STRIKER

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Rules for 15mm Traveller Miniatures

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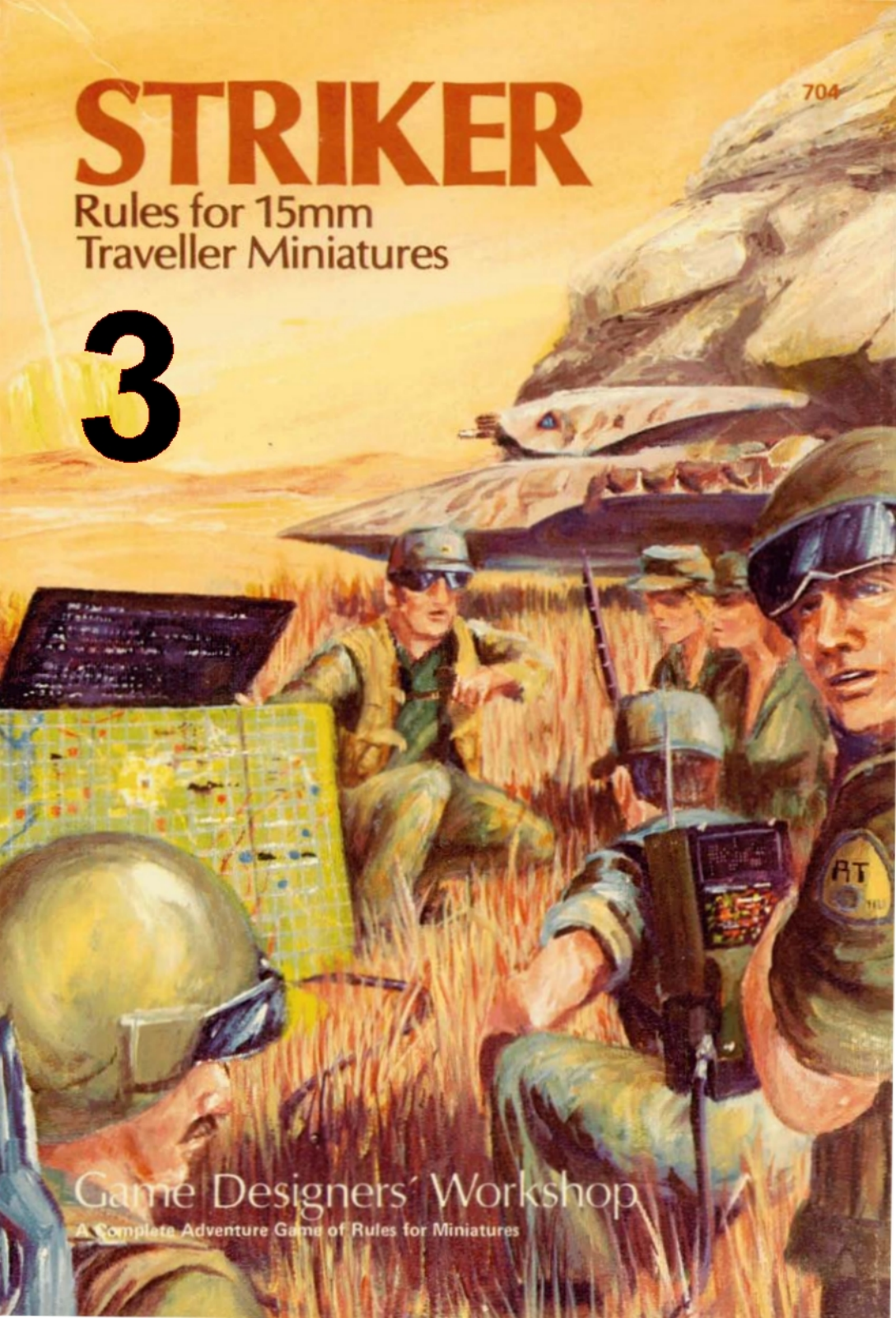

Game Designers' Workshop

A Complete Adventure Game of Rules for Miniatures

STRIKER

Rules for 15mm Traveller Miniatures

A Complete Adventure Game of Rules for Miniatures from Game Designers' Workshop

The Universe of *Traveller* – Communication is limited to the speed of courier ships. Remote central governments exercise only limited control over the affairs of their frontier territories. Megacorporations struggle for control of sparsely settled mineral-rich worlds. And everywhere, there are mercenaries for hire to settle disputes.

Striker fills an important place in the *Traveller* universe – rules for ground combat with 15mm figures and vehicles.

The basic combat system used in **Striker** is based on the popular *Azhanti High Lightning* game system. The movement system is simplified for use with larger forces and a ground scale of 1"=25 meters. The basic rules are written with the beginning miniatures player in mind and can easily be used as a combat resolution system for existing *Traveller* games. All weapons and vehicles covered in *Traveller* and *Mercenary* (Book 4) are rated for use in the game.

The true value of **Striker**, however, lies with the advanced rules. A complete system for designing armored vehicles and aircraft at different tech levels is presented, along with air-to-air and air-to-ground combat rules. The package contains everything a *Traveller* adventurer needs for campaigning with miniatures.

This box contains the following game components:

Book 1 – Basic Rules
Book 2 – Equipment
Book 3 – Advanced Rules
2 Dice

15mm figures and vehicles are available separately

Design: Frank Chadwick
Development: John Harshman
Art Director: Paul R. Banner

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Rule Book 3
Equipment

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Rules for 15mm
Traveller Miniatures

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Striker is a set of 15mm miniatures rules designed for use with **Traveller**, but capable of being played separately. It is not necessary to own **Traveller** in order to play *Striker*.

CREDITS

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STRIKER
Book 3, Equipment

2 3 4 5 6 7 8 9 10 11 12 13 14 15

Although this game (as represented in Books 1, 2, and 3) envisions a referee or umpire to supervise play and resolve questions, the publisher is prepared to answer questions or inquiries on *Striker* provided a stamped, self-addressed envelope accompanies the request.

Traveller is GDW's trademark for its science fiction role-playing game materials.

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Introduction to Book 3

The third book of *Striker* covers the ordnance, vehicles, and other equipment needed to play the game. The book is divided into 3 sections: design sequences, sample vehicles, and equipment lists. The design sequences allow construction of a wide variety of vehicles and weapons to specification. For easy reference during the design process, the various tables used in the design sequences have been placed in a separate booklet. The samples are a number of ready to use vehicles, complete with weapons. The equipment lists cover weapons, sensors, and other items that may be bought "off-the-rack".

Players should realize that a field commander very rarely has a chance to design his own vehicles and heavy weapons before combat, and thus the design rules are not intended to give players this option. Instead, they are included as an aid to the referee in providing the widest possible variety of vehicles and weapons to add realism to the myriad environments of a science fiction universe. Realistically, it is a tremendous burden on the referee to expect him to design all the equipment. Instead, referees should delegate players to design several vehicles and weapons with specified parameters (tech level, price, etc.) and then file them away for future use.

A note on weapons: all designed weapons weighing 1 ton or more are heavy crew served weapons; all others are light crew served weapons. Tac missile package launchers under 30 kg total weight are infantry weapons.

Overview of Technology

A science fiction game must make assumptions about the nature of future technological developments. In addition to progressive refinements of current weapons and equipment, there are several areas of postulated advanced technology deserving of comment. In *Striker*, the attempt is made to base technology on principles that are at least logically explainable (even if far beyond present science), avoiding the introduction of mysterious "zapotron rays".

The major advance in power generation postulated is the development of a working fusion reactor. The most obvious effects are immense increases in vehicle weights and the feasibility of portable energy weapons.

Armor development is projected on several lines. Composite laminates are similar to the armor currently being produced for the U.S. Abrams tank, among others. Crystaliron is iron grown with perfect crystal structure and carefully controlled quantities of impurities for maximum toughness and hardness. Superdense armor has had its electron structure partially collapsed (as occurs to a much greater degree in white dwarf stars), increasing its density and strength. Bonded superdense armor is the same material using advanced technology to channel a small power input into the armor's internal electronic bonds, increasing its strength even more.

Damper technology is one of the two major postulated scientific breakthroughs. It assumes that a deeper understanding of the strong nuclear force will allow us to manipulate it. Nuclear damper units create an interference field in the force. Point defense dampers focus a negative node on incoming nuclear warheads, lowering the potential barriers around the nucleus; the warhead will shed neutrons at very low energies and be rendered harmless after a very short exposure. Damper boxes, on

the other hand, focus a positive node on their contents, raising the potential barrier and preventing nuclear decay.

Anti-gravity is the second major breakthrough. The postulated technology produces both neutralization of weight and lateral thrust.

Plasma and fusion guns use a laser to heat hydrogen to a plasma state inside a magnetic bottle. When the plasma reaches maximum energy, an aperture is opened in the bottle, releasing the plasma as a high-temperature, high-velocity bolt. Fusion guns, through superior magnetic containment, are able to contain the fuel until a fusion reaction has begun, thus producing a more powerful bolt.

Mass drivers (and the smaller versions called gauss guns) are linear accelerators which use electromagnets to propel a metal projectile. Only engineering details and the high required power input preclude their use today.

Meson guns and communicators make use of the properties of a subatomic particle called the pi neutral meson. Mesons, like neutrinos, do not interact significantly with other particles, and matter is therefore transparent to them. However, mesons decay in a short time into other particles which do interact, and which possess high energy. Mesons are created by the collision of an electron and a positron, in the converging beams from two particle accelerators. In a meson gun, the beam travels to the target, where the mesons decay, causing a large energy release. Range is set by varying the velocity of the mesons. In the communicator, a much smaller beam travels from the transmitter to the receiver, where a small meson screen (again, a development arising from an understanding of the strong nuclear force) causes the particles to decay; the beam carries a signal by amplitude modulation.

Design Sequence 1: Vehicles

All grav vehicles, wheeled and tracked ground vehicles, and ACVs are designed using the procedure below. Vehicles are produced by adding components to a basic structure. The vehicle's volume is determined by its dimensions, and components may be added until the volume is filled. Components also have a weight and price; the vehicle's weight and price are determined by adding together the costs of its components. Steps A through E should be followed in order; the remainder of the steps may be done in any order. To provide an example of vehicle construction, the design of a tech level 6 tank (a World War II Panther) is given.

A. Chassis Dimensions: The chassis is the main body of the vehicle, which houses its power plant, suspension, crew, and so on. Its height, width, and length must all be defined. The minimum height is 1 meter, and the length must be greater than the width but not more than 2.5 times the width. There are no other restrictions.

The chassis volume is determined by multiplying together the height, width, and length; the volume is in cubic meters (m^3).

Example: The tank has a height of 1.3 meters, width of 3.5 meters, and length of 7 meters; the volume is 31.85 m^3.

B. Suspension: Grav vehicles do not have suspensions. Each of the other types of vehicles has a different suspension. All ACV suspensions occupy 10% of the chassis volume. Wheeled and tracked suspensions occupy a volume with length equal to the length of the chassis and height of 1 meter. Width is determined by the designer; the width of a wheeled suspension must be at least 5% of the vehicle width, and the width of a tracked suspension must be at least 10% of the vehicle width. The width of the suspension affects ground pressure, as explained later. All suspensions weigh

1 ton per m^3. ACV suspensions cost Cr4000 per m^3; wheeled suspensions cost Cr1250 per m^3; tracked suspensions cost Cr2500 per m^3.

Subtract the suspension volume from the chassis volume before proceeding.

Example: The tank has 40% of its chassis width (1.4 meters) allocated to a tracked suspension. The suspension volume is thus 7 meters (the chassis length) times 1 meter times 1.4 meters, or 9.8 m^3. Remaining chassis volume is 22.05 m^3. The suspension weighs 9.8 tons and costs Cr24,500.

