Chaff

Chaff is a defensive countermeasure that uses a small explosive device to disperse a cloud of highly reflective threads. This cloud scatters electro-magnetic and photon energy in random directions, confusing radar and reducing the effectiveness of lasers

Chaff rounds are available for grenade launchers and 20mm guns.

Effect: Chaff rounds create an Impairment for optics in a 300 meter radius and an additional Impairment to hit a target with a laser weapon.

	PB	S	Med	L	Ex
Sensor Imp	90%	60%	30%	20%	10%
Laser Imp	40%	30%	20%	10%	5%

Blast Range Class: B
Mass: 300 g
Cost: ¥5,400

Concertina Wire

These spools of razor edged wire are quickly strung across an enemy's path. Concertina Wire is also called razor wire because of it's razor sharp edges. Even if an enemy is armored, the wire can entangle the subject.

Effect: The wire does one point of damage. If the Concertina Wire does damage to an animal or person they must make a Con roll to keep walking or running. Victims are entangled. If a victim is entangled they must make a Agi roll with a 70% Impairment to escape or suffer one point of damage for each failed attempt to escape.

Save vs. entanglement: Agility roll. Must roll under the victim's Agi to avoid entanglement.

Cost: ¥100 per 70 meters

IR Flare Decoy

The IR flare is similar to an illuminator Grenade but the IR flare emits mainly infra-red light. The light is bright enough drown out any other sources of low intensity infrared such as vehicles and humans that are near the flare.

The launcher for these flares is a simple aluminum tube with an electrical trigger that can be wired into a vehicles electrical system.

Effect: The IR Flare makes it very difficult to target any object inside the effect radius with Infrared Optics.

	PB	S	Med	L	Ex
Sensor Imp	90%	80%	60%	20%	10%

Blast Range Class: A
Range Class: A
Payload: 1
Mass: 400 g
Cost: ¥4,000

Flares
Mass: 75 g
Cost: ¥8,000

Multiple Flare IR Decoy

The Multiple IR Flare Decoy creates a larger field effect than a single flare. Multiple flare launchers are mounted to a vehicle and triggered by an electrical button switch or trigger device.

Effect: The IR Flare makes it very difficult to target any object inside the effect radius with Infrared Optics.

	PB	S	Med	L	Ex
Sensor Imp	90%	80%	60%	20%	10%

Blast Range Class: B
Range Class: A
Payload: 1 load of six flares
Mass: 400 g
Cost: ¥4,000

Flares
Mass: 75 g
Cost: ¥8,000

Personal ECM System

The Personal ECM system is designed to combat the FCS and AFCS systems but is also effective against cameras, video cameras, telescopic and infrared optics. The unit is attached to the belt or shoulder. A low intensity laser system scans a thirty (30) degree cone in front of the weapon. The unit scans for a phenomenon known as "Sensor-Retroreflectivity". This phenomenon can be illustrated as being similar to the glow in an animal's eye at night when a light is shined at

it. The Personal ECM System looks for this phenomenon and fires an argon laser at the optic. There is no roll to strike since the system handles this. When an optics system is targeted by the ECM system. Microabrasions in the optics glass scatter this particular wavelength of light turning the entire lens a glaring, opaque green. As a result, a sniper could not see through their scope, an FCS operator could not, with any accuracy lase their target and a AFCS could not see targets.

The ECM has a 60% chance of identifying and neutralizing optics. The ECM can simultaneously effect all optics systems in its scanning cone, but a percentile roll must be made for each target.

Battery Life: 6 Hours
Mass: 1.1 Kg
Cost: ¥140,000

Smoke Grenade

	PB	S	Med	L	Ex
Vision Imp	90%	80%	60%	20%	10%

Blast Range Class: A
Mass: 175 g
Cost: ¥4,000

Archaic Weapons

Baton

These are simple weapons used to cause pain and dissuade a target from further aggression. Also called nightsticks, these clubs are used by police to subdue criminals. A wide verity of batons are available, from the police like side handle baton to telescoping spring batons.

Damage: 2 points
Parry: 20% Impairment
Mass: 750 g
Cost: ¥300-900

Blowgun

A blowgun is a long narrow tube that is used to guide small darts. The user blows into the tube. This forces the dart down the tube and propels it through the air.

Blowgun darts are good for hunting very small prey by themselves. However with the addition of a poison or sedatives applied to the tip of the dart, much larger targets may be taken down.

	PB	S	Med	L	Ex
Damage	2	2	2	2	1

Range Class: A
Payload: 1
Rate of Fire: 1
Mass: 50 g
Cost: ¥1,000

Bola

A bola consists of two weights tied to either end of a rope. The Bola is swung in a circular motion over the head. When released, the bola spins as it flies. On striking a target, the bola wraps around and entangles limbs. The bola is effective in entangling even large animals such as cattle.
Effect: The Bola entangles it's victim and when the weights fully wrap around the victim can stun the victim. Roll for normal hit location. If the Bola strikes the legs, the victim cannot walk, and must make a Agi roll to keep standing. If the Bola strike the arms or chest the victim cannot use their arms. If the Bola strike the head double the damage as normal. If the Bola does damage the victim must save versus stun as normal.

Damage: 1
Range Class: A
Parry: 20% Impairment
Mass: 1 Kg
Cost: ¥400

Bow

The bow in its simplest form is a wooden shaft that is bent to put tension on a cord. An arrow with a notch in the back is placed on the cord. The cord is then pulled back which bends the wood shaft further and creates tension. That tension is then released when the cord is released propelling the arrow toward its target.

Bows are very quiet but not silent.

	PB	S	Med	L	Ex
Damage	8	8	7	4	2

Range Class: B
Payload: 1
Rate of Fire: 1
Mass: 500 g
Cost: ¥6,000

Bullwhip

Damage: 2 points

Parry: 80% Impairment
Ensnare: Agi + WS Whip
Mass: 500 g
Cost: ¥200-400

Caltrops

Caltrops are four pointed metal spikes. Three spikes will rest on the ground while one of the spikes points straight up. The points are arranged so that when dropped, one point will always stay up. A number of caltrops are usually dropped in clusters in the path of a wheeled vehicle, animal or humans. The caltrops do not do any significant amount of damage, but impede motion.

The victim has a saving roll to notice the caltrops (roll vs. Int) but will have a much harder time if on an animal or in a vehicle (80% Impairment to Int).

Requires 20 caltrops per square meter to be effective.
Effect: does one point of damage per step, up to 5 points. The points however are sharp enough to pierce anything up to AR 5 due to the weight of a human body pressing into the point or will pierce anything up to AR 15 for any vehicle or animal over 500 kg. If the caltrop does damage to an animal or person they must make a Con roll to keep walking or running. If the caltrop does damage to a wheeled vehicle treat the damage as a critical hit to the vehicles drive system.
Cost: ¥100 per 20

Compound Bow

The compound bow uses mechanical tension from a spring instead of tension generated by the wood shaft in a regular bow. The mechanical tension is created by a system of pulleys and creates a "draw" with a high tension at the beginning and a lower tension at the end. This makes the bow easier to aim by allowing the user to hold the cord back for extended periods.

Bows are very quiet but not silent.

	PB	S	Med	L	Ex
Damage	9	9	8	5	2

Range Class: B
Payload: 1
Rate of Fire: 1
Mass: 550 g
Cost: ¥7,000

Composite Bow

Composite bows create tension through a large cam that rotates when the bowstring is drawn. Like the Compound bow, the Composite bow creates a high tension at the beginning of the draw but lowers toward the end of the draw. The drop in tension is greater in a Composite Bow than a Compound and therefore allows the same user to use a bow with a greater draw.

Bows are very quiet but not silent.

	PB	S	Med	L	Ex
Damage	10	9	8	5	2

Range Class: B
Payload: 1
Rate of Fire: 1
Mass: 550 g
Cost: ¥8,000

Arrows

Broadhead arrows are used in most types of hand drawn bows.
Cost: ¥80 per arrow.

Double sided axe

Damage: 20
Parry: 20% Impairment
Mass: 2-5 Kg
Cost: ¥3,000-10,000

Sjambok

Tool used in Africa as a cattle prod, riding crop, a whip and a self-defense weapon. The Sjambok is a flexible shaft wrapped in leather, It is swung like a stick and is very effective against small animals because of its speed and accuracy.
Damage: 2 points
Parry: 40% Impairment
Mass: 500 g
Cost: ¥200-400

Slingshot

A Slingshot uses elastic bands to launch small objects.

	PB	S	Med	L	Ex
Damage	3	3	2	1	1

Range Class: A
Payload: 1
Rate of Fire: 1
Mass: 50 g
Cost: ¥1,000

Sling

A Sling is a pouch with cords attached. It is swung or snapped to launch fist sized rocks at great speed. This weapon can be made with very little resources and it's

ammunition can consist of rocks or hard clay balls.

WS Sling (3) - A Sling cannot be used without having the WS Sling skill. Although an effective weapon, it is very hard to learn to use accurately.

	PB	S	Med	L	Ex
Damage	10	9	9	7	5

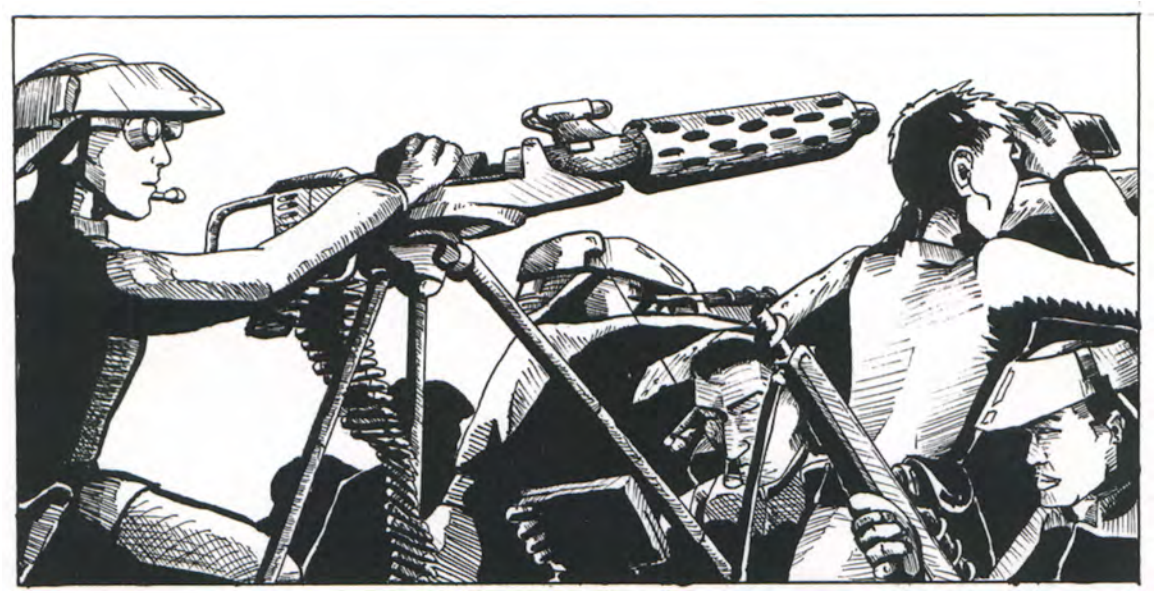
Range Class: B
Payload: 1
Rate of Fire: 1
Mass: 10 g
Cost: ¥1

Spear
Damage: 15
Parry: 20% Impairment
Mass: 4-5 Kg
Cost: ¥3,000-5,000

Sword
Damage: 15
Parry: 0
Mass: 3 Kg
Cost: ¥2,000-10,000

Throwing Knife
Damage: 7
Parry: 60% Impairment
Mass: 100-250 g
Cost: ¥1,500-3,000

Throwing Axe
Damage: 12
Parry: 30% Impairment
Mass: 1.5-2.5 Kg
Cost: ¥3,000-7,000



ASO / I-CA Weapons

10 Gauge shotgun

	PB	S	Med	L	Ex
Damage	25	18	15	10	8

Range Class: A
Payload: 1-2-6
Rate of Fire: 2
Mass: 2.8 Kg
Cost: ¥7,000

10 Gauge Ammunition (200 rounds)
Cost: ¥1,500

Derringer Pistol

The Derringer Pistol is most often a single shot weapon designed for concealment. They often consist of a two to three centimeter barrel and a guardless trigger.

	PB	S	Med	L	Ex
Damage	7	5	3	2	1

Range Class: A
Payload: 1
Rate of Fire: 1
Mass: 30 grams
Cost: ¥4,000

High Caliber Pistol

	PB	S	Med	L	Ex
Damage	11	11	10	8	5

Range Class: B
Payload: 10
Rate of Fire: 5
Mass: 1 KG
Cost: ¥12,000

Low Caliber Hunting Rifle

Low caliber hunting rifles are used to hunt small prey such as rodents. These weapons are lightweight as is their ammunition. Ammunition for these rifles is often very affordable.

	PB	S	Med	L	Ex
Damage	8	8	7	5	2

Range Class: B
Payload: 1-10 (often 1 or 5)
Rate of Fire: 2
Mass: 2 KG
Cost: ¥10,000

Medium Caliber Hunting Rifle

Medium caliber hunting rifles are often used to hunt medium to large prey.

	PB	S	Med	L	Ex
Damage	10	10	9	8	5

Range Class: B
Payload: 1-10 (often 1 or 5)
Rate of Fire: 2
Mass: 2.8 KG
Cost: ¥10,000

High Caliber Hunting Rifle

High caliber hunting rifles are meant for hunting large to very large prey.

	PB	S	Med	L	Ex
Damage	15	15	12	10	5

Range Class: B
Payload: : 1-10 (often 1 or 5) Rate of Fire: 2
Mass: 4.5 Kg
Cost: ¥30,000

Low Caliber Sniper Rifle

Low caliber sniper rifles use high power rounds to propel the slug a great distance.

The damage listed below is for a standard round, these weapons are most often used with armor piercing rounds. See: Rifle Ammunition, Armor Piercing.

	PB	S	Med	L	Ex
Damage	10	10	9	8	5

Range Class: C
Payload: 10-30
Rate of Fire: 2
Mass: 2.1 KG
Cost: ¥10,000

Medium Caliber Sniper Rifle

The medium caliber sniper rifle has slightly better stopping power due to the mass of the bullets it fires but is little better at extended ranges due to increased drift and a more dramatic drop off in the projectile's velocity over a distance.

The damage listed below is for a standard round, these weapons are most often used with armor piercing rounds. See: Rifle Ammunition, Armor Piercing.

	PB	S	Med	L	Ex
Damage	12	12	10	8	5

Range Class: C
Payload: 10-30
Rate of Fire: 2
Mass: 2.8 KG
Cost: ¥10,000

High Caliber Sniper Rifle

High caliber sniper rifles saw their first uses nearly a hundred years ago in the attempt to defeat improving vehicle armor. These weapons have also been found effective anti-sniper and EOD (Explosive Ordinance Disposal) weapon because of their high level of penetration. The weapon is effective in counter sniping when the target is under hard cover. They have actually been shown effective at shooting through cover to remove the sniper threat. It's EOD role is both because of the weapon's long range accuracy and its ability to hit buried targets from a distance.

High caliber sniper rifles often require a bipod to be fired accurately because of their high recoil. Without a bipod, high caliber sniper rifles have an effective range class of B.

The damage listed below is for a standard round, these weapons are most often used with zirconium tipped rounds. See: Rifle Ammunition, Armor Piercing Incendiary.

	PB	S	Med	L	Ex
Damage	20	20	18	16	10

Range Class: C with Bipod
Range Class: B without Bipod
Payload: 10
Rate of Fire: 3
Mass: 4.5 Kg

Cost: ¥30,000

Assault Weapon / Submachine Gun

The Assault Weapon is the primary infantry weapon for more than a hundred years. The trend has been to produce lighter more accurate weapons. Thousands of designs have been produced many have variants for special purposes such as for use by paratroopers or as a personal defense weapon for pilots of vehicles. These variants are often lighter with collapsible stocks. Many modern assault weapons have "component systems" that expand the role of the weapon such as bayonets, attachable grenade launchers, and in the case of the G-82 (see: The Artifact, Equipment) there is the AVW rocket launcher. More modern weapons have computers built into their sights that can perform a series of functions.

Assault weapons differ from sub-machine guns in that the user can select the firing mode of the weapon. Nearly all weapons have a single round mode for sniping and extended range fire and a burst mode that fires two (2) to five (5) rounds dependent on the weapon. A large majority of assault weapons also have a fully automatic mode that will continue to fire as long as the trigger is pulled and there are rounds in the magazine.

Modern weapons are often of the "bullpup" configuration, meaning that the magazine and therefore the firing chamber is behind the trigger mechanism. This serves to make the weapon more stable when firing. This however is not always the case especially noteworthy is that neither the ASO nor I-CA weapons are of this configuration.

Ammunition for assault weapons can be either standard cased rounds or the more modern caseless rounds (See: Rifle Ammunition, Caseless Rounds). However one weapon cannot fire both interchangeably. The advantage of cased ammunition is the resilience of the ammunition and weapon. Weapons firing cased rounds are more rugged and can better withstand extreme environments. Weapons firing caseless rounds need to have very strict conditions in their firing chamber (i.e. no moisture or dust). The advantage of caseless rounds is lighter weight ammunition because there is no heavy brass and a higher rate of fire because the weapon cuts out the step of ejecting the case. All weapon stats are given for cased rounds.

This category is called Assault "Weapons" because the class is very broad. Some are classified as rifles and others as carbines. For game purposes the distinction is not important but for accuracy, the more general term is used.

Low Caliber Assault Weapon

The low caliber assault weapon is the choice of most modern militaries. The small caliber is usually the 5.56mm NATO standard round. The advantage of smaller caliber is greater accuracy at longer ranges and better armor penetration.

	PB	S	Med	L	Ex
Damage	10	10	9	8	5

Range Class: B
Payload: 30
Rate of Fire: 15
Mass: 2.56-3.9 Kg
Cost: ¥12,000

Medium Caliber Assault Weapon

Medium caliber weapons are still in use by a select few armies in 2085. Most notably is the Chinese AK-140 developed in 2040 and still in use today. They have greater stopping power than low caliber weapons but they are less accurate at longer ranges.

	PB	S	Med	L	Ex
Damage	12	12	10	8	4

Range Class: B
Payload: 30
Rate of Fire: 15
Mass: 4.3 KG
Cost: ¥12,000

Optional Weapon Systems for Assault Weapons

The first optional weapon system for an infantryman's gun was the bayonet. This addition was indispensable for the early gun since they were unreliable and only fired a single shot. However as guns became the primary battlefield armament, the bayonet became less important. The history of optional weapon systems dries up until the under barrel grenade launcher was introduced. At the middle of the 21st century the integrated Fire Control System (see: FCS) greatly enhanced the functionality of the grenade

launcher, HEAP Guns and rocket propelled rounds.

Under Barrel Grenade Launcher

Under barrel grenade launchers are often 40mm or 37mm grenades that use a high-low pressure system that allows the propellant to develop a relatively high pressure in a high-pressure chamber before venting gases into a low pressure chamber in the grenade cartridge case. The under barrel grenade launcher is a single-shot, muzzle-loading weapon. It has a protected fixed front sight and a rear leaf sight that is adjustable for windage.

This optional system is among the oldest of assault weapon modifications. The oldest of these weapons are incompatible with FCS systems. However the under barrel systems that are available for the AK-140 are able to use FCS systems. There is no under barrel grenade launcher for the G-82 assault weapon.