C. Chassis Configuration: The chassis has six faces: front, rear, deck, belly, left side, and right side. The deck and belly are assumed to be horizontal surfaces. The other four surfaces may be given vertical, moderate, or radical slope. The two side faces must have the same slope. Each face with moderate slope reduces chassis volume (after suspension volume is subtracted) by 10%; each face with radical slope reduces chassis volume by 20%. After determining the slope of all faces, subtract the indicated percentage from chassis volume; the result is the chassis usable space.

Example: The tank has a radical slope on its front, moderate slope on its rear, and vertical sides. Its usable space is 22.05 m^3 minus 30% (6.615 m^3), or 15.435 m^3.

D. Turret Dimensions: A vehicle may have a turret if desired, although it is not necessary to have one. The turret has no minimum dimensions, but its height may not be greater than the chassis height, its width may not be greater than the chassis width, and its length may not be greater than 70% of the chassis length. Determine turret volume by multiplying the three dimensions.

Example: The tank's turret is 2.5 meters wide, 2.5 meters long, and 1.2 meters high. Its volume is 7.5 m^3.

E. Turret Configuration: The turret has four faces: front, rear, left side, and right side. Each side may be sloped in the same manner as the chassis. After determining slope, subtract from turret volume to find usable turret space.

Example: The tank has a vertical front, and moderate slope for the sides and rear. The total reduction in volume is 30% (2.25 m^3) leaving 5.25 m^3 of usable space.

F. Weapons: Any weapons may be mounted on vehicles, in a variety of mounts. A weapon station, fire control, stabilization, or an autoloader may also be required.

1. Mounts: Each weapon must be in a mount, and the mount's location must be specified. There are 6 types of mounts: chassis, turret, cupola, pintel, remote, and open. In addition, tac missiles may be mounted outside the vehicle on launch rails.

Weapons in chassis mounts emerge from one of the six faces. Weapons in turret mounts must also be specified. A cupola or pintel mount is either on top of the turret or, if there is no turret, on the chassis deck. Weapons in open mounts are on the chassis deck. Weapons in remote mounts are on any face of the turret or chassis.

Cupolas and pintel mounts have a volume of 0.2 m^3, which is not taken from available vehicle space. Remote mounts are unmanned turrets; the total volumes of remote mounts and turrets on a vehicle may not be more than 70% of the chassis volume. Only 10% of the volume of an open mount weapon is taken from chassis space. The volume of a launch rail is not taken from available vehicle space.

Example: The tank has a 7.5 cm high velocity CPR gun and a machinegun in the turret, a machinegun in the chassis front, and a pintel mount machinegun on top of the turret. The 7.5 cm gun weighs .6 tons and takes up .6 m^3 in the turret. Each machinegun weighs 5.5 kg and takes up .0055 m^3 (although the pintel mount machinegun does not take up any of the vehicle's space). Total weight is .6165

tons, and total price is Cr49,600.

2. Weapon Stations: There must be one crew station for every gunner. A gunner may fire more than one weapon, but he may only fire weapons controlled from his station. One station may control all weapons mounted on the same side of the chassis or in any part of a turret. One station is required for each cupola or pintel mount. One station may control any number of remote mounts. The station must be in the same part of the vehicle as the weapons controlled, exept that a turret-mounted weapon may be controlled from the chassis, and remote-mounted weapons may be controlled from anywhere. The crew station for a cupola or pintel mount is located below the weapon, in the chassis or turret.

Example: The tank has three weapon stations, one in the chassis for the 7.5 cm gun and turret machinegun, one in the turret for the pintel machinegun, and one in the chassis for the chassis machinegun.

3. Fire Control: Fire control must be provided for each weapon station (not each weapon). Weapon stations equipped only with infantry weapons or tac missiles do not require fire control equipment. A weapon station may have direct fire control equipment, indirect fire control equipment, point defense fire control equipment, or a combination of these. The different types of fire control equipment are listed in the fire control sequence. Half the volume of the fire control is inside the weapon station, and the other half is in the weapon mount.

Example: The only station requiring fire control is the one for the turret weapons. Tech level 6 direct fire control equipment weighs 10 kg, displaces .01 m^3, and costs Cr1000. The equipment uses .005 m^3 in the turret and .005 m^3 in the chassis.

4. Weapon Stabilization: Stabilization gear enables a vehicle to fire its weapons while moving; the stabilization table lists the characteristics of stabilization gear at various tech levels. Stabilization gear stabilizes all weapons in a single mount. The gear is located on the mount; however, the stabilization gear for an open mount is located in the chassis. The stabilization table expresses the volume of the gear as a percentage of the weight of the weapons being stabilized; the minimum volume is that for one ton of weapons, even if the weapons weigh much less than a ton. Stabilization gear weighs 1 ton per m^3.

Example: Only the turret-mounted weapons are stabilized. Since total weapon weight is less than a ton, the total volume of the gear is .05 m^3; weight is .05 tons, and price is Cr1000.

5. Autoloader: CPR guns require one or more crewmen as loaders in addition to the gunner. All the weapon's loaders may be replaced by an autoloader; weapons in remote mounts must have autoloaders. An autoloader's volume is equal to 30 rounds of the weapon's ammunition. Half the autoloader's volume is in the weapon mount and half is in the part of the vehicle in which the ammunition is stored (ammunition may be stored anywhere). Autoloaders are available at tech level 7+; they weigh 1 ton and cost Cr10,000 per m^3.

Example: The tank, being a tech level 6 design, may not have an autoloader. A tech level 7 tank with the same 7.5 cm gun could have an autoloader with a volume of .36 m^3, a weight of .36 tons, and a cost of Cr3600.

G. Crew: Crew may be either seated or standing. All loaders are standing. If the vehicle has a turret, cupola, or pintel mount, the vehicle commander must be standing. Any cupola or pintel mount gunner must be standing. All other crew are seated. A vehicle crew must include a driver, one gunner for each weapon station,

and as many loaders as are required for its weapons.

The amount of space required for a crew member is dependent on tech level, as most crew functions become easier to perform and crew controls become more compact at higher tech levels. The crew space table lists the space requirements at the various tech levels. Crew stationed in the turret occupy 1 m^3 of the turret's space; the remainder of their space is taken up in the chassis. The vehicle commander, any loaders for turret-mounted weapons, and gunners for cupola or pintel mounts on top of the turret are stationed in the turret. Each crew position, regardless of volume, weighs .2 tons (this includes the crewman's weight) and costs Cr100.

Example: The tank has a crew of five: a driver, chassis gunner, turret gunner, loader, and vehicle commander (who also fires the pintel mount machinegun). Each of the 3 seated crewmen takes up 1.5 m^3 in the chassis; each of the 2 standing crewmen (the commander and the loader) takes up 1 m^3 in the turret and an additional 1.5 m^3 in the chassis. Total weight is 1 ton and total cost is Cr500.

H. Power Plant: The power plant is installed in the chassis, and provides power to move the vehicle and to fire its energy-using weapons. It has an output in megawatts, which depends on its volume and tech level; see the power plant table.

Example: The tank has a .525 megawatt power plant; its volume is 2.1 m^3, its weight is 2.1 tons, and its price is Cr4200.

I. Transmission: Grav and air cushion vehicles do not require transmissions. Wheeled and tracked vehicles must have a transmission installed in the chassis. The transmission table lists the volumes and prices of transmissions for wheeled and tracked vehicles at the various tech levels. The volume is listed in m^3 per megawatt of power plant output; price is listed per m^3 of transmission installed. Weight is 1 ton per m^3.

Example: The tank's transmission has a volume equal to twice the power plant output, or 1.05 m^3. It weighs 1.05 tons and costs Cr1312.

J. Auxiliary Water Propulsion: Vehicles may have auxiliary water propulsion. Its volume is 5% of power plant volume; it weighs 1 ton and costs Cr1000 per m^3.

K. Grav Generators: A grav vehicle requires grav generators installed in its chassis. Each .02 m^3 of grav generators produces 1 ton of thrust and requires .1 megawatts of power from the power plant. They weigh 2 tons and cost Cr100,000 per m^3.

L. Avionics: Grav vehicles must have avionics installed in the chassis in order to be capable of fast NOE flight. The avionics table lists the characteristics of avionics at the various tech levels. Avionics equipment weighs .5 tons per m^3.

M. Fuel: Fuel is carried in liters; each liter of fuel occupies .001 m^3 in the chassis. The power plant table shows the liters of fuel required to run each megawatt of power plant capacity for an hour. The amount of fuel carried may vary, but a suggested minimum is enough to run the entire power plant at maximum output for 2 hours. Fuel for fusion power plants weighs .07 kilograms and costs Cr.035 per liter; fuel for other power plants weighs 1 kilogram and costs Cr.25 per liter.

Example: The tank carries 730 liters of fuel, enough to run the power plant at maximum output for 2.78 hours. The fuel weighs .73 tons and costs Cr183.

N. Chassis Armor: Each of the six faces of the chassis must be armored with at least .25 cm of armor (except that a vehicle may have a completely unarmored deck; if so, it is open-topped). The two side faces must have the same amount of armor. Calculate the total volume of armor on each face by multiplying the armor thickness (in cm) by the two dimensions of that face (in meters) and divide by 100.

The result is the volume of armor on that face in m^3. Add the volume of armor on all the faces together (remember that there are two side faces) to determine the total armor volume. The armor type table gives the weights and costs of armor at various tech levels.

Example: The tank has 8 cm of armor on the front, 4 cm on each side and the rear, 1.5 cm on the deck, and 3.5 cm on the belly. The front armor has a volume of 8 x 1.3 x 3.5 x .01, or .364 m^3. Each side is 4 x 1.3 x 7 x .01, or .364 m^3. The rear is 4 x 1.3 x 3.5 x .01 or .182 m^3. The belly is 3.5 x 7 x 3.5 x .01, or .8575 m^3. The total volume of chassis armor is 2.499 m^3; it weighs 19.992 tons and costs Cr3998.

O. Turret Armor: Only the front, sides, and rear of the turret are armored. The turret deck is assumed to have the same armor as the chassis deck, and no special allowance is made for it (the actual armor being equal to the armor removed from the chassis deck to make room for the turret). Calculate the total volume, weight, and cost of turret armor as in the previous step.

Example: The tank's turret has 11 cm of armor in front and 4.5 cm on the sides and rear. The turret front is 11 x 1.2 x 2.5 x .01, or .33 m^3. The sides and rear are 4.5 x 1.2 x 2.5 x .01, or .135 m^3 each. The total volume of turret armor is .735 m^3; it weighs 5.88 tons and costs Cr1176.

P. Obscuration Devices: Smoke and aerosol dischargers may be mounted on any part of a vehicle; their characteristics are listed on the obscuration device table.

Example: The tank has six smoke dischargers in the turret, for a total volume of .03 m^3, a weight of .03 tons, and a cost of Cr900.

Q. Laser Sensors: Laser sensors may be installed in any part of a vehicle. Their characteristics at various tech levels are listed on the laser sensor table.

R. Electronics: Any of the electronic equipment listed and described in the electronics section of this book may be installed in a vehicle.

Example: The tank has a 200-power radio in the turret. It has a volume of .02 m^3, weighs .01 tons, and costs Cr700.

S. Passengers: Each passenger requires a space in m^3 equal to the height of the chassis in meters, but never more than 2 m^3. If the vehicle is to be used for extended periods of time as a habitat as well as a means of transport, double the required volume. (This is necessary for large ATVs, scientific exploration vehicles, recreational vehicles, etc.) Each passenger space weighs .2 tons (including the weight of the passenger) and costs Cr50.

T. Environmental Control Equipment: The environmental control equipment table lists the characteristics of equipment at the various tech levels. The volume of sealed environment equipment is calculated separately for the turret and the chassis. Other equipment may be installed anywhere in the vehicle.

U. Ammunition Storage: Ammunition must be carried for any weapon which fires a projectile. The weapons tables indicate the weight of an individual round or of a clip or belt of rounds. The amount of ammunition carried may vary, but a suggested minimum is enough ammunition for 20 fire phases.

Example: The tank has ammunition storage facilities for 80 rounds of 7.5 cm ammunition and 4,000 rounds of machinegun ammunition. Each 7.5 cm round has a volume of .012 m^3, for a total of .96 m^3, and each 100-round belt of machinegun ammunition has a volume of .0025 m^3, for a total of .1 m^3 for all 40 belts. Total ammunition volume is 1.06 m^3, all of which is stored in the turret.

V. Cargo: Cargo space is designated in blocks of 1 m^3 each. Fractional amounts

of space are not usable.

W. Waste Space: All space remaining after all the vehicle's components have been put in is wasted.

Vehicle Rating: Once the vehicle is designed, its characteristics and capabilities must be determined and recorded.

A. Weight: Vehicle weight is determined by adding together the weights of all the components. The vehicle is assumed to be carrying a full load of ammunition and a full load of cargo, at 1 ton per m^3.

Example: The tank's component weights are totalled as follows: suspension, 9.8 tons; weapons, .6165 tons; fire control, .01 tons; stabilization, .05 tons; crew space, 1 ton; power plant, 2.1 tons; transmission, 1.05 tons; fuel, .73 tons; chassis armor, 19.92 tons; turret armor, 5.88 tons; obscuration, .03 tons; electronics, .01 tons; ammunition, 1.06 tons. Total weight is 42.2565 tons.

B. Flotation: Determine the total volume of the vehicle by adding together its suspension, usable chassis space, and usable turret space. If the total volume of the vehicle in m^3 is greater than its weight in tons, the vehicle will float. If its total volume is less than its weight, the vehicle will not float.

Example: The tank's usable chassis space is 15.435 m^3. Its usable turret space is 5.25 m^3. Its suspension volume is 9.8 m^3. Thus, the vehicle's total volume is 30.485 m^3, which is less than its weight of 42.2565 tons. The tank will not float.

C. Ground Pressure: Grav vehicles and ACVs have no ground pressure. The ground pressure of a tracked vehicle is determined by dividing its weight in tons by the volume of its suspension in m^3 (which is also its ground surface area in m^2). For wheeled vehicles, double this figure. Round down to the nearest whole number.

Example: The tank has a suspension volume of 9.8 m^3 and a weight of 42.2565 tons, which yields a ground pressure of 4 tons per m^2.

D. Power to Weight Ratio: Grav vehicles do not have a power to weight ratio. For other vehicles, divide the power plant output in megawatts by the vehicle weight in tons, multiply by 1000, and round down to the nearest whole number. If the vehicle has any weapons which draw energy from the power plant, it will have two power to weight ratios: one when the weapons are in use and one when they aren't.

Example: The tank, with a weight of 42.2565 tons and a power plant output of .525 megawatts, has a power to weight ratio of 12.

E. Road Speed: Road speed is a function of power to weight ratio, suspension type, weight, and tech level. The vehicle mobility table lists the road speed of tracked vehicles at tech level 5 for each power to weight ratio. The table also lists modifications to this value for increased tech level, light weight, and wheeled or air cushion suspension. Speed is listed in kilometers per hour.

Example: The tank's power to weight ratio of 12 results in a road speed, taken from the table, of 35 kph. Since the vehicle is built at one tech level higher than 5, 10 kph is added to this for a total road speed of 45 kph.

F. Cross-Country Speed: The cross-country speed of an air cushion vehicle is the same as its road speed. The cross-country speed of a wheeled or tracked vehicle is a percentage of its road speed which depends on its power to weight ratio and its ground pressure.

Example: Since the tank is tracked and has a power to weight ratio of 12, its cross-country speed is 50% of its road speed, or 22.5 kph. Its ground pressure is not

enough to reduce this.

G. Amphibious Speed: If the vehicle floats, it may have an amphibious speed. A tracked vehicle without an auxiliary water propulsion unit has an amphibious speed equal to .05 times its road speed. A wheeled vehicle without an auxiliary water propulsion unit has no amphibious speed. Any vehicle with an auxiliary water propulsion unit has an amphibious speed equal to .1 times its road speed.

H. Grav Vehicle Thrust: A grav vehicle generates one ton of thrust for each .02 m^3 of grav generators it has powered by .1 megawatts from the power plant. If a vehicle has energy-consuming weapons, it has two thrust values: one for when the weapons are firing and one for when they are not.

I. Grav Vehicle Maneuver Gs: A grav vehicle has Gs of acceleration equal to its thrust in tons divided by its weight, also in tons. One G is needed to keep the vehicle in the air (and if its thrust is less than one G, the vehicle cannot move); thrust in excess of one G is used for maneuver. Thus to find maneuver Gs, subtract one from the total G value.

J. Grav Vehicle Speeds: A grav vehicle has three speeds: maximum speed, cruising speed, and nap of the earth (NOE) speed. Its maximum speed is a function of its maneuver Gs, as listed on the grav vehicle speed table. Its cruising speed is 75% of its maximum speed, and its NOE speed is 25% of its maximum speed, but never more than is allowed by the vehicle's avionics. Speeds are given in kph.

K. Movement Rates: To determine game movement rates, in cm per turn, divide speeds (in km per hour) by 1.2.

L. Movement Effects on Firing: The effects of movement on fire are dependent on the stabilization system in use, and are listed on the stabilization table.

Example: The tank has a stabilized main gun and turret machinegun, while the chassis and pintle mount machineguns are unstabilized. If the vehicle moves half its movement rate or less, the stabilized weapons suffer a DM of -4 in the enemy fire phase, while the unstabilized weapons may not fire at all in the enemy fire phase and suffer a DM of -4 in the friendly fire phase. If the vehicle moves more than half its movement rate, the stabilized weapons may not fire in the enemy fire phase and suffer a DM of -4 in the friendly fire phase, while the unstabilized weapons may not fire in either fire phase.

M. Armor Ratings: Armor ratings must be determined for the six faces of the chassis and the four faces of the turret. They are based on three variables: thickness, slope, and toughness. Thickness is the actual thickness, in cm, of the armor on that face. Slope is the slope built into the vehicle face and modifies the effective armor thickness; if a face has moderate slope, its effective armor thickness is multiplied by 1.5; if a face has radical slope, its effective armor thickness is multiplied by 2. Toughness is a function of the type of armor used. The armor types table lists the toughness multiplier of each type. The armor rating table lists the thickness of hard steel required to receive a given armor rating. To determine a vehicle's armor rating, multiply its armor thickness by the slope multiplier and the thickness multiplier of the armor type used. Then consult the armor rating table to determine the armor rating. If the final effective armor thickness falls between two values listed on the table, use the lower of the two.

Example: The tank has hard steel armor, with a toughness of 1; thus the only variables considered are thickness and slope. The chassis front has a thickness of 8 cm and a radical slope, giving a modified thickness of 16 cm and an armor value of

31. The chassis sides have a thickness of 4 cm and no slope, for a rating of 15. The chassis rear has a thickness of 4 cm and moderate slope, for a modified thickness of 6 cm and a rating of 20. The deck has a thickness of 1.5 cm for a rating of 6. The belly has a thickness of 3.5 cm for a rating of 13. The turret front has a thickness of 11 cm and no slope for a rating of 27, while the turret sides and rear all have 4.5 cm at moderate slope for a modified thickness of 6.75 cm and a rating of 21.

N. Target Size DMs: Multiply chassis height by the sum of its length and width. Divide the result by 10, rounding fractions up. The result is the low hit DM. Multiply turret height by the sum of its length and width, and add the volume of any cupola, pintel, or open mount weapon. Divide by 10, rounding fractions up. The result is the high hit DM. However, if either value is less than .1, the DM is zero.

Example: The tank has a chassis height of 1.3 which is multiplied by the sum of width (3.5) and length (7) to produce a result of 13.65; divided by ten and rounded up, this equals a low hit DM of +2. The tank has a turret height of 1.2 which is multiplied by the sum of its width (2.5) and length (2.5) to produce a result of 6; divided by ten and rounded up, this equals a high hit DM of +1.

O. Firing Characteristics: A weapon's firing characteristics are determined by consulting the section of this book dealing with the weapon. Some weapons may be read from a list, while others must be designed.

Example: The tank has three machineguns and a 7.5 cm high velocity CPR gun. The characteristics of the machineguns may be found in the equipment lists section while the 7.5 cm CPR gun must be designed according to the CPR gun design sequence.

P. Miscellaneous Equipment: All the vehicle's miscellaneous equipment should be listed and its capabilities recorded.

Example: The tank has three batteries of smoke dischargers, each with two smoke rounds. It has a radio with a power of 200.

Q. Price: The price of the vehicle is determined by adding together the costs of its components. The price may or may not include a full load of ammunition and fuel, depending on the referee's determinations of the circumstances.

Example: The tank's suspension costs Cr24,500; its machineguns cost a total of Cr3600; the 7.5 cm gun costs Cr46,000; the fire control system costs Cr1000; stabilization for the turret weapons costs Cr1000; crew space for the 5 crewmen costs a total of Cr500; the power plant costs Cr4200; the transmission costs Cr1641; the chassis armor costs Cr3998; the turret armor costs Cr1176; the smoke dischargers cost Cr900; the radio costs Cr700. The total vehicle price is Cr88,886.

Design Sequence 2: CPR Guns

CPR stands for chemically propelled round; a CPR gun fires a projectile which is propelled by the expansion of gases in a chemical explosion. They are the most common weapons of 20th Century Earth.

A. Specifications: The characteristics of CPR guns are determined by a small number of initial specifications. There are 6 specifications.

1. Tech Level: This is the basic tech level of production of the weapon. Some components of the weapon may be produced at other tech levels; see below.

2. Bore Size: This is the diameter of the weapon's projectile in cm.

3. Type: CPR weapons come in several types, differing in their muzzle velocities. These are mortars, low velocity, medium velocity, high velocity, and hyper

velocity. Low velocity guns are also referred to as howitzers. Hyper velocity guns are not available at tech level 5.

4. Fire Control: The type and tech level of fire control equipment must be specified. Fire control is available for direct fire, indirect fire, and point defense. A weapon may have more than one type.

5. Mount: A weapon may be specified as vehicle-mounted or towed.

6. Gunshield: A weapon may be specified as having or not having a gunshield.

All other characteristics of the weapon follow from its specifications.

Example: To provide an example of CPR gun design, a weapon is shown with these specifications: a tech level 9, 11 cm, medium velocity gun with tech level 9 direct and indirect fire control equipment, a towed mount, and a gunshield.

B. Crew: Every CPR gun requires a crew; one of the crewmembers is the gunner and the rest are loaders. The CPR gun table lists normal and minimum crew sizes for each bore size. The listing is for a towed weapon; vehicle-mounted weapons require half the listed crew (rounding fractions down), but always require a crew of at least 2. Vehicle-mounted weapons with autoloaders require a crew of 1 (the gunner only). A weapon with indirect fire control must have at least its normal crew assigned; a weapon with direct fire control must have at least its minimum crew assigned. Crew casualties will affect a weapon's ability to fire; see Book 1.

Example: The gun has a normal crew of 10 and a minimum crew of 3.

C. Ammunition Carriers: Any vehicle-mounted weapon may be assigned one ammunition carrier vehicle to contain additional ready supply of ammunition. This vehicle must carry, in addition to a driver, a number of loaders equal to half the listed normal crew for that bore size, rounded up.

D. Weight: The weight of a weapon system is equal to the weight of the weapon itself, plus its fire control, plus its carriage (if towed), plus its gunshield (if any).

1. Weapon: The weight of a high velocity gun is listed on the CPR gun table for each bore size. For other types, multiply the listed weight by the multiplier given on the CPR multiplier table.

2. Fire Control: The weights of various fire control systems are given in the fire control section.

3. Carriage: A towed weapon requires a carriage for support while moving and firing. To determine carriage weight, multiply the weapon's weight by the number given on the CPR carriage table.