Damage: See Grenades
Range Class: B
Payload: 1
Rate of Fire: 1
Mass: 1.1 Kg
Cost: ¥25,000

Under Barrel 20mm Gun

The under barrel 20mm gun is a short range weapon designed to fire high explosive air bursting rounds or high explosive armor piercing rounds. The 20mm gun has significant recoil making it difficult to fire accurately at a distance.

High Explosive Air Bursting

	PB	S	Med	L	Ex
Damage	40	25	8	2	1

Blast Range Class: A
Range Class: B

Ammunition
Mass: 100 g
Cost: ¥1,600

High Explosive Armor Piercing

	PB	S	Med	L	Ex
Damage	50	50	40	30	10

Range Class: B
Payload: 3
Rate of Fire: 1
Mass: 1.6 kg
Cost: ¥135,000

Ammunition
Mass: 100 g
Cost: ¥2,000

Under Barrel 12 Gauge Shotgun

This is a cut down version of a 12 gauge shotgun. It is fully functional as such but cannot be aimed and is inaccurate due to it's short barrel (-10 modifier to hit). This optional weapon system is incompatible with FCS systems.

Use statistics for a 12 gauge shotgun found in The Artifact game book (pg. 273).
Mass: 1.4 Kg
Cost: ¥3,500

Over Barrel Grenade Launcher

The grenades used for the over barrel launcher are slightly smaller than those used in the under barrel launcher, but are longer and therefore carry the same payload. The majority of these weapon systems use a three round tubular magazine and one grenade is inserted into the barrel giving the weapon a four round capacity.

Over barrel weapons are only available to assault weapons that do not have a built in stock. This is because the over barrel weapon acts as the stock of the assault weapon.
Damage: See Grenades
Range Class: B
Payload: 4
Rate of Fire: 1
Mass: 3.9 kg
Cost: ¥6,000

Over Barrel 20mm Gun

The over barrel 20mm gun uses a longer barrel than it's under barrel counterpart. It uses gas compensators to vent off some of the gas that causes excessive recoil on the under barrel version. This weapon is designed to fire high explosive air bursting rounds or high explosive armor piercing rounds.

Over barrel weapons are only available to assault weapons that do not have a built in stock. This is because the over barrel weapon acts as the stock of the assault weapon.

High Explosive Air Bursting

	PB	S	Med	L	Ex
Damage	40	25	8	2	1

Blast Range Class: A
Range Class: C

Ammunition
Mass: 100 g
Cost: ¥1,600

High Explosive Armor Piercing

	PB	S	Med	L	Ex
Damage	50	50	40	30	10

Range Class: C

Ammunition
Mass: 100 g
Cost: ¥2,000

Payload: 6
Rate of Fire: 3
Mass: 3.6 kg
Cost: ¥245,000

Over Barrel Rocket Launcher

This kind of optional system is rare. A notable exception is the G-82 but the majority of modern assault weapons forgo the rocket-propelled weapons for HEAP guns for better payload and ease of use. There has also been the problem of a rocket's backwash injuring the user or friendly forces as the weapon is fired. These optional weapon systems use a "cold launch" system that propels the rocket fifteen meters and then the primary rocket fires. This kind of system is sophisticated and expensive.

Over barrel weapons are only available to assault weapons that do not have a built in stock. This is because the over barrel weapon acts as the stock of the assault weapon.

	PB	S	Med	L	Ex
Damage	200	150	100	50	10

Blast Range Class: A
Range Class: D
Payload: 2
Mass: 5.2 KG
Black Market Cost: ¥1,000,000

Rocket Mass: 4.3 KG
Black Market Cost: ¥5,000

Over Barrel HEAP Gun

Although 20mm guns fire HEAP (high explosive armor piercing) rounds, the HEAP gun fires a more powerful round and uses a recoilless design to allow for accurate fire.

Over barrel weapons are only available to assault weapons that do not have a built in stock. This is because the over barrel weapon acts as the stock of the assault weapon.

	PB	S	Med	L	Ex
Damage	60	60	50	40	20

Range Class: C
Payload: 5
Rate of Fire: 2
Mass: 5.1 kg
Cost: ¥165,000

Ammunition
Mass: 180 g
Cost: ¥2,500

Low Caliber Sub-machine pistol

The sub machine pistol is often seen in guerilla combat and are often seen in urban environments were close combat is likely. Sub machine pistols often have a prodigious rate of fire, sacrificing accuracy and aiming for a hail of fire. Low caliber weapons are easier to handle because of lower recoil and therefore enable longer effective bursts.

	PB	S	Med	L	Ex
Damage	10	10	9	8	5

Range Class: A
Payload: 10-50
Rate of Fire: 30
Mass: 900 g-2.54 kg
Cost: ¥12,000

Medium Caliber Sub-machine pistol

The sub machine pistol is often seen in guerilla combat and are often seen in urban environments were close combat is likely.

Medium caliber sub machine pistols have very good stopping power. Their heavier slugs reduce the number of rounds that can be accurately fired in a round due to their high recoil.

	PB	S	Med	L	Ex
Damage	12	12	10	8	4

Range Class: A
Payload: 10-30
Rate of Fire: 20
Mass: 900 g
Cost: ¥12,000

Low Caliber Machine Gun

The low caliber machine gun is used to provide heavy firepower and still be portable by a single footsoldier. Because of the high rate of fire of these weapons it is nearly

impossible to fire anything other than short bursts (under 15 rounds) when standing. However light machine guns often have built in bipods that can be used in a prone firing position.

	PB	S	Med	L	Ex
Damage	10	10	9	8	5

Range Class: C with Bipod
Range Class: B without Bipod
Payload: 25-100 belt
Rate of Fire: 30
Mass: 8 Kg
Cost: ¥20,000

Medium Caliber Machine Gun

Medium machine guns are often just on the border of what a single footsoldier can carry. Many forces will have one soldier carry the weapon and the other carry the ammunition boxes. Medium machine guns are nearly impossible to fire standing unless mounted in some way. It is most common to see them used with a built in bipod in a prone position, but tripods are preferable if a base of fire is to be established.

	PB	S	Med	L	Ex
Damage	15	15	12	10	8

Range Class: C with Bipod
Range Class: B without Bipod
Payload: 25-100 belt
Rate of Fire: 30-60
Mass: 9-20 Kg
Cost: ¥20,000

High Caliber Machine Gun

High caliber machine guns are often mounted to vehicles or serviced by a crew of up to five footsoldiers. There is no way that a high caliber machine gun can be fired from a standing position and even a bipod is not enough to stabilize these weapons. Often sandbags hold a tripod down as these monsters churn out fire. These guns are sometimes employed in an anti-aircraft function.

	PB	S	Med	L	Ex
Damage	20	20	18	16	10

Range Class: C
Payload: 25-100 belt
Rate of Fire: 30-60
Mass: 20-38 Kg
Cost: ¥20,000

Gun Platform

These are small-automated weapon systems that have a simple motion detector that scans a 30-degree cone in front of the platform. Any motion will trip the system and the weapon will aim at the last point of motion. When there are multiple moving objects the gun platform can split its fire between targets. The Gun Platform does not distinguish between a moving person and a backpack thrown in front of it. It does however look for an object that is at least 20cm in diameter.

The gun platform fires five round bursts at each target. It will continue to fire until the target has stopped or has moved out of its 30-degree cone.

The gun platform is transported in a protective case that can be carried like a briefcase. When deployed the top of the case is removed and set aside.

An optional communications package can be added on to the system to give a user the ability to "pull the trigger". This way the user can designate when the system should fire.

Ref: 60
Agi: 60

	PB	S	Med	L	Ex
Damage	10	10	9	8	5

Range Class: B
Payload: 200
Rate of Fire: 20
Mass: 45 KG
Cost: ¥520,000

Optional Communications Package
Cost: ¥40,000

Grenade launcher

Grenade Launchers fire 40mm grenades at greater velocities and distance than by being thrown. While these launchers do not use the typical hand grenades in most foot soldiers standard issue, the 40mm grenades have the same effect as their counterparts.
Damage: See Grenades
Range Class: B
Payload: 1
Rate of Fire: 1
Mass: 3.1 Kg
Cost: ¥6,000

Rocket Propelled Grenade (RPG)

Mostly outmoded in modern warfare, the Rocket Propelled Grenade is seen in use in

third world countries and criminal organizations. The RPG as it is most often referred to is a seventy (70) to eighty (80) millimeter grenade with a forty (40) millimeter cylindrical rocket engine attached. The launcher is most often a one meter long tube with two handles and an attached scope for aiming. The grenades carry a mediocre punch but are only accurate at short ranges.

	PB	S	Med	L	Ex
Damage	170	100	60	20	1

Blast Range Class: A
Range Class: B
Payload: 1
Mass: 6.2 KG
Grenade Mass: 2.11 KG
Cost: ¥400,000

Disposable Antitank Rocket Launcher

Disposable antitank weapons are single shot weapons that carry a sixty (60) to seventy (70) millimeter rocket inside a fiberglass reinforced plastic tube. The tube telescopes to its full length and is ready to fire. These weapons have short effective ranges.

	PB	S	Med	L	Ex
Damage	150	80	30	10	1

Blast Range Class: A
Range Class: B
Payload: 1
Mass: 3.3 KG
Cost: ¥200,000

Recoilless Flame-thrower

The Recoilless Flame-thrower is a shoulder-fired weapon. It fires rocket-propelled napalm rounds. The RPO is reusable and can be fired at a rate of one shot per minute. The Recoilless Flame-thrower is effective as antitank weapons, "bunker-busters," and against troop formations.

Effect: When used against vehicles the high heat of the napalm round has a 10% chance of a crew critical hit, a 10% chance of a fuel supply critical hit for vehicles with explosive fuels or plasma, and a 10% chance of an ammo explosion regardless of hit location and armor rating.

The napalm in the round will continue to burn for 2D10 turns and will continue to do damage to targets that were hit even after they have left the blast radius. This is due to the napalm sticking to the target.

	PB	S	Med	L	Ex
Damage	30	30	30	10	5

	PB	S	Med	L	Ex
Damage:	30	30	30	10	5

Blast Range Class: A
Range Class: B
Payload: 1
Rate of Fire: 1/6
Mass: 3.5 KG
Cost: ¥400,000

Ammunition

Mass: 5.2 KG
Cost: ¥20,000

White Phosphorus Grenade

White phosphorus is an elemental form of phosphorus that bursts into flames in the presence of water or when heated significantly. The element burns so hot that it is an effective anti-armor weapon. International treaties restrict the use of white phosphorus devices on personnel and only on their equipment.

	PB	S	Med	L	Ex
Damage	150	75	30	10	3

Blast Range Class: A
Mass: 175 g
Cost: ¥13,000

Artillery Weapons

Artillery can be defined as simply as large firearms. However for the purpose of this book, artillery will be defined as firearms that are too large or powerful to be carried and fired by hand. The majority of weapons listed here is intended for mounting on vehicles or structures and cannot be carried or fired without doing so.

Crew Serviced Weapon

These weapons are small artillery that can be carried and operated by a crew of as little as two but more often three to five soldiers. They are more easily transported and operated than heavy machine-guns and are more effective against lightly armored targets. They can fire either range-fused air bursting munitions, or high explosive armor piercing (HEAP) rounds.

High Explosive Air Bursting

	PB	S	Med	L	Ex
Damage	60	35	16	4	1

Blast Range Class: A
Range Class: C

High Explosive Armor Piercing

	PB	S	Med	L	Ex
Damage	80	80	70	65	40

Range Class: C
Payload: 31 per can
Rate of Fire: 5
Mass: 14.5 Kg
Cost: ¥300,000
7 Kg per 31 round can

Recoilless Rifle

The recoilless rifle is a light weapon designed to be mounted on light trucks, transports, or as a towed weapon.

	PB	S	Med	L	Ex
Damage	80	80	70	60	40

Range Class: C
Payload: varies by installation, (50-100 rounds)
Rate of Fire: 1
Mass: 80 Kg
Cost: ¥310,000

Light Automatic Cannon

Light ordinance automatic cannons are often seen as a towed weapon system or mounted on light naval craft. Air bursting munitions are often employed for anti-aircraft roles.

	PB	S	Med	L	Ex
Damage	80	80	70	60	40

Range Class: D
Payload: varies by installation, (50-1,000 rounds)
Rate of Fire: 15
Mass: 290 Kg
Cost: ¥470,000

Machine Gun Grenade Launcher

These weapons are designed to give a small unit the ability to deliver suppressive fire to large areas at a distance. The machine gun grenade launcher class of weapons is effective against lightly armored vehicles and in lowering force fields. These systems use 40mm grenades. There is no way that these weapons can be fired from a standing position and even a bipod is not enough to stabilize them. Often a tripod is sandbagged to hold them down as they fire or they are mounted to a vehicle. These guns are sometimes employed in an anti-aircraft function.
Damage: See Grenades
Range Class: C
Payload: 20 round belt
Rate of Fire: 8
Mass: 31.5 Kg (with tripod 60.1 Kg)
Cost: ¥6,000

Recoilless Automatic Cannon

The recoilless automatic cannon is a light ordinance weapon that is designed for light vehicles such as transports, trucks, small naval vessels and aircraft.

	PB	S	Med	L	Ex
Damage	80	80	70	60	40

Range Class: D
Payload: varies by installation, (50-100 rounds)
Rate of Fire: 4
Mass: 563 Kg
Cost: ¥760,000

Medium Automatic Cannon

Medium ordinance automatic cannons are externally powered cannons designed for mounting on vehicles such as APCs medium sized naval vessels or tanks. Their recoil is often too much for lighter framed vehicles such as transports or trucks.

	PB	S	Med	L	Ex
Damage	100	100	90	70	50

Range Class: D
Payload: varies by installation, (50-300 rounds)
Rate of Fire: 7
Mass: 575 Kg
Cost: ¥530,000

Heavy Ordinance Close-In Weapons System

These large emplacement weapons are high caliber gatling cannons. They are most frequently used in naval vessels to protect against incoming missiles, small surface craft, surface mines and aircraft. These systems usually have independent radar system and forward looking infrared radar for tracking individual threats. Some of these weapon systems are capable of autonomously detecting, tracking and assess the success of a kill.

The CIWS fires four, three hundred (300) round bursts at each target. It will continue to fire until the target has been destroyed or moves out of range.

The damage statistics given are for standard rounds. However the CIWS is most often armed with Armor Piercing Discarding Sabot (APDS) rounds, or Depleted Uranium sub-caliber penetrator

Ref: 60
Agi: 60
Actions: 3

	PB	S	Med	L	Ex
Damage	60	60	55	50	30

Range Class: C
Payload: 1,550 rounds
Rate of Fire: 1200
Mass: 6,120 Kg
Cost: ¥40,520,000

25 mm Machine Gun System

	PB	S	Med	L	Ex
Damage	80	80	70	65	40

Range Class: C
Payload: varies by installation, (100-1000 rounds)
Rate of Fire: 30
Mass: 850 Kg
Cost: ¥520,000

76mm gun

This is the largest artillery piece that has been transported to The Artifact at this time (although not the highest caliber artillery piece). The I-CA has imported two hundred of these systems so far and transported them to the Methane Wastes. However they have not been forthcoming with the purpose for transporting so many. However, they are not hiding them and will even show them off from time to time. There are also rumors that the I-CA has sold an unknown number of these weapons to unspecified buyers.

The damage statistics given are for standard rounds. However 76mm guns are often armed with high explosive rounds.

	PB	S	Med	L	Ex
Damage	400	400	380	350	250

Range Class: D
Payload: varies by installation, (500-2000 rounds)
Rate of Fire: 20
Mass: 6,120 Kg
Cost: ¥520,000

Infrared Guided Air to Air Missile Launcher

Infrared guided air to air missiles are most often armed with an explosive fragmentation warhead. An infrared heat seeking guidance system controls them. There is no user intervention once the missile is deployed. Because of this if the missile is dodged the character does not roll to re-acquire the target (see: The Artifact, Game Rules, Missiles), this is done by the IR guidance system.

The guidance systems of these missiles have some pattern recognition abilities so they are not as easy to fool as versions built a century ago, but tend to be confused by low IR signature vehicles such as AG vessels that do not rely on thrusters for movement.

They are also easily foiled by most ECM systems in use on The Artifact (If the target makes a successful ECM roll the missile will loose its lock on the target).

The launcher is most often-mounted on fighter jets but can operate on helicopters and AG vehicles.

Guidance System
Percent to Re-acquire: 75%

	PB	S	Med	L	Ex
Damage	3,000	1,500	1,500	750	150

Blast Range Class: A
Range Class: E
Payload: 1
Mass: 561.6 Kg
Black Market Cost: ¥1,500,000

Rocket Mass: 78.4 Kg
Missile Black Market Cost: ¥826,000

Radar Guided Air to Air and Surface to Air Missile Launcher

Radar guided air to air missiles are most often armed with a high explosive warhead. A compact radar guidance system controls them. There is no user intervention once the missile is deployed. Because of this if the missile is dodged the character does not roll to re-acquire the target (see: The Artifact, Game Rules, Missiles), this is done by the radar guidance system. These missiles are very versatile and have some anti-missile capabilities (40% chance to intercept another missile). They are highly maneuverable and can strike in any direction in respects to the launcher.

They are easily foiled by most ECM systems in use on The Artifact (If the target makes a successful ECM roll the missile will loose its lock on the target).

The launcher is most often-mounted on fighter jets but can operate on helicopters and AG vehicles in an air to air capacity. In a surface to air capacity the launcher can be mounted on a wide verity of platforms including naval vessels and all the way down to light transports.

Guidance System
Percent to Re-acquire: 90%

	PB	S	Med	L	Ex
Damage	10K	8K	8K	3L	900

	PB	S	Med	L	Ex
Damage:	10K	8K	8K	3K	900

Blast Range Class: B
Range Class: E
Payload: 1
Mass: 1,486 Kg
Black Market Cost: ¥10,740,000

Missile Mass: 225 Kg
Missile Black Market Cost: ¥3,308,000

Pistol Ammunition

Low Caliber Pistol

Low caliber pistols often have very low stopping power and are often disregarded as a sidearm. However low caliber pistols are still dangerous and easier to fire due to low recoil.
Mass: 1 Kg per 100 rounds
Cost: ¥150 per 100 rounds

Medium Caliber Pistol (FMJ)

Medium caliber pistol rounds are effective and easy to fire. They balance stopping power with average recoil.
Mass: 3.2 Kg per 100 rounds
Cost: ¥300 per 100 rounds

High Caliber Pistol (FMJ)

High caliber pistol rounds offer the best stopping power but also high recoil which can become tiring and possibly injure the user.
Mass: 6.4 Kg per 100 rounds
Cost: ¥540 per 100 rounds

Soft Point

The soft point round has an opening in the tip of the round's metal jacket. This causes the bullet to expand on striking its target. This causes greater damage to unarmored targets, but is less effective against armored targets.

Soft point rounds are illegal for military use but are effective hunting rounds.
Damage: +2 for objects with AR 0, -2 for objects with an AR 1 or greater.
Cost: Soft point rounds cost roughly the same as FMJ rounds.

Hollow Point

Like the soft point round, the hollow soft point has an opening in its metal jacket. However the hollow soft point has an indentation in the tip of the bullet that causes rapid expansion that is greater than the regular soft point. As a result, the hollow soft point is even more damaging to unarmored targets but is also even less effective against armored targets.
Hollow soft point rounds are illegal for military use.
Damage: +4 for objects with AR 0, -4 for objects with an AR 1 or greater.
Cost: Hollow soft point rounds cost roughly the same as FMJ rounds.