4. Gunshield: The weight of a gunshield is .07 times the listed normal crew for that bore size.

Example: The gun itself weighs 1.5 times .75 or 1.125 tons; the fire control systems weigh a total of .25 ton; the carriage weighs 1.125 times 2.5 or 2.8125 tons; the gunshield weighs .07 times 10 or .7 tons; the total weight is 4.8875 tons.

E. Volume: The volume of a CPR gun in m^3 is equal to its weight in tons.

Example: The gun has a volume of 4.8875 m^3.

F. Price: The price of the weapon system is equal to the price of the weapon itself, plus its fire control equipment, plus its carriage (if towed), plus its gunshield.

1. Weapon: The price of a low velocity gun is listed on the CPR gun table for each bore size. For other types, multiply the listed price by the number given on the CPR multiplier table.

2. Fire Control: The prices of fire control systems of various types are listed in the fire control section.

3. Carriage: To determine the price of the carriage, multiply the price of the weapon by the number given on the CPR carriage table.

4. Gunshield: A gunshield costs Cr20 times the listed normal crew for that bore size.

Example: The gun itself costs Cr50,000 times 1.5 or Cr75,000; the fire control systems cost a total of Cr40,000; the carriage costs Cr75,000 times .25 or Cr18,750; the gunshield costs Cr20 times 10 or Cr200; the total price is Cr133,950.

G. Set-Up Time: The CPR gun table lists set-up times, in complete turns, for a towed weapon of each bore size. For mortars, multiply the listed time by .5 (rounding fractions up); for vehicle-mounted weapons, multiply the listed time by .5 (rounding fractions up). For vehicle-mounted mortars, therefore, multiply the set-up time by .25.

Example: The gun's set-up time is 20 turns.

H. Indirect Fire Range: The CPR gun table lists indirect fire range for mortars, howitzers (low velocity guns), and guns (medium, high, and hyper velocity) at tech level 5. Range also depends on the tech level of the weapon or its indirect fire control system, whichever is lower; when determining range, count down one row on the table for each tech level above 5. Count down 1 if the weapon is a high velocity gun, and 2 if it is a hyper velocity gun.

Example: The listed range for an 11 cm gun is 20 km; since both the weapon and its fire control are tech level 9, count down 4 columns, giving a range of 24 km.

I. Accuracy: The accuracy of a weapon depends on its type and on the tech level of the weapon or its indirect fire control, whichever is lower. Weapons' accuracies are listed on the CPR accuracy table. Each weapon has two accuracy DMs: one for use when firing at half range or less and one for greater than half range. Add one to accuracy for each tech level above 5.

Example: The gun has an accuracy of +2 at up to half range and 0 at greater than half range.

J. Rate of Fire (ROF): Rate of fire is listed on the table for a tech level 5 weapon; count up one row on the table for each tech level above 5. The listed ROF is for howitzers and all mortars greater than 12 cm; for mortars 12 cm or less in bore, multiply ROF by 1.5; for all medium, high, and hyper velocity guns, multiply ROF by .5; if the result is fractional and greater than 1, round down to the nearest whole number; if less than 1, retain fractions.

Example: The listed ROF for an 11 cm weapon is 5; counting up 4 rows gives an ROF of 9; finally, this is multiplied by .5, to give an ROF of 4.

K. Direct Fire Range: Direct fire range depends on the type and tech level of the weapon and on the type of round being fired. However, no direct fire range may exceed the capability of the weapon's direct fire control system. The direct fire range table lists the ranges of the various weapons and rounds.

L. Ammunition: The various types of ammunition have their own characteristics. The weight of a round at each bore size is listed on the CPR gun table. Mortar rounds weigh half the listed weight; RAP rounds (see below) weigh twice the listed weight. A round's price depends on its weight, its type, and the type of weapon it is fired from. The CPR ammunition price table gives the information needed to determine a round's price. Multiply the weight of the round by the multiplier for weapon type and the multiplier for ammunition type to determine the round's price in Cr. The volume of a round in m^3 is its weight in kg divided by 1000; the

volume of a mortar round is its weight divided by 500.

Example: Rounds for the gun weigh 35 kg each and have a volume of .035 m^3. CBM rounds cost 35 times 3 times 3 or Cr315.

1. HE: The CPR gun table lists the contact penetration, burst size, and fragmentation penetration of a tech level 5 or 6 HE round. This value does not vary with weapon type or range. HE penetration does increase with tech level; count down 1 row on the table for every 2 tech levels (or fraction thereof) above 6. Mortar rounds have a higher burst size and fragmentation penetration than others; count down 2 rows to determine them.

Example: The weapon's HE round has statistics of 19/3/3, down 2 rows from the listed values for an 11 cm weapon.

2. KEAP: The CPR gun table lists the penetration of a tech level 5, low velocity KEAP round at effective range. Tech level and weapon type modify this value: +1 for each tech level above 5, +3 for medium velocity guns, +6 for high velocity guns, and +9 for hyper velocity guns. The round's penetration at long and extreme range is given on the KEAP range modifiers table; subtract the indicated number from the effective range penetration.

Example: The gun has a KEAP round with an effective range penetration of (26+4+3=) 33; long and extreme range penetrations are 30 and 27, respectively.

3. KEAPER: These are the same as KEAP rounds with 2 subtracted from penetration at all ranges.

Example: The gun's KEAPER round has penetrations of 30, 28, and 25 at effective, long, and extreme ranges.

4. HEAP: These are available at tech level 6 and above. The CPR gun table lists the penetration of a round fired from a howitzer or mortar at tech level 6. Penetration does not vary with range, but does vary with tech level and type of gun. The HEAP penetration modifiers table gives the number of rows to count up or down to determine penetration.

Example: The listed penetration of an 11 cm HEAP round is 36; counting down 5 rows (for tech level) and up 2 (for gun type) gives a penetration of 41.

5. CBM: These are available at tech level 7 and above, and only for weapons with a bore size of at least 8 cm. Tech level 7 CBM rounds have a penetration (contact and fragmentation) of 6. Tech level 8 and higher CBM rounds have a contact penetration equal to that of a 4 cm HEAP round from a low velocity gun and a fragmentation penetration equal to the contact penetration of a 4 cm HE round of the same tech level. In addition, CBM rounds have a hit DM which depends solely on bore size, as listed on the CPR gun table.

Example: The gun's CBM round has a contact penetration of 21, a fragmentation penetration of 7, and a hit DM of +1.

6. Flechette: These rounds are available at tech level 7+. At tech levels 7-9, they have a penetration of 2; at tech level 10+, they have a penetration of 3. Flechette rounds also have a danger space and a hit DM. Danger space depends on gun type and hit DM depends on bore size, as shown on the flechette table.

Example: The gun's flechette round has a penetration of 2, a danger space of 10 cm, and a hit DM of +6.

7. Illum: Illum rounds illuminate an area with the radius shown on the table. Count down one row on the table for each tech level above 5.

Example: The gun's illum round illuminates a radius of 84 cm.

8. Chaff: Chaff rounds are available at tech level 7 and above. They have no penetration, but the area covered by chaff is the same as the illuminated area of an illum round of the same tech level.

Example: The gun's chaff round has an effect radius of 84 cm.

9. Smoke: Weapons with a bore size of 6.5 cm or less fire smoke shells which create a 1 cm by 1 cm smoke cloud; weapons with a bore size of 7 cm or greater fire smoke shells which create a 2 cm by 2 cm smoke cloud. All chemical smoke rounds from weapons with a bore size of 9 cm or less burn for 4 turns; chemical smoke rounds from weapons with a bore size of 10 cm or more burn for 6 turns.

Example: Both the gun's smoke rounds create a 2 cm smoke cloud. The chemical smoke round burns for 6 turns.

10. Chemical: Chemical rounds must be defined as persistent or non-persistent, lethal or non-lethal.

M. Added Features of Ammunition: The following capabilities may be added to any round at added cost and (sometimes) weight.

1. RAP: Rocket assisted projectiles are available at tech level 6+. They multiply a weapon's indirect fire range by 1.5, while subtracting from its accuracy. Tech level 6 RAP rounds subtract 4 from the weapon's accuracy; tech level 7 rounds subtract 2; tech level 8 or higher rounds do not affect accuracy.

A RAP round costs as much as a normal round of its type plus the cost of an HE round, and weighs twice the usual weight.

2. Laser Guidance: This is available at tech level 8 and above. The addition of laser guidance to a round does not increase its weight, but increases its cost; add the price shown on the CPR laser guidance table to the price of a round.

3. Variable Ballistics: The addition of variable ballistics to a round adds nothing to its weight, but adds to its cost one tenth the cost of laser guidance.

N. Signature DM: A weapon's signature DM depends on its bore size, as given on the CPR signature DMs table.

Example: The gun's signature DM is +3.

O. Number of Targets: All CPR guns engage one target per fire phase.

Design Sequence 3: Auto Cannons

Auto cannons are CPR guns with high speed automatic fire actions. They are designed using the CPR gun design system, with the following exceptions.

A. Specifications: There are three additional considerations.

1. Action: An auto cannon may have either a gas-operated or an electric action. Electric actions are not available until tech level 8.

2. Number of Barrels: An auto cannon may have from 1 to 8 barrels.

3. Bore Size: The largest allowed auto cannon bore size at tech level 5 is 4 cm. The allowed bore size increases by 2 cm at each tech level, up to 24 cm at tech level 15.

B. Crew: The crew of a vehicle-mounted auto cannon is only 1 (the gunner).

C. Weight: The weight of the weapon itself is the weight of its action plus each barrel. A gas-operated action weighs the same as an entire non-automatic weapon of the same type; An electric action weighs .3 times the weight of a weapon; each barrel weighs .3 times the weight of a weapon.

D. Price: The same price multipliers are used as for other CPR guns, with the following additions: .1 for a gas-operated action, .3 for an electric action, and .1 for

each barrel. For example, the price multiplier for a hyper velocity CPR gun is 2.5. In the case of an electric 5-barrel auto cannon, 0.8 would be added, for a total price multiplier of 3.3.

E. Rate of Fire: The rate of fire is used in indirect fire and also determines the autofire hit bonus used in direct fire. The rate of fire equals the ROF of a non-automatic weapon of the same type, times the number of barrels, times 50 for a gas-operated action or 75 for an electric action, divided by the bore size, and rounded down to a whole number. For example, an 8 cm, tech level 9 howitzer has an ROF of 13; a 3-barreled auto cannon with an electric action would have an ROF of (13x3x75/8=) 365. When it is designed, an autocannon may be specified as having an ROF smaller than this number if desired (to conserve ammunition).

F. Autofire Hit Bonus: The autofire hit bonus is determined from the rate of fire. The ROF is the number of rounds fired in a complete turn; the number of rounds fired in a single phase is half that. Using this figure, consult the autofire bonus table to determine autofire bonus at effective, long, and extreme range.

G. Number of Targets: The number of targets engaged depends on the ROF, and is found on the autofire bonus table.

Design Sequence 4: Multiple Rocket Launchers

Multiple rocket launchers (MRLs) are available at tech level 6+; they are constructed using the CPR gun design system, using the same characteristics as mortars with the following exceptions.

A. Launcher: A single launcher consists of a number of launch tubes, plus fire control and carriage.

1. Crew: A launcher's crew is the normal crew for that size weapon, times the number of tubes in the launcher, divided by 10 (but never less than 2). All crew except the gunner are required only for reloading; if the weapon is to be used only once, the rest of the crew may be dispensed with.

2. Weight: Each tube has a weight multiplier of .01.

3. Volume: The volume of a tube is its weight times 25.

4. Price: Each tube has a price multiplier of .5.

5. Indirect Fire Range: There are 3 types of rockets: short range, medium range, and long range. Their ranges are determined on the CPR gun table, using the mortar, howitzer, and gun columns, respectively. Range is modified by the tech level of the rocket or fire control, whichever is lower. At tech level 6, count up 2 rows; at tech level 7, count up 1 row; count down 1 row for each tech level over 8.

6. Rate of Fire: The rate of fire of a launcher is equal to its number of tubes.

B. Ammunition: Rockets are designed in the same way as CPR rounds. They are identical to mortar rounds with the following exceptions.

1. Weight: Rockets weigh twice as much as listed.

2. Volume: A rocket's volume is equal to its weight in kg divided by 500.

3. Price: Short range rockets have a basic price multiplier of 4; medium range rockets have a multiplier of 8; long range rockets have a multiplier of 12.

4. RAP: The RAP option is not available for rockets.

C. Remote MRLs: Properly equipped launchers may be fired from a distance by communicator signal. Both the gunner and launcher must possess communication equipment and must be in communication. In addition, the launcher must include control equipment, which costs Cr1000 and weighs 15 kg; the gunner must also

have control equipment, which costs Cr1000 and weighs 1 kg. A single gunner may control any number of launchers, but may fire only one mission at a time. Only one fire control system is necessary per gunner.

Design Sequence 5: Mass Driver Guns

Mass driver (MD) guns are available at tech level 8+; they are designed using the CPR gun design system with the following exceptions.

A. Specifications: An additional specification is rounds per second. This may be any number, although power requirement (see J below) is an effective limitation.

B. Crew: The crew of a vehicle-mounted mass driver is only 1 (the gunner).

C. Weight: The weight of the weapon itself is 1.2 times the weight of a CPR gun of the same type. The weight of the carriage is .2 times the weapon weight for a MD mortar, and 2 times the weapon weight for all other types.

D. Price: The price of the weapon itself is Cr100,000 for basic circuitry, plus Cr100,000 times the weapon's weight.

E. Ammunition: All rounds weigh and cost the same as a CPR mortar round. Volume in m3 is weight in kg divided by 1000.

F. Signature DM: All MD guns have a signature DM of zero.

G. Rate of Fire: The rate of fire equals number of rounds per second times 30.

H. Autofire Hit Bonus: The autofire hit bonus is determined from the rate of fire. Divide the ROF by 2 to determine the number of rounds fired per phase. Using this figure, consult the autofire hit bonus table to determine the autofire bonus at effective, long, and extreme range.

I. Number of Targets: The number of targets engaged depends on the ROF, and is found on the autofire bonus table.

J. Input: Mass drivers require a power input, generally from a vehicle's power plant. The required input, in megawatts, is equal to the weight of a single round in kg, times the number of rounds per second, times a multiplier for weapon type. The multiplier is found on the MD gun input multiplier table.

Design Sequence 6: Lasers

Lasers emit a high-energy beam of electromagnetic radiation. At lower tech levels the beam is visible light. At tech level 13+, lasers fire a beam of x-rays.

A. Specifications: A laser's characteristics depend on 6 initial specifications.

1. Tech Level: This is the basic tech level of production of the weapon. Its fire control and batteries (if any) may be produced at different tech levels.

2. Type: Lasers are either beam lasers or pulse lasers. Pulse lasers may have from 1 to 16 lenses.

3. Power Input: The laser's power depends on its input, in megawatts, from an outside power source, usually a vehicle's power plant.

4. Fire Control: The type and tech level of fire control equipment must be specified. Lasers may have either direct or point defense fire control.

5. Mount: A laser must be specified as being either vehicle-mounted or towed.

6. Gunshield: A laser may or may not have a gunshield.

B. Crew: A vehicle-mounted laser has a crew of 1 (the gunner); a towed laser has a crew of 1 per ton of total weight (round fractions up).

C. Batteries: A pulse laser must have batteries with an energy storage capacity in megawatt-seconds equal to its input in megawatts. The characteristics of batteries

are found on the battery table.

D. Weight: The weight of a laser is the weight of the laser itself, plus its fire control, plus its batteries (if a pulse laser), plus its gunshield (if any). The weight of the laser is .066 tons times its input in megawatts. The weights of fire control systems are listed in the fire control section. A gunshield weighs .07 tons per crewman.

E. Volume: The volume of a laser in m^3 is equal to its weight in tons.

F. Price: The price of a laser is equal to Cr4000 times its input in megawatts, plus the price of its fire control, plus the price of its batteries (if a pulse laser), plus Cr20 times the number of crewmen if it has a gunshield.

G. Set-up Time: A towed laser requires 2 turns to set up.

H. Output: The output of a beam laser is equal to its input divided by 4. The output of a pulse laser is equal to its input divided by its number of lenses.

I. Range: A laser's range depends on its output. Effective range in km is equal to 2 times output; long range is equal to 4 times output; extreme range is equal to 20 times output. However, none of these ranges may exceed the limit imposed by the weapon's fire control system.

J. Penetration: To find a laser's penetration in cm of hard steel at effective, long, and extreme ranges, multiply its output in megawatts by the numbers on the laser penetration table which correspond to its type and tech level. The laser's penetration value is the value on the armor ratings table which corresponds to the greatest listed armor thickness which is less than or equal to the laser's penetration.

K. Hit Bonus: Lasers have a positive DM when firing, as shown on the laser hit bonus table. The same DM is used at all ranges.

L. Signature: Lasers have a signature DM of +1 per 4 megawatts of output.

M. Number of Targets: Number of targets is given on the laser hit bonus table.

Design Sequence 7: Energy Weapons (Plasma and Fusion Guns)

Plasma and fusion guns fire bolts of superheated hydrogen. In fusion guns, energy is increased by a partial fusion reaction within the plasma.

A. Specifications: Energy weapons have the following specifications.

1. Tech Level: This is the basic tech level of production of the weapon. Fire control systems may be of a different tech level.

2. Type: The weapon may be either a plasma gun (available at tech level 10+) or a fusion gun (available at tech level 12+).

3. Rapid Pulse: The weapon may be a rapid pulse gun. Rapid pulse plasma guns are available at tech level 11+, rapid pulse fusion guns at tech level 12+.

4. Power Input: The weapon's power depends on its input, in megawatts, from an outside power source, usually a vehicle's power plant. If the weapon is a rapid pulse gun, the final required input will be modified from the specified value.

5. Fire Control: The type and tech level of fire control equipment must be specified. Energy weapons may have either direct or point defense fire control.

6. Mount: A weapon must be specified as either vehicle-mounted or towed.

7. Gunshield: An energy weapon may or may not have a gunshield.

B. Crew: Only one crewman (the gunner) is needed for a vehicle-mounted weapon. A towed weapon requires one crewman per ton of weight (round up).

C. Weight: The weight of a weapon is the sum of the weights of the weapon itself, its fire control, its carriage (if towed), and its gunshield (if any).

1. Weapon: A weapon's weight in kg is equal to its input in megawatts times

the weight multiplier listed for that tech level on the energy weapon table.

2. Fire Control: The weights of fire control systems are given on the fire control tables.

3. Carriage: A towed weapon's carriage weighs 9 times the weight of the weapon. A weapon in an open vehicle mount has a carriage which weighs 4 times the weight of the weapon.

4. Gunshield: A gunshield weighs 70 kg per crewman.

D. Volume: An energy weapon's volume in m^3 is equal to its weight in tons.

E. Price: The price of an energy weapon is equal to the sum of the prices of its components. A plasma gun costs Cr4000 times its input; a fusion gun costs Cr6000 times its input. The prices of fire control systems are listed on the fire control tables. The price of a carriage is .1 times the price of the weapon. The price of a gunshield is Cr20 times the number of crewmen.

F. Set-up Time: A towed energy weapon requires 1 complete turn to set up per ton of weight (round fractions up).

G. Output: A weapon's output in megawatts is equal to its input times the output multiplier given for the weapon's tech level on the energy weapon table.

H. Range: A weapon's effective, long, and extreme ranges, in km, are equal to the square root of its output times the multipliers given on the energy weapon multiplier table. However, none of these ranges may exceed the limits imposed by the weapon's fire control system.

I. Penetration: To find a weapon's penetration in cm of hard steel at effective, long, and extreme ranges, multiply its output by the multipliers given on the energy weapon multiplier table which correspond to its type. The weapon's penetration value is the value on the armor ratings table which corresponds to the greatest listed armor thickness which is less than or equal to the weapon's penetration.

J. Burst Size and Penetration: An energy weapon's burst size in cm is equal to the square root of its output in megawatts times a multiplier. The multiplier is 1.5 at effective range, 1 at long range, and .5 at extreme range. Round fractions down; if a weapon's burst size is zero, it does not inflict fragmentation hits. Fragmentation penetration is equal to contact penetration at that range minus 16 (but at least 1).

K. Signature: Energy weapons are automatically spotted when they fire.

L. Number of Targets: A non-rapid pulse gun engages 1 target.

M. Rapid Pulse Guns: Rapid pulse weapons are designed using the sequence above, but have several additional characteristics and limitations.

1. Hit Bonus: A rapid pulse gun receives a hit bonus, specified by the designer. There is a maximum hit bonus at each tech level, and a maximum allowed input at each tech level for each hit bonus, as given on the rapid pulse table. The hit bonus is used at all ranges.

2. Number of Targets: The number of targets engaged depends on the hit bonus, and is given on the rapid pulse table.

3. Modified Input: After weapon design is completed, the required input is increased: multiply input by the multiplier given on the rapid pulse table. This has no effect on anything other than the weapon's power requirement.

Design Sequence 8: Fire Control

All weapons designed using the preceding sequences require a fire control system in order to fire. There are three types of fire control systems: direct fire

control allows a weapon to conduct direct fire; indirect fire control allows a weapon to conduct indirect fire; point defense fire control allows a weapon to conduct direct fire and point defense fire. One fire control system is required per weapon, or per weapon station on a vehicle. In addition, a weapon's crew must be in communication with a fire direction center in order to conduct an indirect fire mission.

A. Direct Fire Control: Each weapon has its own range, as specified by its design, but a weapon's ranges may not exceed the ranges listed for its fire control system on the direct fire control table. However, penetration does not depend on fire control; if a weapon's effective range exceeds the long range of its fire control, then its effective range penetration is used at long range. The same holds true if its effective or long range exceeds the fire control's extreme range. For example, if a laser has an effective range of 5 km, but its fire control has effective, long, and extreme ranges of 2, 3, and 4.5 km, the laser's penetration at all ranges would be its effective range penetration.

B. Indirect Fire Control: A weapon's indirect fire range and accuracy are limited by the tech level of its indirect fire control. Characteristics of indirect fire control systems are found on the indirect fire control table. Multiply weights and costs by .25 if the weapon is a mortar.

C. Fire Direction Centers: An indirect fire weapon must be in communication with a fire direction center in order to conduct a fire mission. The number of fire missions a center may direct at a time depends on tech level. Some centers also add to the initiative of weapon crews under their direction. These and other characteristics of fire direction centers are listed on the fire direction center table.

D. Point Defense Fire Control: Point defense fire control is available at tech level 9+, at ten times the price and weight of direct fire control of the same tech level. Only rapid fire weapons may be fitted with point defense fire control. Although a weapon may use point defense fire control as direct fire control, it may be economically preferable to purchase both a direct fire control system and a point defense fire control system of a lower tech level for the same weapon; this is most useful when providing a limited point defense capability for a weapon intended for the direct fire role.

A tech level 9 point defense system rolls 4 dice for hits on enemy indirect fire rounds. Roll 2 additional dice for each tech level above 9; for example, a tech level 15 system rolls 16 dice for hits.

Design Sequence 9: Tac Missiles

A tac missile system has two elements: the missile and the launcher.

A. Missiles: Each missile has three components: warhead, guidance system, and propellant. The different types of guidance systems all have different design parameters. Warhead and propellant are determined in the same way for all types.

The weight and cost of a missile are the total of the weights and costs of its three components. Its volume in m^3 equals its weight in kg divided by 1000.