Reduced Penetration (frangible)

Used in aircraft to reduce the possibility of cabin depressurization. Also used for urban settings to reduce the possibility of a bullet passing through the target, walls or doors reducing the likelihood of unwanted casualties.
Damage: Double the AR of targets when using these rounds.
Cost: 3x FMJ rounds cost.

Rifle Ammunition

Rifle ammunition is given below in general categories for simplicity. It should be noted that ammunition is often very specific to the model gun that it was manufactured for. This is especially true in the case of the higher caliber ammunitions. Some low caliber ammunition (especially in the low caliber hunting rifle range) the GM may show some flexibility in transferring ammunition between models, but with higher caliber weapons this should be expressly forbidden. An example of this is swapping between a high caliber machine gun and a high caliber sniper rifle. One type of ammunition is belt fed and a clip feeds the other but even this is a minor difference. There is also the caliber, the grains, the firing mechanism can be different, and often the ammunition for one model will perform poorly even if it should happen to function in a different model weapon. As a result, when ammunition is purchased, it should be listed next to the weapon it can be used with.

Low Caliber Hunting Rifle

Low caliber hunting rifle ammunition is lower powered than the low caliber rifle entry. These rounds are effective for hunting small animals and are inexpensive.
Mass: 1 Kg per 100 rounds
Cost: ¥100 per 100 rounds

Low Caliber Rifle (FMJ)

Low caliber rifle ammunition manufactured for assault weapons is distributed in battlepacks of three hundred rounds and come in thick waterproof bags with carry handles. Low caliber rifle rounds that are manufactured for machine guns are sometimes distributed in belts of 25 or 50 and are distributed in ammo cans. Otherwise they are distributed in the same manner as assault weapon ammunition.
Mass: 1 Kg per 100 rounds
Cost: ¥260 per 100 rounds

Medium Caliber Rifle (FMJ)

Medium caliber rifle rounds manufactured for assault weapons are most likely sold in battlepacks of 200 rounds and come in thick waterproof bags with carry handles. Five battlepacks (1,000 rounds) are stored in small wooden ammo crates.

Medium caliber rifle rounds that are manufactured for machine guns are sometimes distributed in belts of 25 or 50 and are distributed in ammo cans. Otherwise they are distributed in the same manner as assault weapon ammunition.
Mass: 6.2 Kg per 200 rounds
Cost: ¥700 per 200 rounds

High Caliber Rifle (FMJ)

There are relatively few weapons that use high caliber rifle ammunition. Because of this, ammunition is often manufactured specifically for individual weapons.

High caliber rounds are bulky and expensive and a hundred (100) rounds often fills an entire ammo can.
Mass: 15.9 Kg per 100 rounds
Cost: ¥3,600 per 100 rounds

Caseless Rounds

Caseless rounds require a weapon that is designed to fire them. When a weapon is purchased or assigned to a character, if it is to use caseless rounds it must be designated next to the weapon.

Caseless rounds are expensive and raise the possibility of the weapon jamming. However, they allow a higher rate of fire than brass cased round and weigh less.
Effect: Rate of fire x1.4. If the weapon is exposed to significant dust or water there is a 20% chance of jamming when fired.
Mass: x.6
Cost: x2 FMJ rounds cost.

Tracer Bullet

Tracer rounds are used to create a bright red visible streak along the path of the bullet. This makes grouping bursts easier, but also gives away the position of the person firing. The streak is generated by a flammable insert such as magnesium and ignites when the bullet is fired. This effect is also useful for designating a target to a group and signaling. Tracer rounds are red tipped so they can be easily identified.
Effect: 20% Advantage when firing a burst.
Cost: Tracer rounds cost roughly the same as FMJ rounds.

Steel Core

Steel core rounds are used to enhance the penetration of a round. Steel core rounds are not as effective as modern armor piercing rounds but are effective against light body armor and lightly armored vehicles.

Steel core rounds are often black or green tipped.
Damage: same as FMJ (standard rounds)
Armor piercing 25%

Cost: 140% of FMJ rounds cost.

Soft point

Military ammunition is covered in a full metal jacket (or FMJ) as is required by international law. The soft point round has an opening in the tip of the round's metal jacket. This causes the bullet to expand on striking its target. This causes greater damage to unarmored targets, but is less effective against armored targets.
Soft point rounds are illegal for military use but are effective hunting rounds.
Damage: +2 for objects with AR 0, -2 for objects with an AR 1 or greater.
Cost: Soft point rounds cost roughly the same as FMJ rounds.

Hollow Soft Point

Like the soft point round, the hollow soft point has an opening in its metal jacket. However the hollow soft point has an indentation in the tip of the bullet that causes rapid expansion that is greater than the regular soft point. As a result, the hollow soft point is even more damaging to unarmored targets but is also even less effective against armored targets.

Hollow soft point rounds are illegal for military use.
Damage: +4 for objects with AR 0, -4 for objects
with an AR 1 or greater.
Cost: Hollow soft point rounds cost roughly the same as FMJ rounds.

Reduced Penetration (frangible)

Used in aircraft to reduce the possibility of cabin depressurization. Also used for urban settings to reduce the possibility of a bullet passing through the target, walls or doors reducing the likelihood of unwanted casualties.
Damage: Double the AR of targets when using these rounds.
Cost: 3x FMJ rounds cost.

Reduced Velocity

The majority of rifle rounds travel at supersonic speeds. This means the bullet itself creates a loud crack in addition to the sound of the gun being fired. This can be detrimental to snipers or anyone who is trying not to be located. The reduced velocity round travels just under the speed of sound and therefore produces no supersonic crack.
Reduced velocity rounds are blue tipped.
Damage: -2
Cost: 2x FMJ rounds cost.

Armor Piercing Discarding Sabot (APDS)

Saboted rounds have a soft plastic case around the bullet that falls away after leaving the barrel. The remaining sub-caliber penetrator is often made of a material such as tungsten.

APDS rounds are only available for medium to heavy caliber rounds.
Damage: -1
Armor piercing 60%
Cost: x3 FMJ rounds cost.

Armor Piercing

Modern armor piercing rounds are often made of a dense and hard substance such as tungsten and may have a coating such as Teflon at the tip.

Armor piercing rounds are usually green tipped.
Armor piercing 50%
Cost: x3 FMJ rounds cost.

Incendiary

Incendiary rounds usually have a insert of a combustible material such as magnesium or zirconium. As the bullet mushrooms the intense heat ignites the insert and starts any nearby combustible material on fire. Incendiary rounds are often used by snipers to ignite fuel tanks in unarmored or lightly armored vehicles and fuel dumps. Incendiary rounds will also start wood on fire.

Soft targets such as cloth or flesh do not offer enough resistance to start the insert on fire.

Incendiary rounds are tipped blue.
Effect: +30% to get a critical hit on a fuel tank called shot.
Cost: x3 FMJ rounds cost.

Armor Piercing Incendiary

Armor Piercing Incendiary rounds has an insert of magnesium or zirconium in front of an armor-piercing insert. As the round impacts the target, the friction of the jacket crumpling ignites the flammable insert. The armor-piercing insert is then propelled forward through the bullet and into the target, trailing the flammable insert material behind it.

Soft targets such as cloth or flesh do not offer enough resistance to start the flammable insert burning.

Armor piercing incendiary rounds are tipped with aluminum or white.

Effect: +30% to get a critical hit on a fuel tank called shot.
Armor piercing 50%
Cost: x3 FMJ rounds cost.

D.U.M. rounds (Depleted Uranium Munitions)

Depleted uranium is a rare naturally occurring metal that is mined on earth. It has several unique properties that make it highly effective. The first is that uranium is denser than lead and therefore carries more energy. Uranium rounds are also "self sharpening". The tip burns away as it penetrates leaving a continuously sharp point instead of mushrooming.
Damage x3
Armor Piercing 50%
Cost: x10 FMJ rounds cost.

Depleted Uranium Sub-caliber Penetrator

Depleted uranium Sub-caliber Penetrators are D.U.M. rounds that are saboted to create a thinner and more stable projectile. Only medium and heavy caliber weapons can use this kind of ammo. The saboted rounds carry less punch than regular rounds, but are better at penetrating heavy armor.
Damage x2
Armor Piercing 75%
Cost: x15 FMJ rounds cost.

Explosive rounds (HESH)

Explosive-tipped bullets are essentially hollowpoint bullets with an explosive element designed to dramatically and rapidly enhance bullet expansion upon impact.

HESH rounds are illegal for military use. Damage x2 to unarmored targets, -4 to targets with an AR of 3 or more.
Cost: x5 FMJ rounds cost.

Artillery Ammunition

Standard Ammunition

Standard artillery ammunition prices are not usually listed because it is assumed that military characters will be supplied with ammunition that they need. Standard ammunition prices are listed by Range Class and use the Point Blank Damage of the weapon to determine their cost.

Range Class A
Cost: ¥0.1 x PB Damage

Range Class B
Cost: ¥0.25 x PB Damage

Range Class C
Cost: ¥1 x PB Damage

Range Class D
Cost: ¥3 x PB Damage

Range Class E
Cost: ¥10 x PB Damage

High Explosive

High explosive rounds are used against lightly armored ground targets such as E-Suits.
Damage: x1.25
Cost: x3 normal

Fused Delay Explosive

Fused Delay rounds are used against semi-hardened targets. Because the round pierces the armor and then detonates, the round has a greater chance of causing a critical hit.
Damage: normal
Armor piercing 20%
Critical: +10%
Cost: x2 normal

Armor Piercing Discarding Sabot

APDS rounds are used against heavily armored targets.
Damage: Reduced by 10%
Armor piercing 50%
Cost: x5 normal

Tracer

Tracer rounds are used to create a bright red visible streak along the path of the shell. This makes grouping shots easier, but also gives away the position of the person firing. The streak is generated by a flammable insert such as magnesium and ignites when the shell is fired. This effect is also useful for designating a target to a group and signaling. Tracer rounds are red tipped so they can be easily identified.
Damage: Normal
Cost: x2 normal

Air Burst Munitions

ABM rounds are used against aircraft, light vehicles, dismounted troops and bunkers.

The damage that ABM rounds do is based on the point blank damage for that round. Each range slot is multiplied by a decimal number shown below. The ABM does less direct damage than a standard round but has a blast radius and effects all targets in that radius.

	PB	S	Med	L	Ex
Damage	0.9	0.7	0.3	0.1	0.01

Range Class: B
Cost: x2 normal.

D.U.M. rounds (Depleted Uranium Munitions)

Depleted uranium is a rare naturally occurring metal that is mined on earth. It has several unique properties that make it highly effective. The first is that uranium is denser than lead and therefore carries more energy. Uranium rounds are also "self sharpening". The tip burns away as it penetrates leaving a continuously sharp point instead of mushrooming.
Damage x2
Armor Piercing 50%
Cost: x10 normal.

Depleted Uranium Sub-caliber Penetrator

Depleted uranium Sub-caliber Penetrators are D.U.M. rounds that are saboted to create a thinner and more stable projectile. The saboted rounds carry less punch than regular rounds, but are better at penetrating heavy armor.
Damage x1.5
Armor Piercing 75%
Cost: x15 normal.

12 Gauge Ammunition

Anti-Riot rounds

Anti-Riot rounds fire either rubber bullets or a small beanbag that stuns the target. Because of the force of the shotgun blast, these rounds can do significant damage at close range.

	PB	S	Med	L	Ex
Damage	8	5	Stun	Stun	Stun

Range Class: A
Cost: ¥120 each

Anti-Sniper round

Anti-Sniper rounds fire small flechettes that can pass through light cover each flechette does not do a lot of damage, but the round increases the likelihood of hitting a concealed target.

	PB	S	Med	L	Ex
Damage	1D10	1D10	1D6	1D6	1D6

	PB	S	Med	L	Ex
Damage	1d10	1d10	1d6	1d6	1d6

Range Class: A
40% Advantage to hit
Cost: ¥94 each

Birdshot

The damage listed under a shotgun is for solid slug rounds. Solid rounds travel further and inflict more damage at long range. Birdshot is used to increase the chances of hitting small targets such as birds or rodents. However Birdshot also has very high stopping power at close range.

	PB	S	Med	L	Ex
Damage	22	15	4	2	1

Range Class: A
40% Advantage to hit
Cost: ¥60 each

Bird Bomb

Used in agriculture to scare off birds and other animals, bird bombs are small explosive devices that create a loud noise.

	PB	S	Med	L	Ex
Damage	3	1	-	-	-

Range Class: B
Cost: ¥60 each

Explosive Round

	PB	S	Med	L	Ex
Damage	30	25	20	18	15

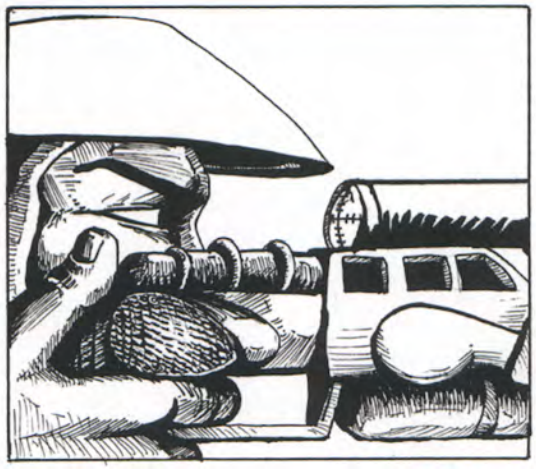
Range Class: B
Cost: ¥240 each

Flare Round

	PB	S	Med	L	Ex
Damage	3	1	-	-	-

Range Class: B
Cost: ¥160 each

Gun Accessories



This optional equipment enhances the performance and usability of a weapon.

Telescopic Sight

The telescopic sight gives a plus to strike at medium and greater ranges. However fast moving targets are harder to target through the sight.

Plus to Strike: 60% Advantage at medium or longer rages, but 40% Impairment to hit fast moving targets.

Mass: 250 g
Cost: ¥ 4000

Laser Sight

The laser sight projects a tiny red dot of laser light on the target. However the dot is too difficult to see past forty meters without a telescopic sight.

Plus to Strike: 20% Advantage for targets under forty meters away.

Mass: 150 g
Cost: ¥ 2000

Infra-Red Sight

Infra Red sights allow for use when visibility is poor. These sights also commonly also function as telescopic sights.

Plus to Strike: No negative modifiers for darkness, fog, smoke, or foliage.

Mass: 450 g
Cost: ¥ 5500

Laser Sight/Rangefinder

This accessory is identical to the Laser Sight, but also determines range to a target. This is especially useful when linked to a Guncomp.
Mass: 55 g
Cost: ¥ 2100

Bipod

This accessory is used with weapons with masses over five kilograms. A bipod also aid in reducing recoil. This accessory allows the use of heavy weapons without con rolls and increases accuracy in bursts.

The Bipod gives a 50% Advantage to hit. While the Bipod is in use, the character's wielding mass is ignored.

Mass: 3 kg
Cost: ¥ 6,000

Recoil Reducer

Recoil reducers are used to reduce some of the kick from slug throwing weapons. The reducer is often a rubber pad attached to the but of a rifle stock but occasionally is a mechanical device inside the stock of the rifle.

The recoil reducer gives a 10% Advantage to hit.

Mass: 100 g
Cost: ¥ 400

Bayonet

Bayonets are knifes fixed to the barrel of a gun, usually used with rifles but can be used with shotguns if specially modified.
Damage: 10
Mass: 300 g
Cost: ¥ 800

Detachable/Folding Stock

Detachable stocks are used on shotguns and assault rifles. Removing the stock makes the weapon easier to carry (30% Advantage to Ref rolls) but a 10% Impairment to hit targets and the sniper skill cannot be used.
Mass: 10 g more than a normal stock
Cost: ¥ 3000

Flashlight Holder

This small clamping mechanism attaches to the barrel of a rifle or a shotgun. Will accommodate most round flashlights.

Frees the hands to aim with while illuminating the target.
Mass: 50 g
Cost: ¥ 600

Shotgun Belt

Holds 25 shotgun shells or 50 rifle rounds. Type (shotgun or rifle) must be specified.
Mass: 250 g
Cost: ¥ 250

Bandoleer

Holds 45 shotgun shells or 90 rifle rounds over the shoulder. Type (shotgun or rifle) must be specified.
Mass: 350 g
Cost: ¥ 600

Dummy Cord

A dummy cord is attached to the user's belt or other fixed position and to the butt of a pistol. This is especially important when the user is rushed and needs his hands or if knocked unconscious. The dummy cord will keep the pistol at their side.
Mass: 20 g
Cost: ¥ 200

Fire Control System (FCS)

These devices are available for most modern Assault Weapons and their optional combat systems. The FCS is primarily a telescopic sight, infrared sight and laser rangefinder when attached to the assault weapon itself. However it becomes a primary component of optional combat systems such as smart grenade launchers and rocket propelled systems such as the AVW. The FCS is designed to transmit the range to target to an optional combat system. This allows grenades to airburst over a specified target or the munitions can detonate over foxholes or past corners to strike targets that are under cover.

Most FCS systems include a video camera for recording events on the battlefield.

Plus to Strike for Assault Weapon: 80% Advantage at medium or longer rages, but a 40% Impairment to hit fast moving targets. No negative modifiers for darkness, fog, smoke, or foliage.
Plus to Strike for Optional Combat Systems: 60% Advantage. No negative modifiers for darkness, fog, smoke, or foliage.

Battery Life: 20 Hours
Mass: 570 g
Cost: ¥ 30,000

Advanced Fire Control System (AFCS)

The AFCS saw it's first service in 2023. The AFCS is a pattern-recognizing computer that can identify human and vehicular targets and track them to a limited extent. The AFCS also performs all the functions of the FCS systems. When used with the assault weapon it was designed for, the AFCS attempts to recognize all the human and vehicular targets in it's camera's field of view. The operator then can enter one of four modes.

Combat mode designates all of the human and vehicular targets that the system identifies as valid targets. As the trigger is squeezed, the system will only authorize fire when it believes the round will hit a target. This means that if a target is not recognized by the system it will not fire. 75% likely to recognize a programmed target.

Plus to Strike for Assault Weapon: 90% Advantage. No negative modifiers for darkness, fog, smoke, or foliage.

Plus to Strike for Optional Combat Systems: 60% Advantage No negative modifiers for darkness, fog, smoke, or foliage.

Sniper mode Attempts to recognize targets in the same way as Combat mode, but will only fire on sensitive hit locations. These must be pre-programmed in the AFCS software. Sensitive hit locations generally are, the head and body of humans (although head only can be specified) and fuel tanks and sensors of vehicles. 50% likely to recognize a programmed target.

Plus to Strike for Assault Weapon: 90% Advantage. No negative modifiers for darkness, fog, smoke, or foliage.

Plus to Strike for Optional Combat Systems: 60% Advantage No negative modifiers for darkness, fog, smoke, or foliage.

Selective mode allows the operator to designate what targets that are in the AFCS viewfinder which targets should not be fired upon. This mode is effective for hostage situations and for a variety of other field operations. It takes one (1) action to tag that a target should not be fired upon and the AFCS will loose it's ability to track an individual

target if they move out of the unit's field of view (approx. a 30 degree cone in front of the AFCS). 75% likely to recognize a programmed target.