1. Warhead: The warhead may be any low velocity round described in the CPR gun design system. It weighs .05 times the listed weight; the cost multiplier is 4.

2. Guidance Systems: The various types of guidance systems are described in C below and on the tac missile tables.

3. Propellant: The weight of propellant needed for a missile depends on its intended range and is expressed as a multiple of the combined weights of the war-

head and the guidance system. Multiples for different ranges are listed on the propellant table. Propellant costs Cr1 per kg.

B. Launchers: Each missile launcher has two components: the basic launcher and (again) the guidance system. The guidance system must be of the same type as that of the missiles to be launched.

1. Basic Launchers: There are four basic types of launch systems: launch rails, package launchers, tube launchers, and magazine launchers.

a. Launch Rails: Launch rails must be mounted on vehicles. They are mounted on the vehicle exterior, on any face of the chassis or turret. Each launch rail weighs the same as one missile, and costs Cr50 per kilogram.

b. Package Launchers: A package launcher consists of the guidance system and the missile itself, in a container which serves as a disposable launch tube. One container is required per missile. The weight of the container is equal to half the weight of the missile, and it costs Cr10 per kilogram.

c. Tube Launchers: A tube launcher may be either field-mounted or vehicle-mounted. If vehicle-mounted, the launcher weighs twice as much as a missile; if field-mounted, it weighs 4 times as much as a missile. It costs Cr100 per kg.

d. Magazine Launchers: A magazine launcher is a magazine-fed tube launcher. The designer chooses the magazine's capacity. Magazine launchers may be mounted only in vehicles. The launcher weighs twice the weight of a missile plus half the weight of a missile for each space in the magazine; it costs Cr150 per kg.

2. Guidance System: One launcher guidance system is required for each missile a single gunner will fire in one turn; a single guidance system may control several launchers, but may only control one missile in flight at a time. Homing, target designated, and IR followup missiles do not require any launcher guidance systems. The characteristics of the various types of launcher guidance packages are given in C below and on the tac missile tables.

C. Guidance Systems: There are 5 types of tac missile guidance systems.

1. Operator Guided: Operator guided missiles have 4 types of command links: wire, laser, maser, and radio. Their characteristics found on the operator guided missile table. Maximum range is the greatest distance over which the command link will function.

2. Teleguided: A teleguided missile and launcher, in addition to a teleguidance system described on the teleguided missile table, must also include a radio guidance system as described on the operator guided missile table.

3. Homing: Homing missiles are first available at tech level 7. The guidance system for the missile weighs 1 kg and costs Cr300 at all tech levels. No guidance system is necessary for the launcher.

4. Target Designated: Guidance systems for target designated missiles are given on the target designated missile table. No guidance system is necessary for the launcher, although a laser carbine or laser rifle must be used (not necessarily by the gunner) to guide the missile to its target.

5. Target Memory: Characteristics of target memory missiles and launchers are given on the target memory missile table. All target memory guidance systems cost Cr5000 for the missile and Cr1000 for the launcher. In addition, the missile (but not the launcher) must also contain a homing and a teleguidance system; an operator guidance system is not required.

D. IR Followup Missiles: Any missile with a HEAP warhead may be supported

by an IR followup missile. The IR missile must have the same warhead and range as the other missile; it has an IR guidance system instead of the other missile's guidance system. IR guidance systems are available at tech level 8+; they cost Cr400 and weigh 1 kg at all tech levels. The effect of an IR followup missile is to increase the original missile's penetration by 8.

E. High Performance Missiles: A missile may be constructed as a high performance missile by carrying extra propellant. The missile receives a speed DM of 1 for each 10% extra propellant carried. See Book 2, rule 64.

Design Sequence 10: Drone Missiles and Vehicles

Drone missiles and vehicles may be constructed at tech level 13+.

A. Drone Missiles: Drone missiles are sophisticated tac missiles. Because they must remain in flight for long periods of time, they are grav-propelled.

1. Components: Drone missiles are assembled from 5 components: warhead, brain, communicator, grav module, and battery. A missile's weight, volume, and price are the sum of its components.

a. Warhead: The warhead is identical to the warhead of a tac missile.

b. Brain: The characteristics of drone missile brains are listed on the drone missile brain table.

c. Communicator: To receive orders, the missile must have a communicator of the same type (but not necessarily the same power) as the gunner has.

d. Grav Module: A grav module costs Cr2500 and has a volume of .002 m^3 per kg. Each kg produces 25 kg of thrust.

e. Battery: The battery supplies power to the grav module. The characteristics of batteries are given on the battery table.

2. Characteristics: A drone missile's characteristics depend on its components.

a. Speed: A missile's thrust must be greater than its weight. Divide the missile's thrust by its weight and subtract 1 to get maneuver Gs. Maximum speed depends on maneuver Gs, as shown on the grav vehicle speed table. However, the missile travels at its maximum speed only when attacking. At other times, it flies at one fourth its maximum speed, or 200 km per hour, whichever is less. The missile's movement rate in cm per turn is its speed in km per hour divided by 1.2.

b. Range: A missile's range when attacking is equal to one turn's flight at maximum speed. Divide the maximum speed by 1.2 to get range in cm.

c. Endurance: Endurance is the length of time the missile may spend in flight. To determine seconds of endurance, multiply the battery's output in megawatts by 10,000 and divide by the number of kg of thrust produced by its grav module. To determine turns of endurance, divide the seconds of endurance by 30 and round down to a whole number.

d. Hit DM: A missile's hit DM when attacking depends on its brain, and is given on the drone missile brain table.

B. Drone Vehicles: Drone vehicle's are designed using the vehicle design system. They may mount any weapons. However, any CPR gun must have an auto loader and missile launchers may not be reloaded. The drone requires a brain; brains are listed on the drone vehicle brain table. It must also have a communicator to receive orders from the gunner. Drone vehicles suffer a negative DM when firing, as given on the drone vehicle brain table.

C. Control Stations: The gunner who launches and controls one or more drone

missiles or vehicles must have a control station. The station consists of a communicator, a map box, and a battlefield computer.

Design Sequence 11: Aircraft

Aircraft, or non-grav powered flying vehicles, are designed using the procedure below. The limiting factor in an aircraft's design is its weight, which must be specified first. Components are added to a basic airframe; the total weight of all components must be less than or equal to the specified weight. An aircraft's price is equal to the total of its component prices. To provide an example of aircraft construction, the design of a tech level 7 aircraft is shown.

A. Aircraft Weight: The final weight of the aircraft is specified in tons, and may not be over 400 tons.

Example: The aircraft weighs 10 tons.

B. Airframe Type: The airframe type table lists the characteristics of the available airframes. The weight of the airframe is a fractional multiple of the specified aircraft weight, as given on the table. The cost of the airframe is also a multiple of the specified aircraft weight, also given on the table. In addition, airframes may be specified as STOL or VTOL, at increased weight and cost. STOL is available at tech level 6+; VTOL is available at tech level 7+.

Example: The aircraft has a transonic airframe. It weighs 10 times .1 or 1 ton. It costs Cr30,000 times 10 or Cr300,000.

C. Power and Thrust: The same types of power plants are used for aircraft construction as are used for ground vehicle construction, and are listed on the power plant table. First specify power plant volume in m^3 (volume is not otherwise used); multiply the volume by the numbers given on the table to determine output in megawatts and weight in tons. The power plant description given on the table does not necessarily apply in aircraft; rather, the entry for each tech level is an index of the efficiency of power generation at that tech level. Then choose a thrust agency from the thrust agency table. Note that some have a maximum speed of airframe with which they can be used. To determine final cost of the power plant, multiply its volume by the cost given on the power plant table and by the multiplier given on the thrust agency table.

Example: The aircraft has a 1 m^3 tech level 7 power plant, which has a power output of .4 megawatts and weighs 1 ton. Its thrust agency is a basic turbofan, making the cost 1 times Cr5000 times 35, or Cr175,000.

D. Controls: The controls table lists the available types of controls. Note that some have a maximum speed of airframe with which they can be used. The weight of the controls is a fractional multiple of the weight of the aircraft, as given on the table. The cost is a multiple of the weight of the controls, also given on the table. If an aircraft is to have a radar operator (see below) it must have enhanced or computer enhanced controls. VTOLs also need avionics; see the avionics table.

Example: The aircraft has powered controls, which weigh .15 times 10 or 1.5 tons and cost 1.5 times Cr100,000 or Cr150,000.

E. Crew and Passenger Accommodations: The crew accommodation table lists the various types of crew and passenger accommodations available. An aircraft of 25 tons or less requires 1 pilot; an aircraft of greater than 25 tons requires 2 pilots; an aircraft of at least 50 tons but not greater than 100 tons also requires 1 engineer; an aircraft of greater than 100 tons requires 2 engineers. An aircraft must also have

gunners for its weapons; a gunner may control any number of weapons, but may fire only one per phase. However, a gunner in a simple turret may control only weapons in the turret. If the aircraft has terrain-following radar or has both target acquisition radar and operator-guided, high performance missiles, a radar operator is required; he may also be a gunner. If the aircraft has any form of radar, ladar, ECM, vision enhancement device, or enhanced controls, both pilots must be in complex cockpits. A radar operator must also be in a complex cockpit. Pilots of aircraft without advanced electronics may be in simple cockpits, and all other crewmembers may be in crew stations. Passengers may be carried in any empty crew station or cockpit, or in a passenger section. Several options may be added to any cockpit or crew station for the additional costs and weights given on the table. A transonic aircraft requires ejection seats for all crew; a supersonic aircraft requires advanced ejection seats; a hypersonic aircraft requires rocket escape.

Example: The aircraft has 1 pilot in a complex cockpit with an ejection seat. It weighs .35 tons and costs Cr55,000.

F. Armament: Any type of weapon may be installed in an aircraft. Tac missiles must be mounted on launch rails, and may not be reloaded. Bombs may be mounted on individual hardpoints, external bomb racks, or internal bombays. Other weapons may be mounted in turrets or in fixed forward firing mounts. The pilot may fire homing or target-seeking missiles, weapons in fixed forward firing mounts, and bombs on hardpoints or racks, but not in bays. The weapon mounts table lists the weights, costs, and capacities of the various types of mounts. Launch rails are described in the tac missile design system.

Example: The aircraft has a tech level 7, 2 cm, 4-barrel, gas-operated, high velocity autocannon, with tech level 7 direct fire control, in a fixed forward firing mount; it weighs .24 tons and costs Cr10,000. It also has 2 launch rails for 100 kg homing missiles, which weigh a total of .2 tons and cost Cr10,000. It also has 6 bomb racks, which weigh a total of .6 tons and cost Cr48,000. The total weight of weapons and mounts is 1.04 tons; total cost is Cr68,000.

G. Ammunition: Ammunition for weapons must be stored on the aircraft, and the weight and cost added to the total. Weapons mounted on the outside of the aircraft (tac missiles and bombs in racks or hardpoints) are in addition to the specified aircraft weight.

Example: The aircraft carries 750 KEAP rounds for its autocannon internally, for a total weight of .3 tons and a total cost of Cr2400. It carries 2 missiles and 36 bombs externally; the missiles weigh .2 tons; other factors may vary depending on the exact type of missiles and bombs carried.

H. Electronics: Any electronic systems may be installed. Characteristics are listed in the electronics section.

Example: The aircraft has a basic ECM package (.01 tons, Cr50,000), a 300 power radio (.01 tons, Cr400), and a 30 power target acquisition radar (.1 ton, Cr1,000,000). Total weight is .12 tons; total cost is Cr1,050,400.

I. Cargo: The aircraft may have weight allocated to cargo. Each ton of cargo capacity allows the aircraft to carry 1 ton of cargo. There is no cost.

Example: The aircraft has no cargo capacity.

J. Maneuver Enhancement: The designer may allocate any percentage of the total aircraft weight to maneuver enhancement. There is no cost.