Plus to Strike for Assault Weapon: 90% Advantage. No negative modifiers for darkness, fog, smoke, or foliage. It is 90% likely that the AFCS will not fire on a target if it has been specified.

Plus to Strike for Optional Combat Systems: 60% Advantage No negative modifiers for darkness, fog, smoke, or foliage. The Optional Combat System will not fire if targets have been tagged.

Manual mode returns the weapon to normal operation and the ACFS acts as the FCS system.

Plus to Strike for Optional Combat Systems: 60% Advantage No negative modifiers for darkness, fog, smoke, or foliage.

Battery Life: 12 Hours
Mass: 695 g
Cost: ¥ 70,000

Weapon Mounted Personal ECM System

The Weapon Mounted ECM system is identical in function to the Personal ECM System (see: Defensive Systems). The unit attaches to the underside of a rifle or carbine barrel. The ECM has a 60% chance of identifying and neutralizing optics. The ECM can simultaneously effect all optics systems in its scanning cone, but a percentile roll must be made for each target.
Battery Life: 6 Hours
Mass: 1.1 Kg
Cost: ¥ 140,000

Pistol Silencer

Fixed to projectile pistols greatly reduces flash and noise. A silencer is not exchangeable between different weapons.
Mass: 160 g
Cost: ¥ 10,000

Rifle Silencer

Fixed to projectile rifles greatly reduces flash and noise. Some rifle silencers only disperse the sound of the rifle firing so that it is more difficult to locate the weapon. A silencer is not exchangeable between different weapons.

Most rifle rounds fire their projectile at supersonic speeds. This produces a loud supersonic crack. Some silencers can suppress this noise by slowing the bullet, but they behave as reduced velocity rounds. (see: Rifle Ammunition, Reduced Velocity)
Mass: 500 g
Cost: ¥ 30,000

Flash Suppressor

This tube screws onto the end of a rifle barrel and prevents flash from giving away your position in dark situations.
Mass: 100 g
Cost: ¥ 1,000

Muzzlebrake

This tube screws onto the end of a rifle barrel. Holes on top of the brake keep the muzzle from rising enhancing accuracy.

The muzzlebrake gives a 20% Advantage to hit a target

Mass: 100 g
Cost: ¥ 1,000

Holster

A handy item often overlooked, a holster is much safer than keeping a sidearm in a pack or tucked in one's pants.
Mass: 200 g
Cost: ¥ 100-200

Underarm Holster

Conceals pistols under 1 kg in mass

20% Advantage to Concealed Object rolls

Mass: 100 g
Cost: ¥ 150-200

Horizontal Concealment Holster

Horizontal holsters are designed to fit underneath a coat (including suit coats) or cloak. A horizontal holster has a quicker draw time than conventional holsters and can be drawn more discretely.

20% Advantage to Ref when drawing.
20% Advantage to Concealed Object rolls

Mass: 200 g
Cost: ¥ 240

Sling

A sling can be used to carry a rifle or shotgun over the shoulder for quick access.

Wielding mass X 2

Mass: 300 g
Cost: ¥ 100-200

Guncomp

Gun comps are tiny computer chips installed into the handle of a gun. Tiny sensors are placed around the gun to monitor number of rounds fired, number remaining in the clip, and temperature levels. The comp also has a voice recognition circuit (90% reliable) to activate and deactivate the safety. A one by three cm. three digit display is fixed to the outside of the gun, showing the number of rounds left. If the gun jams, overheats or malfunctions in any way, the display will flash on and off. The LCD screen is available in opaque and lighted versions. (Lights are easy to see in the dark by you and your enemy.) A secondary screen can link up to rangefinders and telescopic scopes, giving the gun a smart targeting feature (20% Advantage to hit).
Mass: 15 g
Cost: ¥ 60,000

Gun Case

Used for transporting weapons so they do not get damaged or rust. Also holds extra ammunition and gun cleaning accessories
AR 2
HP 10
Mass: 2 kg empty
Cost: ¥ 1,000

Pistol Case

Used to transport Pistols so they are not damaged or rust. Also holds extra ammunition and gun cleaning accessories
AR 2
HP 10
Mass: 1 kg empty
Cost: ¥ 1,000

Gun Sock

A lightweight protective cover used for storing and protecting guns from moisture, minor abrasion and grit.
Mass: 15 g
Cost: ¥ 200

Magazine Pouch

Keep extra Magazines on the belt within easy reach to facilitate reloading. Holds 3 magazines.
Mass: 30 g
Cost: ¥ 180

Jungle Clipper

Attaches two magazines together so a fresh magazine is readily available once the first is spent.
Mass: 4 g
Cost: ¥ 100

Demolition and Construction

Contact Detonator

The contact detonator uses an electrical circuit as a detonator. The detonator can be set to trip when the circuit is closed or open. This is often employed to boobytrap something such as a door or window, either sensing that it has opened or closed. Any electrical devices can be used in conjunction with this system to either create or break the electrical circuit (requires an Electrical Repair skill roll in addition to the standard Explosives skill roll).

The detonator has a safety pin that must be removed for it to operate.
Cost: ¥500

Infra-red Detonator

The infra-red detonator consists of two devices, the detonator and the transmitter. The transmitter is reusable. The detonator is also the receiver and uses any standard blasting cap to detonate an explosive payload. The transmitter and the detonator have short selectable keys that prevent accidental detonation by infra-red radiation. These keys must match in order for the detonator to operate.

The infra-red detonator requires an unobstructed line of site to operate.

The detonator has a safety pin that must be removed for it to operate.
Range: 1km unobstructed
Cost: ¥800

Laser Detonator

The laser detonator consists of two devices, the detonator and the Laser. The laser can be any source of low level laser light. The detonator is also the receiver and uses any standard blasting cap to detonate an explosive payload. Any laser light striking the detonator will trigger the device.

The Laser detonator requires an unobstructed line of site to operate.

The detonator has a safety pin that must be removed for it to operate.
Range: 2km unobstructed
Cost: ¥1,200

Motion Detection Detonator

Motion detector detonators use infrared beams to detect objects moving into their field of view. Crossing a single beam can trip the detector. The detonator uses any standard blasting cap to detonate an explosive payload.

The detonator has a safety pin that must be removed for it to operate.

Every turn that an object is moving through the detector's one hundred and eighty degree (180) field of view there is a ninety percent (90%) chance of detection. Range Class Impairment modifiers effect this chance.
Range Class: A
Mass: 100 g
Cost: ¥200

Pull Cord/Trip Line Detonator

The pull cord/trip line detonator has a tension spring that is adjustable to the amount of force required to activate the detonator. This can range from a slight touch, to a hard yank on the attached cord. An eyelet is used to connect any cord under five millimeters in diameter to the device. When pulled with the correct tension or greater, the detonator triggers any standard blasting cap.

The detonator has a safety pin that must be removed for it to operate.
Cost: ¥550

Radio Detonator

The radio detonator consists of two devices, the detonator and the transmitter. The transmitter is reusable. The detonator is also the radio receiver and uses any standard blasting cap to detonate an explosive payload. The radio and the detonator have short selectable keys that prevent accidental detonation by radio signal. These keys must match in order for the detonator to operate.

The radio signal can be jammed or may be cut off by physical obstruction.

The detonator has a safety pin that must be removed for it to operate.
Range: 5km unobstructed
Cost: ¥ 1,000

Temperature Detonator

The temperature detonator normally consists of two bimetallic strips that bend as it is heated or cooled. One detects a temperature drop and the other a rise in temperature. The detonator can be set to detect either or detonate when it gets to a specific temperature.

The detonator has a safety pin that must be removed for it to operate.
Cost: ¥600

Tilt/Vibration Detonator

The tilt/vibration detonator uses a mercury switch to trigger a standard blasting cap. The mercury switch will create a circuit if the detonator is rocked or tipped more than 3 degrees from plumb. The detonator itself has a bubble level built in that can be used for leveling the switch. for These detonators are dangerous because they can trip the sensor as soon as they are armed. If the detonator is not level, it will go off.

The detonator has a safety pin that must be removed for it to operate.
Cost: ¥600

Time-delay Detonator

The time-delay detonator uses a timer to trigger any standard blasting cap. The time -delay is often selectable and can range from seconds to hours.

The detonator has a safety pin that must be removed for it to operate.
Cost: ¥800

Field Prepared Detonators

The detonators listed above are pre-made systems. However any character with Electrical Repair and Explosives skills can prepare their own detonators if they have access to the correct equipment. Field prepared detonators take one hour to build. Jury rigging the detonator can reduce that time but it has a much greater chance of failure. If a half-hour is taken to build the detonator, it has a twenty five-percent (25%) chance of failure. If fifteen minutes is taken to build the detonator, it has a fifty-percent (50%) chance of failure. If less time than that is taken, the detonator has a seventy-five percent (75%) chance of failure.

The builder must have access to equipment that they can use to build the detonator such as radios for a radio detonator etc.
Cost: various

Detcord

Detcord is a ropelike explosive that is used to start multiple explosions in a timed sequence. The cord is an explosive itself that

when wrapped around a lightly or unarmored object can "cut" the object.

When used to trigger multiple explosions the cord is strung between the explosive payloads. There is a millisecond time delay for anything up to a hundred meters of cord. As such delays between explosions are not perceivable. The time delay is only useful for enhancing the explosive force of the multiple charges by creating a path for the force to travel (requires an Explosives skill roll and a Structural Recognition skill roll). When successful, the damage caused by this time-sequenced explosion is increased by ten percent (10%).
Damage: 5 per meter of cord.
Blast Range Class: None
Mass: 80 g per meter of cord
Cost: ¥2,000 per meter of cord

Penetration Augmented Munition

These munitions are designed to be effective against reinforced structures such as bridges or bunkers, and have also been shown effective in removing large volumes of concrete or CCC. The Penetration Augmented Munition uses a three-phase process that reduces the volume of explosives necessary to defeat a target. The first phase is a shaped charge that blasts a hole into the target. The second phase propels a charge into the hole created. The third phase consists of the charge detonating inside of the target.

A silenced explosive stud driver secures the munition to the target. The Munition is then triggered by a standard blasting cap.

The Penetration Augmented Munition, if used against a vehicle will cause 1d10 critical hits.
Damage: 5000
Blast Range Class: None
Mass: 13 Kg
Cost: ¥800,000

Light Attack Munition

These are self-contained munitions designed to be carried and used by footsoldiers to defeat lightly armored vehicles and structures. The munition consists of a shaped charge and a multi-mode fuse system that supports blasting cap detonation, user selectable time delay firing device (up to 2 hours), or a fuze by wire mode that allows remote detonation by running communication wire.

The light attack munition uses a shaped charge to defeat armored targets.
Damage: 600
Blast Range Class: None
Mass: 500 g
Cost: ¥20,000

Teleport Bomb

The teleport bomb is a special tactical device developed by the Chinese government. It uses teleporter technology to deliver an explosive payload to a target. To teleport the payload to the target a receiver must be in place. The receiver needs a method of communicating with the transmitter. In most instances standard radio transmission will suffice, however sometimes wormhole communicators are used but this greatly increases the power requirements of the receiver.

The receiver does not have an internal power supply. In order to function, there must be a power source capable of supplying roughly sixty thousand (60,000) watts of power.

	PB	S	Med	L	Ex
Damage	10K	5K	5K	2K	1K

Blast Range Class: C
Mass: 120 KG
Cost: ¥200,000,000

Bomb Sniffer

A bomb sniffer is a chemical detector that draws in samples of air and tests for chemicals in explosives. The bomb sniffer is calibrated to explosives that are manufactured on Earth but have been modified to detect LCF

Mass: 402 g
Cost: ¥30,000

Cutting Explosives

	PB	S	Med	L	Ex
Damage	25	1	0	0	0

Blast Range Class: A +1 Range Class for more than 500 grams
Mass: 5 G
Black Market Cost: ¥800 for 5 grams

E-Suit Entrenchment Tool (BHS Big Hydraulic Shovel)

A cross between a shovel, and a jackhammer, the BHS as it is often referred to connects to the E-Suits Hydraulic systems to generate a jackhammer action for cutting though soil or breaking rocks and CCC.
Mass: 315 Kg
Cost: ¥110,000

Electrical Cable

This is electrical cable that is used to carry power through hexes but is often wrapped in cloth or an insulator to make a kind of extension cord. The cable is scavenged and then whatever insulator that is available is wound around it.

Gauss Meter

A Gauss Meter is a measuring device for detecting the strength of magnetic fields. It has many uses, one of which is to tell if electrical cables are electrified and with a successful Mathematics skill roll the amount of power going through can be determined. The location of magnetic mines can be pinpointed with this device.
Mass: 1 Kg
Cost 34,000

Ground Penetrating Radar/Sonar

These devices can detect the presence of hard materials buried underground. They can also be used to find hidden passages in floors, walls or soil.
Mass: 40 Kg
Cost: 28,000,000

Particle Cutter

This is a Scimrahn tool used to cut out the outline of a CCC Slab and then the slab is sheared off with an electrothermal device, or explosives

	PB	S	Med	L	Ex
Damage	200	30	5	1	1

Range Class: A
Payload: Draws from Hex Power
Mass: 18 Kg
Cost: ¥110,000

PHE Rapid 40mm gun

The PHEG (pronounced 'peg' by some but most normally 'feg') stands for Penetrating High Explosive Gun and is use for drilling tunnels. The PHEG fires a 40mm caseless round that penetrates into its target and then detonates. This process is used in bunker demolition on earth against heavy concrete structures. It is effective against low to medium grade CCC but not HDCCC as the round does not penetrate.

In rock the PHEG will blast a 1m by 1m hole 50cm deep per round, but CCC breaks differently and the size of the tunnel is dependent on the direction of the grain. When firing into the grain, the hole is often 3m tall and 30cm wide and 30cm deep, firing against the grain causes more dramatic fracturing and will open a 1.5m by 1.5m and 30cm deep hole.

	PB	S	Med	L	Ex
Damage	250	250	220	190	120

Range Class: B
Payload: 25 per belt
Rate of Fire: 20
Mass: 402 Kg
Cost: ¥1,800,000

Plasma Wand

A Plasma Wand is a small plasma torch that is used to clean off white spoor, chemical, biological and nanotech weapon residues. The amount of plasma that is used is very small and will not harm most materials if handled properly. If the plasma wand is left in one place it can ignite combustible materials.
Mass: 740 g
Cost: ¥1,200

Wheelbarrow

Wheelbarrows cut the time that it takes to move soil.

One person with a wheelbarrow can move four times the amount of soil in the same amount of time.
Mass: 8 Kg
Cost: ¥1,800

Non-Lethal Weapons

These are weapons that are explicitly designed and employed so as to incapacitate personnel or their equipment, while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment. Unlike conventional lethal weapons that destroy their targets, non-lethal weapons employ means other than gross physical destruction to prevent the target from functioning. Non-lethal weapons are intended to have one, or both, of the following characteristics: 1. They have relatively reversible effects on personnel or materiel , 2. They affect objects differently within their area of influence

Adhesive Foam

Adhesive foam was conceived as a method for restricting the movement of a target with minimal harm. A backpack of

pressurized liquid feeds a nozzle that sprays a solid stream of ultra-dense adhesive foam.

The foam is so sticky that it instantly adheres to the target. The foam is also extremely cohesive resisting nearly any attempt to remove it.

When the foam is targeted at the feet and legs, it also sticks to the floor and completely immobilizes the target. If the foam strikes any other part of the body it is a major hindrance to the target's movement. However the technique had one major flaw. If the foam were to strike the face, the victim would not be able to remove it and would suffocate. A breakthrough in material technology allowed this hurdle to be overcome. Chemical binders of hydrophobic molecules repel the water in the foam and bridge the bubbles of air found in the foam and form tubes that allows air to be transmitted through the foam and prevent suffocation.

This technology first began appearing in commercial applications such as "super glue" and quick setting foam insulation. It is extremely persistent and is virtually impossible to remove without a liquid solvent. The solvent can be applied as a spray or poured on. The foam then appears to dissipate, releasing its hold. Sticky foam came to public attention on February 28, 1995 when U.S. Marines used it in Mogadishu, Somalia, to prevent armed intruders from impeding efforts to extricate United Nation forces from that county.

Effect: If hit in the feet or legs and the floor is a solid surface, victims are effectively glued to the floor and are immobilized. If hit anywhere else in the body, the victim cannot use that appendage or anything that was held or stored there. Anything touching that body part will also become stuck including other body parts.

Save vs. immobilization: Strength roll with a 90% Impairment, and the foam cannot touch the floor again or the target will have to brake free again.

Range Class: A
Payload: 2
Rate of Fire: 1
Mass: 16 KG
Cost: ¥62,300

Anti-riot Microwave Emitter

Developed in the late 1990's by the United States government. The original device was vehicle mounted and designed to be used at a distance. The low energy microwave stream causes the target to feel as if their skin were burning. The microwave emitter has seen vast technical improvement over the years, including miniaturizing which has made the device a sidearm sized device. This has amplified several moral issues in regards to its use. Since the device leaves very little physical trace of it's use when used in the proper manner, it has been employed as a torture device by a range of organizations.

Effects: Victims feel as if their skin is burning. This often causes the victim to panic and flee. The beam causes Mental stress on the target

Save vs. Panic: Psyche roll

	PB	S	Med	L	Ex
Damage	2	1	burn	burn	burn
Mental Stress	8	4	3	2	1

Range Class: B
Payload: 5
Rate of Fire: 1
Mass: 31 KG
Cost: ¥76,000

Stun Gun

The stun gun is a hand held device that delivers a high voltage electric charge to the target. There are two types of stun guns, one that fires two needle like projectiles trailed by thin wires and the hand to hand models. There is a large variety of these devices available on the open market. They are for the most part considered safe unless used repeatedly on a target. Stun guns are effective on a large majority of targets, only those that are extremely large are routinely slightly more resistant to its effects. However, some narcotics such as PCP, Cocaine, and Pump in higher doses have been known to make a person highly resistant to the stun gun's effects.

Effects: Victims are rendered unconscious.
Save vs. stun: Constitution roll or Psyche roll with two 60% Impairments.

Projectile
Damage: stun + 4 Physical, 2 Functional and 2 Mental stress
Range: 3 meters
Payload: 1/10
Rate of Fire: 1
Mass: 75 g
Cost: ¥2,000

HTH
Damage: stun + 4 Physical, 2 Functional and 2 Mental stress
Range Class: touch
Payload: 10
Rate of Fire: 1
Mass: 75 g
Cost: ¥1,800

Tranquilizer Rifle

This specially designed breach loading rifle fires a needle tipped vial of tranquilizer at a target. Dosage can be adjusted when filling the vials with the tranquilizer to suit the requirements of the target. In this manner even extremely large or resistant targets may be effectively brought down. (See: Sedatives)

	PB	S	Med	L	Ex
Damage	tranq	tranq	tranq	tranq	tranq

Range Class: B
Payload: 1
Rate of Fire: 1
Mass: 2.3 Kg
Cost: ¥9,000

Tranquilizer Pistol

These are CO2 powered pistols that fire a short range hypodermic needle. The hypodermic needle is normally used to deliver a dose of sedatives (See: Sedatives) but can also deliver a variety of other drugs.

	PB	S	Med	L	Ex
Damage	tranq	tranq	tranq	tranq	tranq

Range Class: A
Payload: 1
Rate of Fire: 1
Mass: 7 g
Cost: ¥16,000

Sedatives

Sedatives are chemical agents that induce sleep. While there are a variety of drugs that may be used to that end, this section will treat them more or less generically.