Example: 10% of the aircraft's weight (1 ton) is given to maneuver enhancement.

K. Fuel: Each ton of fuel capacity is equivalent to 1,000 liters of pre-fusion fuel or 14,000 liters of fusion fuel. Fuel capacity has no cost, although fuel itself costs Cr.25 per liter for pre-fusion fuel and Cr.035 per liter for fusion fuel.

Example: The aircraft carries 5.19 tons (5190 liters) of pre-fusion fuel; a full load of fuel costs Cr1297.

Aircraft Rating: Once the aircraft has been designed, its characteristics must be determined and recorded.

A. Weight: Vehicle weight is the quantity specified at the beginning of the design sequence. The designer should ensure that the total weights of all interior components (including ammunition and bombs in bays) exactly equal the specified weight; extra fuel or cargo capacity may be added if there is no other use for the weight.

In addition to its empty weight, the aircraft also has a loaded weight, which is its empty weight plus the weight of all externally carried weapons (missiles and bombs in hardpoints or racks).

Example: The aircraft weighs 10 tons. Its components weights are 1 ton (airframe), 1 ton (power plant), .35 tons (cockpit), 1.04 tons (weapons mounts), .3 tons (ammunition), .12 tons (electronics), 1 ton (maneuver enhancement), and 5.19 tons (fuel), for a total component weight of 10 tons.

Its loaded weight includes .2 tons of missiles and 3.6 tons of bombs (assuming 36 100-kg bombs), for a total of 13.8 tons.

B. Thrust: An aircraft's thrust in tons is equal to its power plant output in megawatts times the thrust multiplier of its thrust agency.

Example: The aircraft's power plant has an output of .4 megawatts; the thrust multiplier of a basic turbofan is 30; the aircraft's thrust is 12 tons.

C. G Rating: The G rating is determined by dividing the aircraft's thrust by its weight, and multiplying by the G efficiency of its airframe. An aircraft has two G ratings, one for its empty weight and one for its loaded weight.

Example: A transonic airframe's G efficiency is .95, giving the aircraft a G rating of 1.14 empty and .82 loaded.

D. Maximum Speed: An aircraft's maximum speed depends on its G rating and its drag. Consult the grav vehicle speed table to determine the maximum speed for the aircraft's G rating. Drag is caused by weapons mounts. Consult the weapon mount table to determine the number of drag points for each mount. The drag from bomb hardpoints and racks affects the aircraft only when loaded (that is, only when the bombs are in place). Reduce the aircraft's maximum speed by 1% for each drag point. An aircraft's maximum speed may not exceed the listed design speed of its airframe.

Example: The aircraft's empty G rating of 1.14 gives it a maximum speed of 1200 kph, which is reduced to the airframe's design speed of 1100 kph; its loaded G rating of .82 gives it a maximum speed of 960 kph. However, the aircraft has 6 bomb racks for a total of 24 drag points loaded, which reduces its loaded maximum speed by 24% to 730 kph.

E. Cruising Speed: An aircraft's cruising speed is its maximum speed times .75.

Example: The aircraft's cruising speed is 825 kph empty and 547 kph loaded.

F. Minimum Speed: An aircraft's minimum speed depends on its airframe type, as listed on the airframe type table. Most aircraft use the first listed speed; STOL aircraft use the second listed speed; VTOL aircraft have no minimum speed, but use

the second listed speed when determining fuel use. Minimum speed is reduced by 1% for every 1% of aircraft weight used for maneuver enhancement.

Example: A transonic airframe's minimum speed is 176 kph, but 10% of the aircraft is devoted to maneuver enhancement, making the minimum speed 158 kph.

G. NOE Speed: Only VTOL aircraft have an NOE speed. NOE speed for a VTOL aircraft is .1 times its maximum speed, but not more than is allowed by its avionics.

H. Movement Rate: An aircraft's various movement rates in centimeters are equal to its speeds in km per hour divided by 1.2.

Example: The aircraft has a maximum movement rate of 916 cm empty or 608 cm loaded, a cruising movement rate of 687 cm empty or 455 cm loaded, and a minimum movement rate of 131 cm.

I. Agility: An aircraft's agility is determined by the formula at left, where MS is the aircraft's maximum speed, G is its G rating, ME is the percentage of weight devoted to maneuver enhancement, and MP is maneuver points; round fractions down to a whole number. Maneuver points depend on the type of controls installed, and are listed on the controls table. An aircraft has two agilities, one when empty and one when loaded.

$$\frac{MS}{100} + \frac{G \times 100}{100 - ME} + MP$$

Example: The aircraft's empty agility is 1100/100 + 1.14x100/90 + 2, or 14. Its loaded agility is 730/100 + .82x100/90 + 2, or 10.

J. Turns: An aircraft's ability to turn in a single movement phase is limited. An aircraft's basic turn ability is 45°. Subtract 1° for each drag point, and add 1° for each 1% of aircraft weight devoted to maneuver enhancement and 5° for each maneuver point. An aircraft has two turn rates, empty and loaded.

Example: The aircraft has an empty turn rate of 45° +10° +10° or 65°. Its loaded turn rate is 65° - 24°, or 41°.

K. Damage Points: An aircraft has damage points equal to its weight times 10.

Example: The aircraft has 100 damage points.

L. Fuel Use: The number of liters of fuel used per hour is determined by multiplying the power plant output in megawatts by the fuel use rate listed on the power plant table and the fuel use multiplier listed on the thrust agency table.

Example: The aircraft's power plant has an output of .4 megawatts; a tech level 7 power plant uses 500 liters of fuel per megawatt in each hour; a basic turbofan has a fuel use multiplier of 7. Thus the aircraft uses .4 times 500 times 7 or 1400 liters of fuel per hour.

M. Endurance: Endurance is the number of hours that the aircraft can remain aloft at cruising speed (the most economical speed). To determine endurance, divide the total number of liters of fuel carried by the fuel use rate.

Example: The aircraft carries 5190 liters of fuel and has a fuel use rate of 1400 liters per hour, giving it an endurance of 3.7 hours.

N. Range: Range is the distance an aircraft can fly at cruising speed. Multiply the aircraft's endurance by its cruising speed (empty and loaded).

Example: The aircraft's range is 3052 km empty or 2123 km loaded.

O. Mission Time: An aircraft's mission time is the number of turns it can spend over the battlefield, performing its mission, before it is forced by fuel shortage to return to base. An aircraft has two mission times, one normal and one loaded. To determine mission time, the referee first determines the number of km from the aircraft's base to the target. Divide that value by the aircraft's cruise speed, multiply

by 2, and subtract that value from endurance. The result is the number of hours the aircraft may remain over its target. Multiply by 120 to determine the number of turns it may remain over its target. Aircraft flying at or below cruise speed use 1 turn's worth of mission time each turn. Aircraft dogfighting, flying in terrain following mode, or flying above cruise speed use 4 turns of mission time each turn. VTOL aircraft flying below minimum speed or aircraft using reheat use 8 turns of mission time each turn.

Example: If the aircraft's base is 1000 km away, its hours over target (loaded) are 3.7 - (1000 x 2/547), or .0437. Its mission time is .0437 x 120 or 5 turns.

P. Price: An aircraft's price is the sum of the prices of its components. Fuel and ammunition may or may not be counted at the referee's option.

Example: The aircraft, exclusive of fuel and ammunition, has component prices of Cr300,000 (airframe), Cr175,000 (power plant), Cr150,000 (controls), Cr55,000 (cockpit), Cr68,000 (armaments), and Cr1,050,400 (electronics), for a total price of Cr1,798,400.

Q. Volume: An aircraft's volume is used only for determining the amount of cargo capacity it consumes in a transport. Volume in m^3 is 60 times weight in tons if shipped in a combat-ready condition. If the wings have been removed for ease of transport, volume is 20 times weight.

Design Sequence 12: Helicopters

Helicopters are not designed from scratch like other aircraft. Instead, a helicopter design is chosen from the helicopter table. The design includes an airframe, power plant, enhanced controls, and avionics. All other components, including fuel, must be added. The total weight of added components (including missiles and bombs) must equal the payload. The stated characteristics assume a full payload.

Design Sequence 13: Mines

Mines have two components: the warhead and the trigger.

A. Warhead: Warheads have the characteristics of low velocity CPR rounds of that tech level. HE and HEAP rounds have a contact penetration only; flechette rounds also have a danger space of 5 cm (starting at the mine) and a hit bonus, shown on the flechette table. Anti-vehicle mines must have a penetration of 15 or more. Mines weigh half as much as a CPR round and have the same cost multipliers.

B. Triggers: Triggers have a negligible weight. Pressure triggers cost Cr10, proximity triggers Cr100. The cost of a remote trigger depends on its communications link: wire, Cr10; radio, Cr20; laser or maser, Cr30.

C. Non-Metallic Mines: Prices above are for metallic mines. For non-metallic mines, multiply warhead price by 2 and trigger price by 10.

D. Scatterable Mines: Any mine may be scatterable. Any artillery shell may carry mines equal to half its listed weight. The shell itself costs half the price of an HE round for the weapon. Mortar rounds, MD rounds, and bombs may carry mines equal to their entire weight.

E. Minefields: The number of mines necessary to make a unit minefield is given on the minefield table. To determine the number of rounds necessary for a scatterable minefield, divide the number given by the number of mines in a round.

Imperial Marine Grav APC (Tech Level 15)

The vehicle has a crew of 3 (commander, driver, gunner) and carries 8 passengers. It mounts a rapid pulse fusion Y gun and a tac missile magazine launcher in a remote mount on the chassis deck. It has tech level 15 direct and tech level 9 point defense fire control. Height: 2 m (+ remote mount, .4 m). Width: 6 m. Length: 14 m. Total volume: 168 m^3. Weight: 600 tons. Price: Cr5,609,650.

Movement: Maximum, 600 kph/500 cm; cruise, 450 kph/375 cm; NOE, 150 kph/125 cm.

Movement Effects on Fire: None.

Armor: Mount and chassis front, 73; mount and chassis side, 62; mount and chassis rear, 56; belly, 65; deck, 56.

Target Size DMs: +1 high, +4 low.

Equipment: Laser sensor (roll 2+); 100-power radio; 50-power target acquisition radar; meson communicator (100 km range); extensive ECM; battlefield computer; map box; sealed environment with life support for 3.

Power: 156 megawatt fusion power plant consumes 234 liters fuel per hour; fuel capacity is 2000 liters, enough for 8.5 hours. Grav generators produce 1.5 Gs.

Weapons: The rapid pulse Y gun's direct fire characteristics are given on the list of standard energy weapons. In point defense fire, its effective, long, and extreme ranges are 250, 350, and 500 cm, with effective range penetration values; it rolls 4 dice against indirect fire rounds.

The missile launcher carries 5 missiles in the magazine, and the vehicle has storage space for 26 more. The launcher includes guidance for teleguided (100 power radio) and target memory missiles, and a laser carbine for guiding target designated missiles. Missiles weigh 95 kg each and have nuclear warheads. The following types are available:

.1 kt missiles with 13 km range: target memory (Cr7885, DM+3); teleguided (Cr2785, DM+3); target designated (Cr1285); homing (Cr1385).

.1 kt high performance missile (speed DM+10) with 3.5 km range: homing (Cr1385).

.5 kt missiles with 7 km range: target memory (Cr11,881, DM+3); teleguided (Cr6781, DM+3); target designated (Cr5285).

1 kt missiles with 4 km range: target memory (Cr16,877, DM+3); teleguided (Cr11,777, DM+3); target designated (Cr10,277).

Laser Grav Tank (Tech Level 9)

The vehicle has a crew of 3 (driver, gunner, commander). Its turret mounts a pulse laser, a heavy machinegun, and a 7 mm gatling gun in a single mount, with direct fire control. Height: 1.5 m (+turret, 1.3 m). Width: 4.5 m. Length: 9 m. Total volume: 113.4 m^3. Weight: 326 tons. Price: Cr4,5000,000.