The most effective means for delivering sedatives is by injection because the dosage entering the bloodstream is consistent. However some may be ingested or inhaled with various degrees of effectiveness, but rates of respiratory absorption and digestive system absorption is different, along with the quantity of exposure.

The addition of a chemical called DMSO (dimethyl sulfoxide) increases the absorption rate of several kinds of sedatives about ten times what is normal. This allows for a sedative delivery just by touching the skin. However sedatives do not often come mixed with DMSO. In order to create a skin contact sedative, the player must make a successful chemistry roll to properly prepare the sedative.

Effect of Injection: The amount of drug delivered is tailored to the intended target. As such, the person preparing the injection designates the period of sedation. However the longest period of sedation is thirty minutes for a healthy human, any more than this and a number of serious and potentially deadly health effects occur. These can include respiratory failure and cardiovascular failure.

For targets larger than one hundred Kilograms and animals with unknown biology, the longest "safe" period of sedation is considered to be fifteen minutes.

Effect of Inhalation, Ingestion or Skin Absorption: Because the quantity of drug delivered to the blood stream is unknown, the effective duration of sedation is random. In addition the quantity of drug required for a minimal effect is much greater (5 times the normal dose). In addition the sedatives used in injection are not compatible with the sedatives used in ingestion and inhalation. Mixing the two will often cause adverse health effects, such as respiratory failure and cardiovascular failure. The average period of sedation through ingestion or inhalation is between thirty seconds and five minutes (2D10 turns). The victim may attempt to make a drug resistance roll and cut that time in half.

Save vs. effect: Constitution roll with 3 70% Impairments

Average 5 Min Dosage: 20 cc
Cost: ¥600 per dose

Emetic (vomiting) Agents

Emetic agents cause violent spasms in the digestive tract that cause projectile vomiting and evacuation of the bowls. These agents are dangerous and can cause serious damage and even death. Emetic agents are most often ingested but there are some agents that can be inhaled.

Effect: Victims are incapacitated by violent vomiting and bowel evacuation. If the victim fails their constitution roll and does not receive medical assistance in twelve hours, they will die from the effects of this agent.

Save vs. death: Constitution roll + Drug Resistance skill or a subsequent roll vs. General Medicine.

Save vs. effect: Constitution roll with 3 70% Impairments.

Average Dosage: 20 cc
Cost: ¥240 per dose

Concussion Grenade

Concussion Grenades use a mild explosive and incendiary charge to create a concussive blast and blinding flash that stun a target. These grenades are also called Flash-Bangs.

Effect: Victims are often winded and if they were looking in the direction of the grenade when it went off will be temporally blinded (1d6 turns).

Save vs. stun: Constitution roll
Save vs. blind: Reflex roll

	PB	S	Med	L	Ex
Damage	3	1	stun	stun	stun
Physical Stress	10	10	5	4	3

Blast Range Class: A
Mass: 175 g
Cost: ¥8,000

Sedative Grenade

The sedative grenade is a specially prepared concussion grenade that delivers an airborne and skin contact sedative.

Effect: Victims are often winded and if they were looking in the direction of the grenade when it went off will be temporally blinded (1d6 turns). The sedatives take several seconds to over a minute to take effect (1d6 turns before they are effective). The effect of sedation is between thirty seconds and five minutes (2D10 turns). The victim may attempt to make a drug resistance roll and cut that time in half. Full body armor will half the time that the character is sedated. Vac-suits will block any of the effects of sedation but not the blinding or stun effects of the flash bang.

If a vac-suit is damaged, the effect of the sedation is only halved.

Save vs. stun: Constitution roll
Save vs. blind: Reflex roll
Save vs. sedation: Psyche roll + Drug Resistance skill

	PB	S	Med	L	Ex
Damage	3	1	stun	stun	stun
Physical Stress	10	10	5	4	3

Blast Range Class: A
Mass: 175 g
Cost: ¥8,000

MK1 Illuminating-Grenade

The MK1 Illuminating Grenade, which produces 55,000 candlepower for 25 seconds, effectively blinds targets caught in the center of its illumination zone for short periods of time. The MK1 can also be used for non-combat purposes for illuminating large areas. The illumination effectively lasts for three turns.

Effect: Victims are blinded temporarily (1d6 turns) if they are in dark conditions and are near the grenade when it went off.

Save vs. blind: Victim must roll under their Reflex with two 60% Impairments.

	PB	S	Med	L	Ex
Damage	Blind	Blind	Blind	-	-
Mental Stress	1	1	1	1	-

Blast Range Class: B
Mass: 231 g
Cost: ¥6,000

Isotropic Radiator-Grenade

These special munitions illuminate or bloom with laser-bright intensity causing the same retinal or optical damage as LEL (low energy laser) weapons. Isotropic radiation is generated by an explosive burst that superheats gaseous plasma surrounding it, causing a laser-bright flash. However the bloom is too brief to serve as effective illumination.

Effect: Victims are blinded temporarily (2d10 turns) if they are near the grenade when it went off regardless of local illumination. Failing the saving roll causes permanent partial loss of vision unless corrective surgery

can be performed. Optics such as low-light and infrared can be damaged by the bloom (25% for each device).

Save vs. blind: Victim must roll under their Reflex to prevent permanent vision loss and under their Reflex with two 60% Impairments to avoid temporary blinding.

	PB	S	Med	L	Ex
Damage	Blind	Blind	Blind	Blind	-
Mental Stress	5	5	4	3	1

Blast Range Class: B
Mass: 350 g
Cost: ¥30,000

Clogger Grenade

The Clogger Grenade uses a low yield explosive device to distribute sticky-soft polymer agents to clog up body armor joints. The clogging agent hangs in the air like smoke and will persist for six turns unless air movement blows it away. Clogging agents are mixed with dyes and result in "tinted clouds" whose presence let friendly forces know not to enter them. These clouds can be intermixed with "decoy mines" consisting solely of colored smoke.

Effect: Armored victims loose mobility when caught in the cloud. The Impairments below apply to Agi and Ref until the effected body armor is removed or cleaned with a solvent. The clogging effect is inconsequential to vehicles.

	PB	S	Med	L	Ex
Impairment	60%	40%	20%	10%	5%

Blast Range Class: A
Mass: 350 g
Cost: ¥30,000

Aqueous Barrier Foam

Barrier Foam is a dense soapy material that is blown into place. It is fire retardant non-toxic and biodegradable. The foam can be piled up over one hundred and thirty centimeters (130 cm). The foam is not used to block movement, but slows movement and can be used to conceal booby traps. Simple traps can be made into major obstacles by covering them in barrier foam. Concertina wire becomes nearly impassable and very difficult to clear. Caltrops are nearly undetectable when covered with the barrier foam. By applying the foam over obstacles, it impedes the ability to defeat them (40% Impairment to any dexterity rolls when working in the foam). Barrier foam slows movement by as much as 25% for humans on foot and wheeled or tracked vehicles. E-suits only suffer a 10% loss in speed.

Barrier Foam is generated from a detergent and a water source such as a reservoir. The detergent is stored in five liter bags. Each bag mixes with a hundred liters of water to generate 150 cubic meters of foam in ten minutes. The foam fills in the lowest elevations in a one hundred meter radius and then builds up to a maximum height of 130cm.

Sprayer Mass: 80 Kg
Cost: ¥9,200

Detergent (5 liter)
Mass: 5 KG
Cost: ¥800

Aqueous Barrier Foam Riot Control Agent

The ordinary suds of barrier foam can be enhanced with the addition of chemical irritants similar to those found in teargas. (See: Chemical Irritants.) Any animal (including humans) not sufficiently protected will suffer from the effect of the chemical irritant until they can be washed down with large quantities of water. Body armor by itself will protect for a short period of time, but the fluid will slowly leak through joints and into fabric. The most effective defense against the irritant is wearing a chemical suit or Vac-suit.

Effects: Victims feel as if their skin and eyes are burning. This often causes the victim to panic and flee.

Causes 2 Mental and 3 Functional stress per turn

CS riot control agent (5 liter)
Mass: 5 KG
Cost: ¥1,600

Personnel Net Gun

Fires a net that entangles a human target. The net is 6 meters wide and employs glue-coated strands. The glue can be removed by spraying or pouring on a solvent. The weights have been known to injure targets with relative frequency.

Effect: The net uses a weighted glue coated net to entangle a target. Victims are immobilized.

	PB	S	Med	L	Ex
Damage	8	4	2	1	-

Range Class: A
Payload: 1
Rate of fire: 1
Mass: 750 g
Cost: ¥8,000

Nets
Mass: 2 Kg
Cost: ¥1,000

Vehicular Net Cannon

The net cannon fires a steel cable net that is 9 meter wide and can envelop a car or armored vehicle.

Effect: The net uses a weighted steel net to entangle a target. Vehicular targets under 4 meters long are immobilized.

	PB	S	Med	L	Ex
Damage	20	10	5	1	-

Range Class: B
Payload: 1
Rate of fire: 1
Mass: 90 Kg
Cost: ¥40,000

Nets
Mass: 40 Kg
Cost: ¥40,000

Bucha Strobe Grenade

The Bucha strobe effect is a high intensity strobe light that flashes near human brain wave frequency causing vertigo, and disorientation.

Effects: Victims are disoriented, 3 Mental, 2 Functional and 1 Physical stress per turn in the area effect.

Save vs. Disorientation: Constitution roll or Psyche roll. Victim must roll under either their Constitution or Psyche.

Blast Range Class: A
Duration: 20 Turns
Mass: 680 g
Cost: ¥760,000

Photic Driver

The Photic Driver uses infrared strobes and high power ultrasound to create a disorienting effect that is not easily identified. The victim feels dizzy and of balance because of the inner ear being bombarded by pulsing ultrasound. The flashing infrared strobe penetrates closed eyelids and causes skin discomfort. The effect can cause those prone to epileptic fits to go into convulsions.

Effects: Victims are disoriented 1 Mental and 1 Functional stress per turn in the area effect.

Save vs. Disorientation: Psyche roll. Victim must roll under their Psyche.

Blast Range Class: A
Duration: according to the availability of electricity.
Mass: 31 Kg
Cost: ¥391,000

Chemical Irritants

Teargas Grenade

Effects: Victims feel as if their skin and eyes are burning. This often causes the victim to panic and flee. If the victim panics they must do whatever they can to run away from the teargas.

	PB	S	Med	L	Ex
Mental Stress	4	4	3	1	1
Functional Stress	6	6	4	2	1

Blast Range Class: A
Mass: 175 g
Cost: ¥4,000

Electrically Activated Teargas Grenade

This type of teargas grenade is similar in operation to a normal teargas grenade except that it is activated by an electrical charge. This type of grenade is most often installed as a defensive measure inside of bunkers and vehicles.
Effect: (see: Teargas Grenade)

Oleoresin Capsicum Spray (pepper spray)

Effects: Victims feel as if their skin and eyes are burning. This often causes the victim to panic and flee. If the victim panics they must do whatever they can to run away from the spray and are otherwise incapacitated for 1d6 turns.

Save vs. Panic: Psyche roll or Constitution roll
Causes 2 Mental and 5 Functional stress

Range: 3 meters
Payload: 3-10
Rate of Fire: 1
Mass: 80-200 g
Cost: ¥200-600

Disposable Riot Control Launcher

This hand held launcher consisting of an aluminum tube with a hand activated striker on it's base. The launcher uses a low power charge to propel a rubber teargas grenade.

Effects - Teargas Grenade: (see: Chemical Irritants, Teargas Grenade)

Range Class: B
Payload: 1
Rate of Fire: 1
Mass: 250 g
Cost: ¥7,000

Chemical Cocktails

These concoctions are not normally sold, but are made by a character with the chemistry skill.

Molitov Cocktail

The simplest of concoctions, any flammable liquid is poured into a glass bottle. A rag is placed in the neck and lit. The entire bottle is then thrown at a target. These are not sold pre-made but the price is for the components.

	PB	S	Med	L	Ex
Damage	8	5	4	2	1

Blast Range Class: A
Duration: 3 turns
Mass: 500 g
Cost: ¥40

Stink Bomb

Stink bombs are generally composed of two or more chemical agents that when mixed, generate a putrid odor that is unpleasant but will not cause any negative health effects. This type of device is most often used to clear an area before the target knows it is being attacked.

Effects: Victims are repulsed by the foul smelling gas. This causes the victim to flee the odor.

Save vs. Flee: Psyche roll

	PB	S	Med	L	Ex
Mental Stress	4	4	3	1	1

Blast Range Class: A
Mass: 200 g
Cost: ¥200

Noxious Gas Bomb

This is a generic listing for a simple device that mixes two or more chemicals to generate a toxic gas. This gas in question is usually something like chlorine gas. The gas will generally have a disagreeable odor, cause the victims to become ill after several minutes of exposure and possibly death on longer exposures.

Effects: Victims are repulsed by the foul smelling gas. This causes the victim to flee the odor. If the target does not flee the area they will become sick. For each turn the character inhales the gas they

Save vs. Flee: Psyche roll

Causes 5 Physical 3 Functional and 2 Mental stress for every turn of exposure.
Mass: 200 g
Cost: ¥200

Acids

Acids are corrosive chemicals. For the purposes of this heading, only industrial strength acids will be considered.

The main use of acids is to destroy chemical weapons and are used to quietly burn through armor of hardened structures.

Weaponized acids are prohibited by international treaty and therefore Field Engineers must be very careful with how they are used. Acids may be used on structures. Their use on personnel is prohibited and use on vehicles is also prohibited.

They are used to dissolve metals and organic compounds.

Acids ignore armor ratings but are only effective against specific materials that are mentioned along with each acid.

Wear rubber gloves, facemask or safety glasses, apron, and ensure good ventilation. Do not assume that gloves provide an impenetrable barrier to the acid.

Aqua Regia (Latin, "royal water")

Aqua Regia is a mixture of concentrated hydrochloric and nitric acids. Aqua regia was used by alchemists and its name is derived from its ability to dissolve the so-called noble metals, particularly gold, which are inert to either of the acids used separately.

Aqua Regia is transported in opaque vials that hold the hydrochloric and nitric acids in separate containers. When the lid is unscrewed, it breaks the containers that keep the constituent acids separate. The solution can then be applied to the target.

Proper protection should be worn when using Aqua Regia as it is extremely corrosive. Inhalation of vapor can cause serious injury. Ingestion may be fatal. Liquid can cause severe damage to skin and eyes.

Damage: 2 points per turn for 5 turns on most materials.
Volume: 250 ml
Cost: ¥400

Hydrochloric Acid (concentrated)

Hydrochloric acid is a powerful corrosive that can dissolve metals and organic materials. It is not effective on glass and ceramics.

Proper protection should be worn when using hydrochloric acid as it is extremely corrosive. Inhalation of vapor can cause serious injury. Ingestion may be fatal. Liquid can cause severe damage to skin and eyes and permanent damage.

Damage: 2 points per turn for 5 turns on metals (excluding gold and platinum) and organic materials (includes CCC).
Volume: 250 ml
Cost: ¥40

Hydrofluoric Acid

Hydrofluoric acid is corrosive to glass, concrete, silica, and metals. It is also extremely toxic even when inhaled or through skin contact.

Proper protection should be worn when using hydrofluoric acid as it is extremely corrosive. Inhalation of vapor can cause serious injury. Ingestion may be fatal. Skin contact may be fatal. Acts as a systemic poison, any contact with this material requires immediate medical attention.

Damage: 1 point per turn for 3 turns on metals (excluding gold and platinum). 1 point per turn for 5 turns on organic materials (includes CCC). 2 points of damage for 3 turns on glass, ceramics and concrete. 2 points per turn for 7 turns as a ingested poison. 1 point of damage per turn that the vapor is inhaled.

Volume: 400 ml
Cost: ¥60

Nitric Acid (concentrated)

Concentrated nitric acid is a powerful corrosive that can dissolve metals and organic materials.

Proper protection should be worn when using nitric acid as it is extremely corrosive. Inhalation of vapor can cause serious injury. Ingestion may be fatal. Liquid can cause severe permanent damage to skin and eyes.

Damage: 3 points per turn for 2 turns on metals (excluding gold and platinum) and organic materials. 1 point of damage for 5 turns on glass, ceramics and concrete.
Volume: 250 ml
Cost: ¥55

Sulfuric Acid (concentrated)

Concentrated sulfuric acid is a powerful acid that also reacts violently with water. It is even more effective when heated. Sulfuric acid dissolves organic materials and is often used as a desiccating agent. Heated

sulfuric acid can dissolve most metals (excluding gold and platinum). Sulfuric acid when mixed with water causes a violent reaction that releases heat. If the two are mixed quickly this reaction can cause water to boil and explode into steam this can splash hot sulfuric acid over a one meter area.

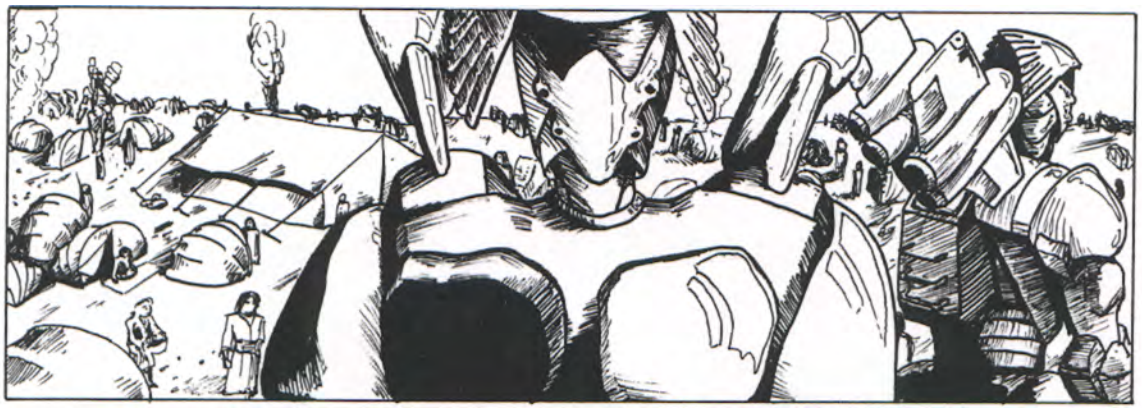
Proper protection should be worn when using sulfuric acid as it is extremely corrosive. Inhalation of vapor can cause serious injury. Ingestion may be fatal. Liquid can cause severe damage to skin and eyes and permanent damage including blindness.

Damage: 1 point per turn for 2 turns on metals (excluding gold and platinum). 2 points per turn for 5 turns on organic materials.

Damage Heated: 1 point per turn for 5 turns on metals (excluding gold and platinum). 3 points per turn for 5 turns on organic materials.

Volume: 300 ml
Cost: ¥55

Scimrahn Survival Gear



E-Suit Finger Camera

The finger camera replaces the tip of one of the TF-2394 index fingers (usually the left). It can rotate 360 degrees and swivel 90 degrees on the tip of the finger. It is used to look around corners and into places that would be difficult to get the sensor head into.
Mass: 400 g
Cost: ¥2,500

E-Suit Life Support Backup

The Life Support Backup is a system of batteries that store power while the E-Suit is functioning. If the E-Suit is damaged, exceeds its fuel capacity or the E-Suit cannot make it to safety, the Life Support Backup can keep the pilot alive for up to two days.
Mass: 110 Kg
Cost: ¥35,000

E-Suit Re-entry System

The TF-2394 is capable of launching into orbit at the poles, with the aid of an anti-grav engine or a booster rocket (see: The Artifact, Vehicles, TF-2394 Additional Hardware). However it must move back to the poles to make a safe re-entry unless it is using an anti-grav engine. In many cases this can be impractical because the total trip can exceed the total fuel capacity of the E-suit. When this is the case, a Re-Entry system is desirable.

The Re-Entry system is an inflatable balloon and tail system that both protects and stabilizes the E-Suit. The balloon inflates in front of the E-Suit to form a protective thermal barrier, while the tail is a fabric ribbon that trails five hundred meters behind the E-Suit with a parachute pod at it's end. Once the suit reaches thirty thousand feet above the surface, the parachute is deployed and the balloon deflates allowing the E-Suit's thrusters to fire. If the E-suit does not have enough fuel to fire it's thrusters. It can leave the balloon inflated and use it as a cushion in a crash landing. In this event the balloon bursts on impact in a controlled fashion, ejecting its gasses back at the E-Suit. This further slows the Suit's decent. However the safety record of these landings are questionable.
Mass: 250 Kg
Cost: ¥1,500,000

E-Suit Saddle Pods

E-Suits are not normally designed to carry much more than a passenger. Saddle pods bolt to the upper legs of an E-Suit and allow a small amount of personal items and food to be transported with a minimum impact on the function of the E-Suit.
Capacity: 100 Kg
Mass: 40 KG
Cost: ¥7,000

Freezer Unit for Scimrahn Freighters

These refrigeration units run off the Freighter's power and cool the contents of the freighter. If fully frozen, many food items can be carried for upwards of six months to a year. However some foods do not freeze well and may be damaged by the freezing process.
Mass: 140 KG
Cost: ¥100,000

Helmet HUD

Scimrahn armor is designed to take a number of add on components. On of these is a Heads Up Display that fits into the helmet visor of both Scimrahn light and heavy armor. The HUD can display text and low resolution video.
The HUD is most often used along with the Scimrahn Comm/Comp and is installed inside the helmet.
Mass: 110 g
Cost: ¥3,000

Listening Spike

The Listening Spike is a sensor device that fires a small HDCCC spike into a nearby solid surface. The device then listens for vibration in that surface detecting the vibration of vehicles, footsteps etc. Although the unit's range is approximately one kilometer, it can be extended by the S-15 E-suit.

The Listening spike may detect ambient noise such as a conversation in a shorter radius but the fidelity of the sound is sometimes poor.
Sensor range class: C
Ambient noise range Class: B
Mass: 950 g
Cost: ¥70,000

Scimrahn Shelter Bag

The shelter bag is very popular among lone scouts. It is similar to a sleeping bag but is designed to completely envelop the person in it. The bag is infrared ablative and normally camouflaged to help prevent detection while the user is sleeping. The bag is designed to protect from the extreme cold that is common in the recesses of the underground and is rated to -25 degrees Celsius.

Protects from 8 Physical and 8 Functional stress per hour due to cold
Mass: 1.1 KG
Cost: ¥3,000

Surgical Box (Kelrath)

The Scimrahn trade with the Kelrath primarily for food, but there are some items that the Kelrath manufacture that the Scimrahn cannot replicate. One such item is the Kelrath Surgical Box.

The box is a cube sixty centimeters to a side and has four extendible legs. On top of the box is two holes that the operator reaches into to control the box. Also on top of the box is a view screen used to monitor the patient. The underside of the box is an array of fifty manipulators each with a different purpose. Heavy manipulators can spread open the chest cavity, while light manipulators can move and hold body tissues. Lasers are used to cut and cauterize. Tiny optical and sonic probes can enter in to the body and show the surgeon what they could not otherwise see. Special manipulators can grab hold of veins and arteries and bridge them to resume normal blood flow. A pump can take over heart function for a period of up to five hours. The Box's four extendible legs hold it several centimeters from the patient's body, and the operator stands over the patient.

The Surgical Box is not a common medical device even for the Kelrath. Only the best of Kelrath doctors could afford to buy this device. As a result, there have only been a few of these devices that have been made available for trade.
Mass: 200 KG
Cost: ¥30,000,000

Laser Sound Projector

The laser sound projector is a device that uses two crossing ultraviolet laser beams to generate a tiny field of heated gas. The heated gas hums quite loudly. The pitch of the humming can be modulated to emulate a range of sounds including human voices and the hiss of plasma fire. However the heated gas is luminous and can be seen for a significant distance.
Range: 300 meters
Mass: 20 Kg
Cost: ¥120,000

Scimrahn Smoke Pod

This device is either dropped or hung from a belt and creates a thick billowing cloud of smoke that is opaque. The Smoke pod is a defensive device that is effective primarily against lasers and to obscure the vision of enemy troops, but is also marginally effective against plasma weapons. The primary disadvantage of the smoke pod is that those using it are often unable to see out of the smoke. Even infrared optics have difficulty cutting through the dense smoke that is formulated to diffract photons.

Effect: All laser weapons firing through the smoke have their range class diminished by one letter. (for example: Range Class B becomes A. Range Class C becomes B, Etc.) All low energy lasers such as those used in sensors and counter measures (ECMs) are completely ablated. In addition, targeting any object through the smoke has an Impairment to hit due to vision being obscured. (Note: Sonic and magnetic sensors are unhindered by the smoke and therefore have no negative modifiers.)

	PB	S	Med	L	Ex
Vision Impairment	90%	90%	80%	40%	10%

Blast Range Class: A
Mass: 334 g
Cost: ¥6,000

Scimrahn Weapons

Discharge Laser

The ion laser uses two ultraviolet lasers to create a path for electricity to travel. In this manner the Discharge laser is able to stun an unarmored target along with normal laser damage.

Effects: Unarmored victims are stunned (-2 actions next turn). If the target's armor is breached by the laser beams, the stun is also effective.

Save vs. stun: Constitution roll or Psyche roll with a 70% Impairment

	PB	S	Med	L	Ex
Damage	13	12	6	3	1

Range Class: B
Payload: 50-250 Backpack
Rate of Fire: 1
Mass: 3.8 KG
Cost: ¥45,000

Mass Spear

This weapon is a combination of a thudstick and a spear. The weapon is engaged when thrust forward and like the thudstick multiplies the impact force of the spear to break through armor.
Damage: 45
Range: 2 meters
Payload: 10
Rate of Fire: 1
Mass: 2.5 kg
Cost 70,000

Plasma Pike

Before the Scimrahn had the ability to manufacture E-suits the Plasma Pike was their only means of defeating a Chezbah E-suit. Despite their best efforts to refine the design, it often required a lucky shot or the use of a number of the Plasma Pikes to take down a single E-suit.

The Pike is a two and a half meter long weapon that carries a single charge. However the lack of a high power magnetic bottle makes the weapon impossible to hold while firing. The flash from the plasma ejection is hot enough to kill or severely injure anyone within two meters of the weapon. To fire the weapon, it is driven into the ground, aimed and then a timer is engaged. The timer gives just enough time to flee the lethal blast radius.

This weapon can be refilled from a plasma conduit without any additional equipment.

The blast range class for this weapon is centered on the Pike itself. The Pike itself has an armor rating of 30 and is not damaged in firing.
This weapon requires it's own weapon skill. (WS Plasma Pike)

	PB	S	Med	L	Ex
Damage	600	300	250	150	50
Blast Damage	30	10	5	1	1

Range Class: C
Blast Range Class: A
Payload: 1
Rate of Fire: 1
Mass: 15 Kg

Cost: ¥200,000

Pulser cannon

The Pulser cannon is usually used to defend a location from attacking vehicles. The weapon is so large that few vehicles can carry it.

This device directs a high frequency radio burst and is tuned to rupture magnetic fields. While devices like magnetic mines also do this, the disruption cannon is designed to penetrate magnetic shielding used in plasma containment units. The intended effect is a breakdown of the plasma's magnetic bottle, and causes a rupture. The Pulser cannon has two other effects. One, the device will do damage to shield generators. If the pulse disrupts the forcefield enough that it collapses, the shield generator is destroyed. Second, any computer controlled vehicle that is struck by the pulse, suffers a critical hit equivalent to it's computer being destroyed (This will usually be a 90% Impairment to pilot the vehicle).

The intended effect is that if the disruption damage is higher than the damage of any plasma weapons on the vehicle then the vehicle suffers an ammo explosion equal to the combined damage of it's plasma payload.

Disruption damage

	PB	S	Med	L	Ex
Damage	2,000	1,500	1,000	500	100

Range Class: C
Rate of Fire: 1
Mass: 45,00 Kg
Cost: ¥70,000,000

Vortex Cannon

A more powerful variant of plasma weapons. Not only does the Vortex Cannon do damage as normal plasma would, gas pressure from the vortex causes a physical impact.

The vortex Cannon is available as a TF-2394 Optional Weapon System.

	PB	S	Med	L	Ex
Damage	700	700	450	350	120

Range Class: C
Payload: 10
Rate of Fire: 1
Mass: 1564.5 Kg

When this weapon is mounted the top speed of the E-suit is dropped ten (15) Km/h and flight is not possible.
Cost: ¥6,200,000

Vehicles

Earth Vehicles

Type Wheeled
Model Quad ATV

These four wheeled all terrain vehicles are excellent short range transports. They can travel at speeds in excess of 120 Km/h.

Overall height	.62 m
Overall width	1.2 m
Overall length	2 m
Dry Mass	300 kg
Full Mass	380 kg

Power plant type: Internal combustion

Movement
top speed 120 Km/h
Total fuel capacity: 3 hours
Fuel type: Gasoline

Armor Rating: 3
Hit Points: 25
Crew: 1
Passengers: 0-1
Piloting Modifier: 0
Cost: ¥100,000

Earth Vehicles

Type Wheeled
Model ARC30

Armored Reconnaissance Carrier 30

The Armored Reconnaissance Carrier is a multifunction wheeled vehicle that can be refitted to a large verity of functions. The vehicle is amphibious and fully all terrain. The front of the vehicle has a crew cabin for a pilot and vehicle captain. The vehicle has eight large wheels that allow it to traverse obstacles under 1 meter high. The pilot can adjust the tire pressure in any or all of the tires to adjust to driving conditions. There is a light turret three quarters of the way to the back of the vehicle and twelve weapon ports that allow passengers to fire small arms out of the vehicle.

The crew and engine compartments have automatic fire detection and suppression systems.

Overall height	3.1m
Overall width	3.4m
Overall length	6.7m
Dry Mass	12,430 kg
Full Mass	13,909 kg

Power plant type: Internal Combustion

Movement
Top Speed 70 Km/h
Total fuel capacity: 12 hours
Fuel type: Petroleum Diesel

Armor Rating: 20
Hit Points: 800
Crew: 2
Passengers: 15
Piloting Modifier: -10
Cost: ¥38,000,000

Turreted Medium Machine gun

	PB	S	Med	L	Ex
Damage	15	15	12	10	8

Range Class: C
Payload: 2000
Rate of Fire: 60
Fire Arcs 1-8

Turreted Heavy Machine gun

	PB	S	Med	L	Ex
Damage	20	20	18	16	10

Range Class: C
Payload: 500
Rate of Fire: 45
Fire Arcs 1-8

Six Smoke Grenade Launchers

	PB	S	Med	L	Ex
Vision Impairment	90%	80%	60%	20%	10%

Blast Range Class: A
Range Class: B

Payload: 6
Rate of Fire: 6
Fire Arc 6

12 Weapon Ports

Weapon ports are slots with small armored flaps to protect passengers. These slots are not operable from the outside of the vehicle. From the inside of the vehicle, simply pushing small arm's barrel through the port will open the door allowing the passengers to fire out of the vehicle.

2 Ports in Crew Compartment
Fire Arcs 1-3
1 Port in Crew Compartment
Fire Arcs 3-5
1 Port in Crew Compartment
Fire Arcs 1, 7 + 8
4 Ports in Passenger Compartment
Fire Arcs 3-5
4 Ports in Passenger Compartment
Fire Arcs 1, 7 + 8
2 Ports in Passenger Compartment
Fire Arcs 5-7

ECM:	10% Impairment
Range Class:	C
Sensors:	20% Impairment
Range Class:	D
Shields:	1 active at 100hp
Cargo Capacity:	5000 KG

Shield information

No. of shields	1 (Arcs 1-3)

Fire Arcs

1	2	3
8	●	4
7	6	5

Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	
1-4	1	1	-	L Side
5	2	2-5	1-5	R Side
6-8	3-7	6-8	6	Front
-	-	-	7	Back
9-10	8-10	9-10	8-10	Turret

Arc 5	Arc 6	Arc 7	Arc 8	
1	1	1-4	1-5	L Side
2-5	2	5	-	R Side
-	-	-	6	Front
6-8	3-7	6-8	7	Back
9-10	8-10	9-10	8-10	Turret

Critical hits 1d10
Front 20% chance of critical
1-2 Cockpit, pilot killed
3-4 Shield generator destroyed
4-10 Ammo Explosion! passengers killed, APC disabled

Back 35% chance of critical
1-3 Fuel Explosion! 50 points 5m blast radius
4 Shield Generator destroyed
5-10 Engine damage, all systems at half power.

Side 70% chance of critical
1-10 Wheel damaged drop top speed by 10 Km/h

Turret 50% chance of critical
1-4 Heavy machine gun destroyed
5-7 Medium machine gun destroyed.
8-10 Sensor system destroyed 40% Impairment to sensor and ECM rolls

VARIANTS:

ARC30-RCB (Radiological-Chemical-Biological Reconnaissance Vehicle)

This is the chemical reconnaissance version of the ARC30. It is equipped with lane-marking poles and flags. The flag/pole dispensers are located on the rear corners of the vehicle hull. The RCB has a sealed hull and a eight hour oxygen supply. This chemical reconnaissance version is armed only with twin medium machine guns.

ARC30-2C (Command Vehicle)

This is the commander's variant of the ARC30, and is equipped with an advanced sensor navigation and communication package. The vehicle enables the commander of a motorized rifle battalion to control his unit and maintain communications with the regimental commander. For this purpose it is fitted with two Video transmitters, two portable video transmitters.

The ARC30 command vehicle consists of a ARC30 with the turret removed and additional radios and antennas added. There is also a generator, which is often mounted on the vehicle roof. Immediately behind a central hatch which is in place of the turret. With a wider and raised superstructure, the vehicle gives greater space for operators and additional equipment.

ECM: 10% Impairment
Range Class: C
Sensors: 40% Advantage
Range Class: D
Shields: 1 active at 200hp

Shield information
No. of shields
1 (Arcs 1-3)

ARC30 with Heavy Missile Launcher

This vehicle consists of a ARC with its turret removed and in its place, a quadruple heavy missile launcher. This missile weighs 29.48 kg. A total of eight missiles are carried including the four in the ready to launch position.

	PB	S	Med	L	Ex
Damage	11,000	9,000	9,000	3,000	900

Blast Range Class: A
Range Class: D
Payload 8
Rate of fire 4
Fire Arcs 1-3

ARC30 with Retractable Missile Launcher

This vehicle is ARC30 with its turret removed and fitted with a platform, under which are mounted six light missile launch tubes. This platform is carried within the hull under armor protection while traveling. When engaging targets, the platform is raised. The gunner, who is seated on the right side of the vehicle, controls the missile through a sight mounted on the front right of the vehicle roof. The vehicle carries eight additional missiles, and the platform can be rearmed while lowered.

	PB	S	Med	L	Ex
Damage	1,000	500	500	250	50

Blast Range Class: A
Range Class C
Payload 12
Rate of fire 1-4
Fire Arcs 1

ARC30 with Heavy Missile Turret

This vehicle consists of the ARC30 with the turret removed and replaced with a rotating heavy missile launcher. The crew reloads the launcher through a small hatch located behind it. The gunner controls the missiles through a sight mounted on the front right of the vehicle. The vehicle can carry 10 missiles to reload the launcher.

	PB	S	Med	L	Ex
Damage	11,000	9,000	9,000	3,000	900

Blast Range Class: A
Range Class: D
Payload 10
Rate of fire 1
Fire Arcs 1-8

ARC30 with Surface to Air Missile System

This version consists of a rotating surface-to-air missile launcher/turret mounted on a modified ARC30 chassis (the belly-wheels have been removed). The launcher/turret is fitted with four infrared-seeking, fire-and-forget missiles, and is manned by one man. Additional missiles can be carried on either side of the hull.

Infra-red Guidance System
Percent to Re-acquire: 75%

	PB	S	Med	L	Ex
Damage	3,000	1,500	1,500	750	150

Blast Range Class: A
Range Class: E
Payload: 4
Rocket Mass: 78.4 Kg
Fire Arcs 1-8

ARC30-P Maintenance Assistance

A number of older ARC30 APCs have been converted for use in the maintenance assistance role and have a raised tarpaulin cover over the troop compartment that runs almost to the rear. Consists of an ARC30 with the turret removed and replaced with a crane and other repair equipment. Standard equipment includes an A-frame, winch, tow bars, small stowage platform to the turret rear and stabilizers under the nose of the vehicle. This vehicle is not armed.

ARC30 Medical Vehicles

The ARC30 vehicle has been adapted to a series of medical vehicles. The M-1 is a medical evacuation vehicle, The M-2 is a battalion medical station, and the M-3 is a mobile dressing station with a team of doctors and their equipment. Up to four casualties on stretchers can be carried inside the hull, and an additional 12 can be housed in an attached tent.

ARC30A

This vehicle incorporates a new turret system, which is of all welded steel construction. Mounted externally on the top of the turret is a medium automatic cannon. A medium machine gun is mounted coaxially to the right of the cannon. The heavy machine gun is removed on this model. Mounted on either side of the cannon is a bank of three additional electrically operated, smoke grenade launchers. Turret traverse is through 360 degrees with weapon elevation being between -5 and +70 degrees.

Medium Automatic Cannon

	PB	S	Med	L	Ex
Damage	100	100	90	70	50

Range Class: D
Payload: 100
Rate of Fire: 7
Fire Arc 1-8

Six Smoke Grenade Launchers

	PB	S	Med	L	Ex
Vision Impairment	90%	80%	60%	20%	10%

Blast Range Class: A
Range Class: B
Payload: 6
Rate of Fire: 6
Fire Arc 1-8

Earth Vehicles

Type Unmanned Helicopter
Model Guardian

The Guardian VTOL is a remote surveillance and strike vehicle. It is capable of launching off the back of a truck and can land in a space 15 meters around. The Guardian is not autonomous and must be piloted from remote. This can cause some significant limitations to its use in the underground. There have been instances that Chezbah priests have taken control of the VTOL despite the use of safeguards.

The Guardian VTOL has a variant developed for use on The Artifact. Because of earth forces inability to launch their own communications satellites, their ability to co-ordinate troop movement has been limited. However the Guardian's ability to hover at over twenty thousand feet, makes it an effective surrogate. The G-Com1 is a communications variant that can be used to oversee the battlefield and give commands from afar.

Overall height	1.2m
Overall width	2.1m
Overall length	2.1m
Dry Mass	3693 kg
Full Mass	4820 kg

Power plant type: Internal combustion

Movement

Flying Top Speed	500 Km/h
Total fuel capacity:	7 hours
Fuel type:	Gasoline

Armor Rating:	5
Hit Points:	70
Barrier Points:	6
Crew:	0
Passengers:	0
Piloting Modifier:	0
Cost:	¥1,000,000

Missile Rack

	PB	S	Med	L	Ex
Damage	900	700	500	250	50

Blast Range Class: B
Range Class C
Payload 5
Rate of fire 5
Fire Arcs 1

ECM: 0
Range Class: C
Sensors: 10% Advantage
Range Class: D

Fire Arcs

\ 1 /
4 ● 2
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Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	
1	1	1	1	Landing Gear
4-7	4-7	4-7	4-7	Body

8-10 8-10 8-10 8-10 Rotor

Critical hits 1d10
Landing Gear 80% chance of critical
1-10 Landing gear destroyed.
Body 60% chance of critical
1-2 Sensor system destroyed -20 to sensor rolls
3-4 Ammo explosion! 200 pts 5m blast radius
5-6 Missile Rack Destroyed
7-8 Fuel Explosion! 40 points 10m blast radius
9-10 Engine damage, all systems at half power.
Rotor 99% Chance of critical
1-3 Minor damage slow descent to the ground.
4-10 Major damage, crash landing!

Variants: G-Comm1 Command Vehicle

The G-Comm1 is a command and co-ordination vehicle that is used to observe and communicate with units up to 100 kilometers away from the command post. This variant is unarmed.

Sensors: 40% Advantage
Range Class: E

Earth Vehicles

Type Tracked
Model R4 Bulldozer

Because of the cost and difficulty of transporting large vehicles to The Artifact, the bulldozers that have been teleported are small bulldozers. However they are still highly effective.

Overall height	2.7m
Overall width	4m
Overall length	9m
Dry Mass	8919 Kg
Full Mass	9269 Kg

Power plant type: Internal Combustion

Movement
Top Speed 20 Km/h
Total fuel capacity: 12 Hours 187 L
Fuel type: Diesel

Armor Rating: 30
Hit Points: 300
Crew: 1
Passengers: 1
Piloting Modifier: 60% Impairment
Cost: $120,000

Sensors: None

Manhour Rating = 75 Earthmoving.

Fire Arcs

1	2	3
8	●	4
7	6	5

Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-4	1-8	1-4	-	Front
5-7	9-10	5-7	1-6	Track
8-10	-	8-10	7-10	Side
-	-	-	-	Back

Arc 5	Arc 6	Arc 7	Arc 8	Hit Location
-	-	-	-	Front
1-3	1-6	1-3	1-6	Track
4-6	-	4-6	7-10	Side
7-10	7-10	7-10	-	Back

Critical Hits 1D10
Front 30% chance of critical
1-5 Engine damaged, speed and Manhour rating down 50%
6-10 Pilot Cabin, pilot takes 50% of damage to vehicle.

Track 30% chance of critical
1-10 Tread damaged. speed and Manhour rating down 50%

Side 60% chance of critical
1-3 Engine damaged, speed and Manhour rating down 50%
4-10 Pilot Cabin, pilot takes 50% of damage to vehicle.

Back 60% chance of critical
1-2 Transmission Damage, speed and Manhour rating down 50%

3-10 Pilot Cabin, pilot takes 50% of damage to vehicle.

Variant: Armored Bulldozer

This is usually a field prepared variant. Slabs of CCC or steel with concrete poured in front of it add huge amounts of hit points and greatly reduce the chances of critical hits.

Armor Rating: 40
Hit Points: 1000
Manhour Rating = 50 Earthmoving.

All critical location percentages are reduced by 25%

Skid Steer

Type Tracked
Model Skid Steer

Because of the cost and difficulty of transporting large vehicles to The Artifact, the bulldozers that have been teleported are small bulldozers. However they are still highly effective.

Overall height	2 m
Overall width	1.7 m
Overall length	3.5 m
Dry Mass	3,525 Kg
Full Mass	3,625 Kg

Power plant type: Internal Combustion

Movement
Top Speed 10 Km/h
Total fuel capacity: 24 Hours 50 L
Fuel type: Gasoline

Armor Rating: 10
Hit Points: 100
Crew: 1
Passengers: 0
Piloting Modifier: 40% Impairment
Cost: $25,000

Sensors: None

Manhour Rating = 20 Earthmoving, 10 Heavy Lifting.

Fire Arcs

\ 1 /
4 ● 2
/ 3 \

Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-4	1-2		1-2	Front
5-7	3-5	1-4	3-5	Track
8-10	6-8	5-6	6-8	Side
-	9-10	7-10	9-10	Back

Critical Hits 1D10
Front 30% chance of critical
1-5 Engine damaged, speed and Manhour rating down 50%
6-10 Pilot Cabin, pilot takes 50% of damage to vehicle.

Track 30% chance of critical
1-10 Tread damaged. speed and Manhour rating down 50%

Side 60% chance of critical
1-3 Engine damaged, speed and Manhour rating down 50%
4-10 Pilot Cabin, pilot takes 50% of damage to vehicle.

Back 60% chance of critical
1-2 Transmission Damage, speed and Manhour rating down 50%
3-10 Pilot Cabin, pilot takes 50% of damage to vehicle.

Tractor Trailer

Type Wheeled
Model Tractor Trailer

Although poorly suited for unprepared roads, Tractor Trailers are very useful for moving large amounts of cargo.

Tractor Trailers are able to haul especially heavy loads that Scimrahn Freighters cannot carry. The stats here are for a tractor trailer with a flatbed trailer but other types of trailers are similar but likely have a smaller cargo capacity.

Overall height	4 m
Overall width	2.59 m
Overall length	6 m
Dry Mass	12,000 Kg
Full Mass	112,000 Kg

Power plant type: Internal Combustion

Movement
Top Speed 210 Km/h
Total fuel capacity: 13 Hours 1500 L
Fuel type: Diesel

Armor Rating: 10
Hit Points: 600
Crew: 1
Passengers: 1-3
Piloting Modifier: 60% Impairment
Cost: ¥20,00,000

Sensors: None
Cargo Capacity: 100,000 Kg

I-CA Vehicle

Type Dirigible

Model Catfish

The Catfish model is a helium filled semi rigid dirigible. It has a much longer range than heavy lift helicopters and can carry far more weight. The catfish is a very large dirigible purpose built for use on The Artifact, it has steel bumpers that extend out in the front of the vehicle to prevent collisions with walls and give the Catfish it's name.

Overall height	30m
Overall width	27.2m
Overall length	232m
Dry Mass	100,100 Kg
Full Mass	180,100 Kg

Power plant type: Internal Combustion.

Movement
Flying Top Speed 120 Km/h
Total fuel capacity: 30 Hours
Fuel type: Gasoline / Alcohol

Armor Rating: 5
Hit Points: 400

Crew: 30
Passengers: 85
Piloting Modifier: -30
Cost: ¥46,000,000

Sensors: +5 to Int
Range Class: D
Cargo Capacity: 80,000 Kg

Fire Arcs

1	2	3
8	●	4
7	6	5

Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-4	1-6	1-4	1-2	Front
5	-	5	3-4	Back
6	-	6	5-6	Belly
7-8	7-8	7-8	7-8	Cockpit
9	9	9	9	Engine
10	10	10	10	Fin

Arc 5	Arc 6	Arc 7	Arc 8	Hit Location
1	-	1	1-2	Front
2-5	1-6	2-5	3-4	Back
6	-	6	5-6	Belly
7-8	7-8	7-8	7-8	Cockpit
9	9	9	9	Engine
10	10	10	10	Fin

Critical Hits 1D10
Front 60% chance of critical
1-8 Gas bag rupture 20 Km/h decent
9-10 Sensors destroyed

Back 60% chance of critical

1-8 Gas bag rupture 20 Km/h decent
9-10 Fuel Explosion! 100 points 10m blast radius

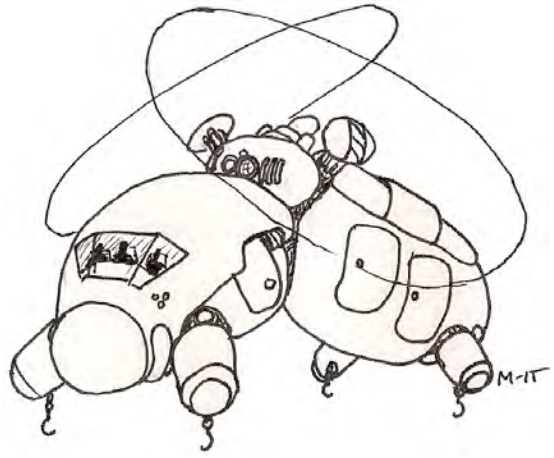
Belly 60% chance of critical
1-5 Gas bag rupture 20 Km/h decent
6-10 Cargo damaged

Cockpit 30% chance of critical
1-8 Crew Hit 1D10 crew killed.
9-10 Controls damaged 60% Impairment to pilot

Engine 30% chance of critical
1-5 Engine damage, energy cut in half, all systems at half power.
5-10 Fuel explosion! 100 points 10m blast radius

Fin 30% chance of critical
1-10 Rudder Damage 40% Impairment to pilot

ASO Vehicle



Type Helicopter
Model J3N1 "Big Jenny"

The J3N1 is a multifunction heavy lift helicopter. It is a twin counter rotating rotor design that uses cross thrust to stabilize heavy loads. Although the blades counter rotate they can vary their rate of rotation to generate more or less thrust. On board computers track the blades in real time and ensure that they do not collide. In addition to this the J3N1 had four modular cargo pods that allow it to modify its primary heavy lift function into hostile extractions and as a fuel transport. The Heavy Lift functionality comes from four on board cranes that extend from the four corners of the helicopter.

Overall height	8.3m
Overall width	29.4m
Overall length	36m
Dry Mass	29,000 Kg
Full Mass	41,500 Kg

Power plant type: Internal Combustion.

Movement
Flying Top Speed 300 Km/h

Total fuel capacity: 3 Hours
Fuel type: Gasoline

Armor Rating: 4
Hit Points: 110
Crew: 3 (2 Pilots 1 Crane Operator)
Passengers: 10
Piloting Modifier:-20
Cost: $25,000,000

Sensors: +5 to Int
Range Class: D

Cargo Capacity: 12,000 Kg

Fire Arcs

1	2	3
8	●	4
7	6	5

Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-4	1-4	1-4	1-4	Body
5-6	5-7	5-6	5	Cockpit
7-9	8-10	7-9	6-7	Rotor
10	-	10	8-10	Cargo pod

Arc 5	Arc 6	Arc 7	Arc 8	Hit Location
1-2	1	1-2	1-4	Body
-	-	-	5	Cockpit
3-5	2-4	3-5	6-7	Rotor
6-10	5-10	6-10	8-10	Cargo pod

Critical hits 1d10
Body 30% chance of critical
1-2 Cargo hook destroyed

3-6 Engine damage 40 Km/h decent
7-8 Fuel explosion! 100 points 10m blast radius
9-10 Sensors destroyed

Cockpit 30% chance of critical
1-4 Controls damaged -30 to pilot
6-10 Crew killed

Rotor 50% chance of critical
1-10 Rotor destroyed

Cargo pod 30% chance of critical
1-2 Cargo in left front pod destroyed
3-4 Cargo in right front pod destroyed
5-7 Cargo in left back pod destroyed
8-10 Cargo in right back pod destroyed

25mm Machine Gun Pod

Reduces the total cargo capacity by 3000 Kg but adds a gunner station with a 25mm Machine Gun.

	PB	S	Med	L	Ex
Damage	80	80	70	65	40

Range Class: C
Payload: 300 rounds
Rate of Fire: 30

Troop Pod

Reduces the total cargo capacity by 3000 Kg but adds the capacity to carry troops and give light fire support.

Passengers = 12

Machine Gun

	PB	S	Med	L	Ex
Damage	20	20	18	16	10

Range Class: C
Payload: 600
Rate of Fire: 60

Machine Gun Grenade Launcher

	PB	S	Med	L	Ex
Damage	50	40	20	10	2

Range Class: C
Blast Range Class: A
Payload: 100
Rate of Fire: 8

Fuel Pod

Reduces the total cargo capacity by 3000 Kg but adds large fuel tanks that can be used to refuel other vehicles. Because the fuel may be of different types the J3N1 does not have the ability to draw fuel from these pods directly. A Repair Machinery roll and 2 manhours of work can make the J3N1 use the tank to extend it's range.

Liters of fuel:

Missile Pod

Reduces the total cargo capacity by 3000 Kg but adds a powerful pilot operated missile launcher.

Missile Rack

	PB	S	Med	L	Ex
Damage	1000	500	500	250	50

Blast Range Class: B
Range Class C
Payload 50
Rate of fire 1-50
Fire Arcs 4 or 8

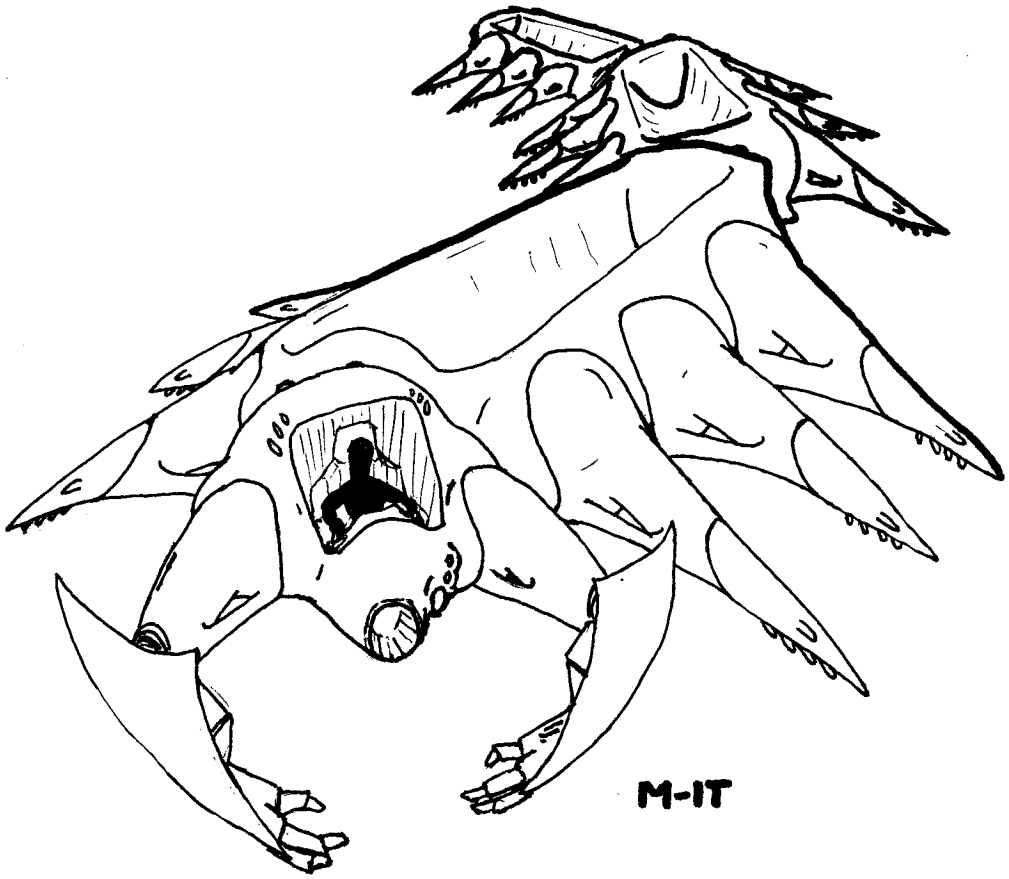
C-Suit

Type C-Suit
Model Builder 562869

This Chezbah C-Suit is a mining and emergency rescue vehicle. It is used for mining ore a the core and is used to rescue workers that have been trapped in fallen rubble. Many Chezbah cities use these when they are being rebuilt and one or more will remain in the city afterward but often fall into disrepair.

The C-Suit walks on it's many legs to distribute it's mass on soft ground. Even when fully loaded it can travel well on loose ground and rubble without disturbing it, an important function for rescue operations.

Overall height	2.6 m
Overall width	6.2 m
Overall length	24 m
Dry Mass	8,919Kg
Full Mass	27,269 Kg



Power plant type: Electrical

Movement
Top Speed 40 Km/h
Total fuel capacity: 12 Hours
Fuel type: Batteries

Armor Rating: 70
Hit Points: 3000
Crew: 1
Passengers: 100 (in cargo beds)
Piloting Modifier: 80% Impairment
Cost: 10,000,000

Particle Beam

Used for cutting into stone or CCC. This tool is useful for mining and rescue.

	PB	S	Med	L	Ex
Damage	10,000	9,000	2,000	1,000	100

Range Class A
Rate of fire 1
Fire Arc 1-3

Sonic Hammer

Used to shake apart tightly packed stones when mining. This tool is too unpredictable for rescue operations.

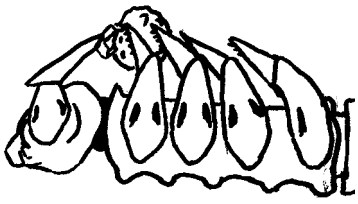
	PB	S	Med	L	Ex
Damage	500	500	200	100	50

Range Class A
Rate of fire 1
Fire Arc 1-3

Sensors: +5 to skill
Range Class: B

Cargo Capacity: 18,000 Kg

Manhour Rating
Earthmoving 120



Shield Information
Shields: 1
active at 200 hp
No. of shields: 1 (Arc 1 only)

Fire Arcs

1	2	3
8	●	4
7	6	5

Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-4	1-6	1-4	1-2	Head
5	7-8	5	3	Arms
6-8	9	6-8	4-7	Legs
9-10	10	9-10	8-10	Bin

Arc 5	Arc 6	Arc 7	Arc 8	Hit Location
-	-	-	1-2	Head
1	1	1	3	Arms
2-7	2-6	2-7	4-7	Legs
9-10	7-10	8-10	8-10	Bin

Critical hits 1d10

Head chance of critical 40%
1-3 Cockpit, pilot killed vehicle disabled.
4-7 Particle Beam destroyed.
8-10 Sonic Hammer destroyed.

Arms chance of critical 40%
1-10 Linkages damaged, arm inoperable.

Legs chance of critical 40%
1-4 Linkages damaged speed down 10%
5-10 Batteries destroyed speed down 10%

Bin chance of critical 20%
1-8 Cargo damaged, cargo takes 50% of damage to vehicle.
9 Batteries damaged, sensors and equipment at 50% power, does not effect movement.
10 Bin Coupler destroyed, one of the bins is disconnected, cargo capacity down 6000 Kg

C-Suit

Type C-Suit
Model Hosent Walking Robot

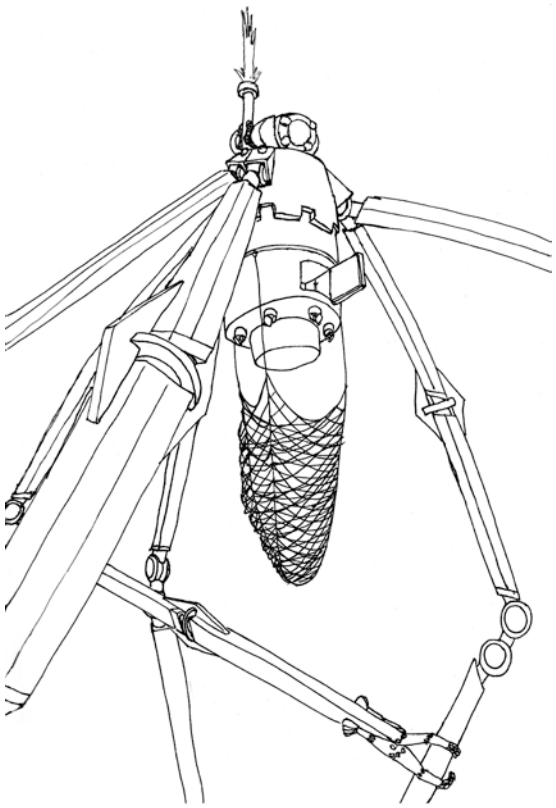
These C-Suits are made from a Hosent robot removed from it's housing and powered electrically by harvesting ultracapacitors from the power management systems in the Power Hex nearby.

The Hosent robot is reprogrammed and controls are attached to it's computer. Then it extends it's arms down to the ground and it's connection to the housing is cut. As this severs the electrical connection to the robot, an extension cord must be made to reconnect it to power. This cord is often harvested from another hex and is up to ten kilometers long. Once powered, the robot then lowers itself to the ground and one of the walls of the Hosent's housing is disassembled allowing the robot to exit. Next the Hosent robot's arms must be reconfigured and reenforced to hold up the mass of it's body. Once this is done, it is a Hosent Walking Robot but it is only powered by it's extension cord. In some industry tribes it is left this way as it does not leave a specified area. However if the Walking Robot is to be used as a vehicle, it is now piloted to the Power Hex and a battery of utracapacitors is removed and attached to the power input of the robot. Now the vehicle is able to travel short distances.

The Hosent Walking Robot is one of the oldest C-Suits in the history of The Artifact. When they started to be built is not entirely clear but it was the Scimrahn that make use of them most often today. In fact only a few centuries ago the Scimrahn used them as general purpose vehicles. It is said that the Hunter E-Suit was specifically designed to hunt down and destroy Hosent Walking Robots.

These vehicles are durable but their legs are not well suited to lifting the mass of the body. Because of this, the loss of a single leg can either topple or immobilize the vehicle.

Overall height	141.2 m
Overall width	35.4 m
Overall length	35.4 m
Dry Mass	150,230 Kg
Full Mass	152,466 Kg



Power plant type: Electrical

Movement
Walking Top Speed: 25 Km/h
Total fuel capacity: 1.5 Hours
Fuel type: Electrical

Armor Rating: 40
Hit Points: 3,500
Crew: 1
Passengers: 12
Piloting Modifier:-60
Cost: 500,000

Sensors: Sonar
Range Class: B

Manhour Rating

Earthmoving 40
Heavy Lifting 20

Lifting Capacity: Kg

Fire Arcs

1	2	3
8	●	4
7	6	5

Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-5	1-5	1-5	1-5	Leg
6-8	6-8	6-8	6-8	Body
9	9	9	-	Cockpit
10	10	10	10	Power Supply

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-5	1-5	1-5	1-5	Leg
6-8	6-8	6-8	6-8	Body
-	-	-	-	Cockpit
9-10	9-10	9-10	9-10	Power Supply

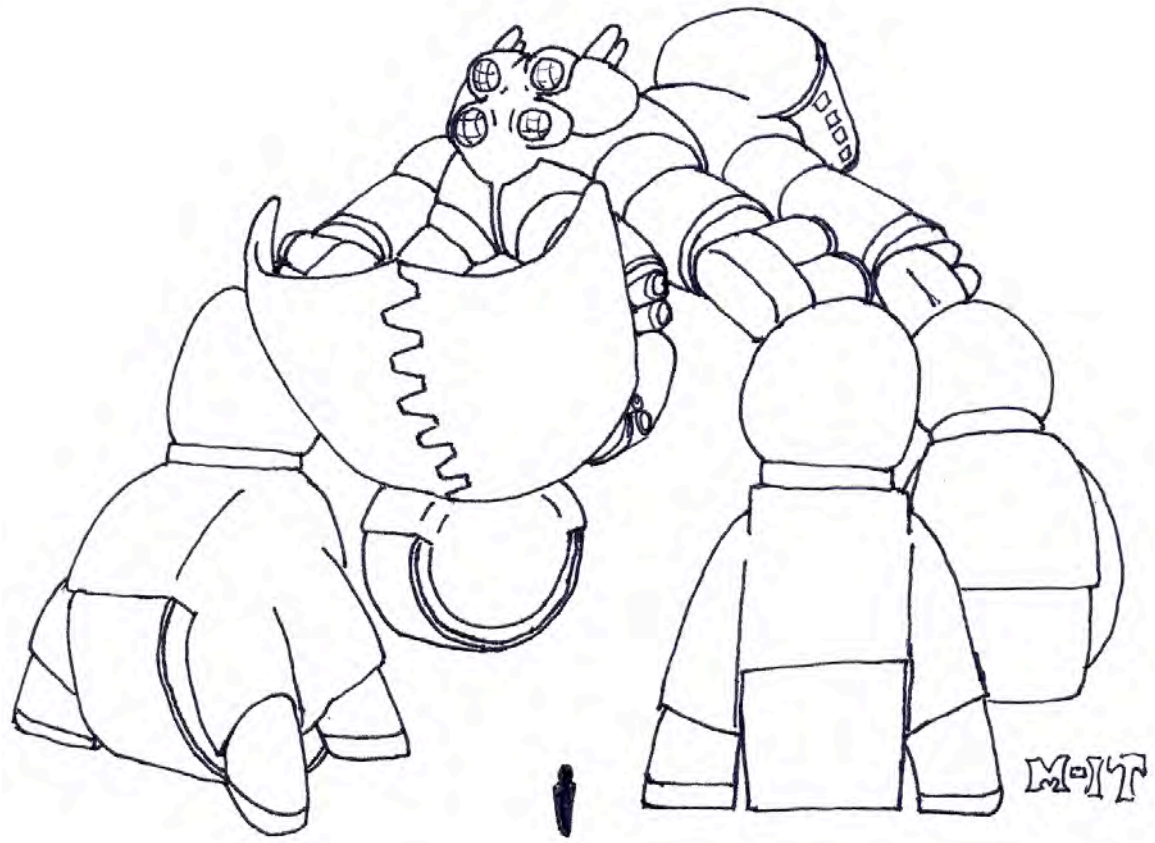
Critical hits 1d10
Body chance of critical 20%
Power Supply damaged
Hydraulic system damaged
Brain destroyed

Arc Furnace/Cockpit chance of critical 20%
Controls destroyed
Cockpit hit pilots killed

Legs chance of critical 50%
1-6 Linkages vehicle immobilized
7-10 Bracing damaged vehicle collapse

Power Supply chance of critical 40%
1-10 Power Supply damaged 1/4th of all power lost

C-Suit



Type C-Suit
Model Kennis Thuphe

The Kennis Thuphe is the largest C-Suit in production. There are several other heavy construction vehicles that the Kelrath produce but they are not considered C-Suits. Because it's size and power it is highly prized by the Scimrahn when building rubble pile style safe houses.

The name of the C-Suit means "Big Kennis", Kennis being the oracle called "the master builder". This enormous E-Suit is used for heavy lifting and earthmoving. Most large Kelrath cities have at least one and mining communities will often have several.

A small number of these have become available to Earth forces.

The Kennis Thuphe uses a hybrid drive system. When moving any distances, the C-Suit uses its wheels to move. When moving over heavily broken ground it walks by moving one leg at a time. When digging or lifting it's eight toes stabilize the front two legs.

Overall height	20.3 m
Overall width	28.9 m
Overall length	35.3 m
Dry Mass	390,900 Kg
Full Mass	681,056 Kg

Power plant type: Internal Combustion

Movement

Driving Top Speed 10 Km/h
Walking Top Speed: 2 Km/h
Total fuel capacity: 12 Hours 6883 L
Fuel type: Liquid Carbon

Armor Rating: 90
Hit Points: 17,000
Crew: 4
Passengers: 2
Piloting Modifier: 80% Impairment
Cost: 3,200,000,000

Sensors:	Ground penetrating radar in toes
Range Class:	B

Manhour Rating

Earthmoving 400
Heavy Lifting 1500

Lifting Capacity: 280,000 Kg

Fire Arcs

1	2	3
8	●	4
7	6	5

Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-3	1-4	1-3	1-2	Shovel
4-5	5-6	4-5	3-4	Wheels
6-7	7-8	6-7	5-7	Legs
8-9	9-1-	8-9	8-9	Body
10	-	10	10	Cockpit

Arc 5	Arc 6	Arc 7	Arc 8	Hit Location
1	-	1	1-2	Shovel
2-3	1-2	2-3	3-4	Wheels
4-5	3-4	4-5	5-7	Legs
6-8	5-7	6-8	8-9	Body
9-10	8-10	9-10	10	Cockpit

Critical hits 1d10
Shovel chance of critical 20%
1-10 Linkages

Wheels chance of critical 20%
1-4 Engine Damage, all systems at half power.
5-10 Fuel Explosion! 800 points 10m blast radius

Legs chance of critical 30%
1-7 Linkages, leg inoperable speed down 1/2
8-10 Stabilizing toes damaged, vehicle unable to lock in place for lifting

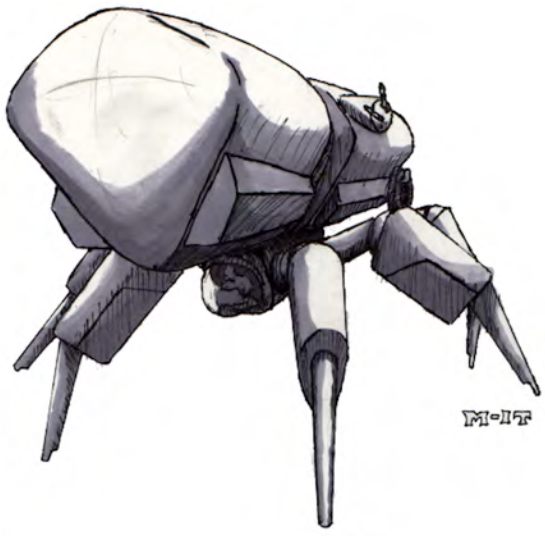
Body chance of critical 30%
1-6 Fuel Explosion! 800 points 10m blast radius
7-8 Floodlight destroyed
9-10 Computer damaged -40 to pilot

Cockpit chance of critical 30%
1-8 Crew killed
9-10 Gyroscope damaged -30 to pilot

Scimrahn Vehicle

Type Anti-Grav
Model Fuel Carrier

This is a variant of the Scimrahn Freighter that has a hull designed to carry liquid instead of dry cargo. These vehicles are very dangerous to pilot because of the huge quantity of fuel they carry.



Overall height	6.3 m
Overall width	3.1 m
Overall length	12.4 m
Dry Mass	5,493 Kg
Full Mass	15,200 Kg

Power plant type: Anti-Grav

Movement
Top Speed 80 Km/h
Total fuel capacity: 2 Months 1,050.6 L
Fuel type: Liquid Carbon

Armor Rating: 10
Hit Points: 1500
Crew: 2
Passengers: 2
Piloting Modifier:-20
Cost: 7,000,000

2 Turrets of 2 Lasers

	PB	S	Med	L	Ex
Damage	20	20	10	5	1

Range Class C
Rate of fire 1 each (4 total)
Fire Arcs T1-1,2,3 T2-1,3,4

ECCM: +5 to skill
Range Class: B
Sensors: +5 to skill
Range Class: C

Cargo Capacity: 9,707 Kg

Shield Information
Shields: 1 active at 100 hp
No. of shields: 2 (Arcs 1+3)

Fire Arcs

\ 1 /

4 ● 2

/ 3 \

Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	Hit Location
1-6	1-5	1-3	1-5	Body
7-8	6-8	4-5	-	R Legs
9-10	-	6-7	6-8	L Legs
-	9-10	8-10	9-10	AG Engine

Critical hits 1d10
Body 20% chance of critical
1-2 Cockpit, pilot killed
3 Laser Destroyed
4-10 Cargo damaged

Engine 35% chance of critical
1-4 Fuel Explosion! 800 points 10m blast radius
5-10 Engine damage, all systems at half power.

Leg 30% chance of critical
1-10 Linkages, Leg inoperable Top speed down 1/6

Scimrahn Vehicles

Type Anti-Grav
Model Rapid Attack
Transport

This light AG vehicle is used by the Scimrahn in guerilla actions against the Chezbah.

The R.A.T. as it is called by Earth forces (restor pid or fast strike in Scimrahn) is one of the smallest AG vehicles and the only one to have it's own defensive force field.

Overall Height 40 cm
Overall Width 86 cm
Overall Length 2.4 m
Full Mass 423 kg

Power plant type: Plasma Coil

Movement
top speed 120 Km/h
Total fuel capacity: 2 hours
Fuel type: Plasma

Armor Rating: 15
Hit Points: 50
Crew: 1
Passengers: 0
Piloting Modifier: 0

Cost: ¥57,000,000

Shields: 1 active at 200 hp

Shield information
No. of shields 1 (Arcs 1 or 3)

Fire Arcs

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Hit locations 1d10

Arc 1	Arc 2	Arc 3	Arc 4	
1-4	1-3	1	1-3	AG Eng
5-9	4-7	2-3	4-7	Body
10	8-10	4-10	8-10	Thrusters

Critical hits 1d10
Body 60% chance of critical
1-6 Pilot hit
7-8 Shield Generator Destroyed
9-10 Controls Destroyed 80% Impairment to Piloting skill

Thrusters 40% chance of critical
1-4 Fuel Explosion! 100 points 10m blast radius

5-10 Thruster damage, cut flight speed in half.

AG Eng 20% Chance of critical

1-6 Minor damage slow descent to the ground. RAT inoperative!
7 - 10 Major damage, crash landing!

Scimrahn Vehicles

Type Armor
Model Powered Armor

A light weapon system that is used as a quick strike platform. Powered Armor uses a plasma coil to power the system. While not a vehicle in itself, the powered armor does have shield generators and weaponry that make it nearly a match against an E-suit at close range. The prohibitive cost to build the suits prevents their widespread use. In addition, the armor is very heavy and the user must support the bulky armor slowing movement and tiring the user.

Overall Height	Varies
Overall Width	80 cm
Overall Length	89.5 cm
Full Mass	52 kg
Power plant type:	Plasma Coil
Total fuel capacity:	4 hours
Armor Rating:	100
Hit Points:	200
Stress per hour:	
Physical 20	
Functional 10	
Mental 2	
Cost:	¥24,000,000

Particle Spear

The particle spear is powered through a conduit in the arm.

	PB	S	Med	L	Ex
Damage	350	300	100	20	2

Range Class: B
Rate of Fire: 1
Mass: 5.8 Kg

Shields: 1 active at 300 hp

Appendix

Berm Calculations

Manhours for one meter long

3 for first meter of hight x 3 for the second meter x 3 for third meter x 3 for fourth meter x 3 for the fourth meter etc.

Multiply the last meter value by 3 for each additional meter in hight.

Hit Points for one meter long

500 for first meter of hight x 3 for the second meter x 3 for third meter x 3 for fourth meter x 3 for the fourth meter etc.

Multiply the last meter value by 3 for each additional meter in hight.

Manhour

The work that one person can accomplish in one hour.

Speed Calculations Light Vehicle

√ Energy to Movement x 60

Speed Calculations Medium Vehicle

√ Energy to Movement x 50

Speed Calculations Heavy Vehicle

√ Energy to Movement x 30

Speed Calculations Super Heavy Vehicle

√ Energy to Movement x 10

Vehicle Type:
Model:

Overall height:
Overall Width:
Overall Length:
Dry Mass:
Full Mass:
Vehicle Rating:

Power plant type:
Power plant energy:
Power plant mass:
Fuel Type:
Fuel capacity:
Fuel mass:

Material Collection Time:
Materials To Parts:
Assembly Time:

Design

Hull Data
Hull Material:
Hull Thickness:
Armor Rating:
Hull Multiplier:
Hit Points:

Hull Mass:

Piloting Modifier
Equipment Piloting Modifier:

Control Systems

Control Piloting Modifier:

Piloting Modifier:

Weapons

	PB	S	Med	L	Ex
Damage:					
Energy:					
Mass:					
Range Class:					
ROF:					
Payload:					

	PB	S	Med	L	Ex
Damage:					
Energy:					
Mass:					
Range Class:					
ROF:					
Payload:					

	PB	S	Med	L	Ex
Damage:					
Energy:					
Mass:					
Range Class:					
ROF:					
Payload:					

Total Energy:
Total Mass:

Arms
of Arms:
Str:
Punch Damage:
Dex CDF:
Length:
Mass:
Energy:

Turrets
Item:
Fire Arcs:
Item Mass:
Turret Mass:

Item:
Fire Arcs:
Item Mass:
Turret Mass:

Sensors
Skill Modifier:
Range Class:
Energy:
Mass:

ECM
Skill Modifier:
Range Class:
Energy:
Mass:

ECCM
Skill Modifier:
Range Class:
Energy:
Mass:

Total Energy:
Total Mass:

Shields
Fire Arcs Covered

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No. of Shields:
HP:
Energy:
Mass:
Total Piloting Modifier:

Drive system type:
Drive system mass:
Energy to Movement:
Max Vehicle Mass:
Top Speed:

Drive system type:
Drive system mass:
Energy to Movement:
Max Vehicle Mass:
Top Speed:

Equipment

Item	Mass	Energy

Total Mass:
Total Energy:

Performance Penalties
Number of Penalties:

Critical Hits

Arc 1	Arc 2	Arc 3	Arc 4	Critical Hit Location

Critical Hit Locations

Location		Crit

Notes

Vehicle Type:
Model:

Overall height:
Overall Width:
Overall Length:
Dry Mass:
Full Mass:
Vehicle Rating:

Power plant type:
Power plant energy:
Power plant mass:
Fuel Type:
Fuel capacity:
Fuel mass:

Material Collection Time:
Materials To Parts:
Assembly Time:

Hull Data
Hull Material:
Hull Thickness:
Armor Rating:
Hull Multiplier:
Hit Points:

Hull Mass:

Piloting Modifier
Equipment Piloting Modifier:

Control Systems

Control Piloting Modifier:

Piloting Modifier:

Weapons

	PB	S	Med	L	Ex
Damage:					
Energy:					
Mass:					
Range Class:					
ROF:					
Payload:					

	PB	S	Med	L	Ex
Damage:					
Energy:					
Mass:					
Range Class:					
ROF:					
Payload:					

	PB	S	Med	L	Ex
Damage:					
Energy:					
Mass:					
Range Class:					
ROF:					
Payload:					

Total Energy:
Total Mass:

Arms
of Arms:
Str:
Punch Damage:
Dex CDF:
Length:
Mass:
Energy:

Turrets
Item:
Fire Arcs:
Item Mass:
Turret Mass:

Item:
Fire Arcs:
Item Mass:
Turret Mass:

Sensors
Skill Modifier:
Range Class:
Energy:
Mass:

ECM
Skill Modifier:
Range Class:
Energy:
Mass:

ECCM
Skill Modifier:
Range Class:
Energy:
Mass:

Total Energy:
Total Mass:

Shields
No. of Shields:
HP:
Energy:
Mass:
Total Piloting Modifier:

Fire Arcs Covered

Drive system type:
Drive system mass:
Energy to Movement:
Max Vehicle Mass:
Top Speed:

Drive system type:
Drive system mass:
Energy to Movement:
Max Vehicle Mass:
Top Speed:

Design

Equipment

Item	Mass	Energy

Total Mass:
Total Energy:

Performance Penalties
Number of Penalties:

Critical Hits

Arc 1	Arc 2	Arc 3	Arc 4	Critical Hit Location

Arc 5	Arc 6	Arc 7	Arc 8	Critical Hit Location

Critical Hit Locations

Location		Crit

Notes