Movement: Maximum, 480 kph/400 cm; cruise 360 kph/300 cm; NOE, 120 kph/100 cm.

Movement Effects on Fire: Move more than ½, -2 EFP.

Armor: Chassis front, 52; chassis sides, rear, and belly, 34; deck, 43; turret front, 69; turret sides, 55; turret rear, 46.

Target Size DMs: +3 low, +2 high.

Equipment: 5000-power radio; maser communicator (5 km range); 5-power target acquisition radar; image enhancement; thermal image; extensive ECM; map box; 100 bottles of anti-laser aerosol; sealed environment with life support for 3.

Power: 84 megawatt fusion power plant consumes 126 liters of fuel per hour; fuel capacity is 3000 liters, enough for 23 hours. Grav generators produce 1.4 Gs.

Weapons: Characteristics of the heavy machinegun and 7 mm gatling gun are given on the crewed weapons: slug throwers table. The tank carries 10,000 rounds for the gatling gun and 2000 rounds for the machinegun. The 38 megawatt input, single lens pulse laser may engage 1 target and is automatically spotted when it fires. Its range and penetration are given below.

Effective	*Long*	*Extreme*
250 (70)	350 (70)	500 (70)

G-Carrier Grav APC (Tech Level 9)

The vehicle has a crew of 2 (driver and gunner) and carries 14 passengers. It is unarmed, but 1 m^3 of chassis space and 1 ton of weight have been set aside for the addition of a weapon mount on the chassis deck. Height: 2 m. Width: 5.6 m. Length: 10 m. Total volume: 112 m3.

mount on the chassis deck. Height: 2 m. Width: 5.6 m. Length: 10 m. Total volume: 112 m^3. Weight: 167 tons. Price: Cr2,055,286.

Movement: Maximum, 300 kph/250 cm; cruise, 225 kph/187.5 cm; NOE, 75 kph/62.5 cm.

Armor: Front, 54; sides, belly, and deck, 34; rear, 46.

Target Size DMs: +4 low, no high hits unless weapons are installed.

Equipment: Laser sensor (roll 7+); 200-power radio; 5-power target acquisition radar; thermal image; image intensification; map box; sealed environment with life support for 16; 2 tons cargo capacity.

Power: 21 megawatt fusion power plant consumes 31.5 liters fuel per hour; fuel capacity is 20,000 liters, enough for 635 hours. Grav generators produce 1.25 Gs.

Self-Propelled Auto Cannon (Tech Level 9)

The vehicle has a crew of 3 (commander, driver, gunner). It mounts an 8 cm auto cannon in a chassis front mount, with direct and indirect fire control. Height: 2 m. Width: 5.6 m. Length: 10 m. Total volume: 112 m^3. Weight: 215 tons. Price: Cr2,667,642.

Movement: Maximum, 300 kph/250 cm; cruise, 225 kph/187 cm; NOE, 75 kph/62 cm.

Movement Effects on Fire: Move more than half, -2 EFP.

Armor: Front, 54; sides, belly, and deck, 34; rear, 46.

Target Size DMs: +4 low, no high hits.

Equipment: Laser sensor (roll 7+), 200-power radio; 5-power target acquisition radar; thermal image; image intensification; sealed environment with life support for 3.

Power: 27 megawatt fusion power plant consumes 40.5 liters fuel per hour; fuel capacity is 10,000 liters, enough for 247 hours. Grav generators produce 1.25 Gs.

Weapon: 3 barrel, 8 cm, low velocity auto cannon with electric action. It engages 16 targets; its other direct fire characteristics are given below.

Effective	*Long*	*Extreme*
100 +6	200 +5	350 +2

The weapon has the following indirect fire characteristics: ROF, 340; range, 12 km (18 km for RAP rounds); accuracy, +2 up to ½ range, +0 over ½ range; set-up time, 8 turns.

Rounds weigh 14 kg each (28 kg for RAP rounds). Their characteristics are listed below.

Type	*Price*	*Characteristics*
HE	52	Contact penetration/burst size/fragmentation penetration: 15/2/3
HEAP	78	Contact penetration: 38
KEAP	52	Contact penetration, effective/long/extreme: 26/24/22
KEAPER	58	Contact penetration, effective/long/extreme: 24/22/20
Flechette	260	Contact penetration/hit DM/danger space: 2/+5/10 cm
CBM	156	Contact pen./burst size/fragmentation pen./hit DM: 21/8/7/+1
Illum	104	Illumination radius: 70 cm
Chaff	104	Effect radius: 70 cm
Ch. Smoke	52	Cloud size/burn time: 2x2 cm/4 turns
In. Smoke	104	Cloud size/burn time: 2x2 cm/2 turns

Variable ballistics may be added to a round for Cr80; laser guidance may be added for Cr800; a RAP round costs an additional Cr52. The vehicle has storage space for 3400 rounds (or 1700 RAP rounds), enough for 10 turns of fire (5 turns for RAP rounds).

INDIVIDUAL WEAPONS: ENERGY WEAPONS

TL	*Weapon*	*Shots*	*Effective*	*Long*	*Extreme*	*Weight*	*Price*	*Targets*	*Dex Mods*
8	Laser carbine	50	15 (7)	30 (3)	150 (1)	5/3	2.5/1	1	6 (-3) 10 (+2)
9	Laser rifle	100	18 (9)	36 (4)	180 (1)	6/4	3.5/1.5	1	7 (-3) 11 (+2)
9	Laser pistol	50	9 (4)	18 (2)	90 (0)	3/1	2/0.4	1	8 (-3) 11 (+1)
12*	PGMP-12	40	25 (20)	45 (8)	75 (1)	6/3	10/2.5	1	8 (-2) 11 (+1)
13	Laser carbine	200	20 (12)	40 (6)	200 (2)	4.4/2	4/14	1	6 (-2) 10 (+2)
13*	PGMP-13	∞	45 (25)	90 (12)	150 (1)	9/60	65/50	1	7 (-1) 10 (+1)
13	Laser rifle	200	40 (20)	80 (12)	400 (4)	8.8/4	8/28	1	6 (-2) 10 (+2)
13	Laser pistol	200	10 (6)	20 (3)	100 (1)	2.2/1	3/7	1	6 (-2) 11 (+1)
14	PGMP-14	∞	45 (25)	90 (12)	150 (1)	1/9**	100/65	1	7 (-1) 10 (+1)
14*	FGMP-14	∞	45 (34)	90 (22)	150 (4)	10/80	100/65	1	7 (-1) 10 (+1)
15	FGMP-15	∞	45 (34)	90 (22)	150 (4)	1/2**	400/300	1	8 (-2) 11 (+1)

*High recoil weapon. The PGMP-13 and FGMP-14 may be used only with battle dress.
**Weights given are when gravitic field generator is on. When off, multiply weight by 10.

Shots: Number of shots before power pack is exhausted.
Effective, Long, Extreme: Range in cm (penetration) at the three ranges.
Weight: Weight of weapon/powerpack in kg.
Price: Price of weapon/powerpack in thousands of Cr.
Signature DMs: Lasers +0; PGMP and FGMP: automatic spot.

INDIVIDUAL WEAPONS: SLUG THROWERS

TL	Weapon	Magazine	Effective	Long	Extreme	Weight	Price	Targets	Dex Mods
5	5.56mm revolver	6	C (0)	1 (0)	5 (0)	300/50	100/3	1	7 (-2) 9 (+1)
5	7mm revolver	6	1 (1)	2.5 (0)	8 (0)	600/75	125/4	1	7 (-2) 9 (+1)
5	9mm revolver	6	1 (1)	4 (0)	10 (0)	900/100	150/5	1	7 (-2) 9 (+1)
5	9mm magnum rvlvr	6	1 (3)	4 (1)	10 (0)	1200/120	300/8	1	7 (-2) 9 (+1)
5	Shotgun	10 (pellets)	5 (1) +6	10 (0) +3	— —	3750/750	150/10	1	4 (-1) 9 (+1)
		10 (bullets)	5 (3) +4	10 (1) +2	— —	/750	/10	1	
5	7.62mm blt-actn rifle	6	25 (3)	50 (2)	75 (2)	4000/200	200/8	1	6 (-2) 8 (+2)
6	7mm auto pistol	15	1 (1)	2.5 (0)	6 (0)	550/200	150/8	1	7 (-2) 10 (+1)
6	9mm auto pistol	15	1 (1)	4 (0)	9 (0)	750/250	200/10	1	7 (-2) 10 (+1)
6	7mm carbine	10	10 (2)	18 (1)	30 (0)	3000/125	200/10	1	5 (-1) 9 (+1)
6	7mm semi-auto rifle	20	30 (3)	60 (2)	90 (2)	4000/500	200/20	1	6 (-2) 8 (+2)
6	7mm auto rifle	20	30 (3) +3	60 (2) +2	90 (2) +1	5000/500	1000/20	2	7 (-2) 10 (+1)
6	9mm submachinegun	30	2.5 (2) +4	5 (1) +3	10 (0) +1	2500/500	150/20	2	6 (-2) 9 (+2)
7	Body pistol	6	C (0)	1 (0)	2.5 (0)	250/50	500/20	1	8 (-3) 11 (+1)
7	5.5mm assault rifle	30	18 (3) +2	35 (2) +1	60 (1) +0	3000/330	300/20	1/2	5 (-1) 8 (+2)
7	7mm assault rifle	30	18 (3) +2	50 (2) +1	75 (2) +0	4000/600	400/30	1/2	5 (-1) 8 (+2)
7	Auto shotgun	20 (pellets)	5 (1) +6*	10 (0) +3*	— —	4000/1500	500/20	1/2	4 (-1) 9 (+1)
		20 (bullets)	5 (3) +4*	10 (1) +2*	— —	/1500	/20	1/2	
8	Snub pistols:								
	10mm revolver	6 HE	C (1)	1 (1)	2.5 (1)	250/30	150/10	1	7 (-2) 10 (+1)
		6 HEAP	C (6)	1 (6)	2.5 (6)	/30	/10	1	
	10mm auto	20 HE	C (1)	1 (1)	2.5 (1)	400/100	200/30	1	7 (-2) 10 (+1)
		20 HEAP	C (6)	1 (6)	2.5 (6)	/100	/30	1	
8	Light assault gun**	5 HE	15 (3)	30 (3)	45 (3)	4000/500	600/20	1	7 (-2) 10 (+2)
		5 KEAP	20 (8)	40 (7)	60 (6)	/500	/20	1	
		5 flechette	7 (2) +2	15 (2) +1	— —	/500	/40	5 cm	
9	6mm accel rifle	15	2.5 (1) +2	5 (3) +1	8 (1) +0	2500/500	900/25	1	6 (-1) 9 (+1)

INDIVIDUAL WEAPONS: SLUG THROWERS (Continued)

TL	*Weapon*	*Magazine*	*Effective*	*Long*	*Extreme*	*Weight*	*Price*	*Targets*	*Dex Mods*
10	9mm ACR	20 slugs	30 (4) +2	60 (3) +1	90 (2) +1	3500/500	1000/15	1/2	6 (-2) 8 (+2)
		20 DS	45 (6) +2	90 (3) +1	— —	/500	/25	1/2	
		20 HE	30 (3) +2	60 (3) +1	90 (3) +0	/500	/20	1/2	
10	7mm ACR	20 slugs	30 (3) +2	60 (2) +1	90 (1) +1	3000/400	800/10	1/2	6 (-2) 8 (+2)
		20 DS	45 (4) +2	90 (2) +1	— —	/400	/20	1/2	
12	4mm gauss rifle	40	60 (7) +3	120 (3) +2	— —	3500/400	1500/40	1/2	7 (-2) 10 (+2)
13	4mm gauss pistol	15	2 (4)	4 (3)	6 (1)	650/200	600/20	1	7 (-2) 10 (+1)

*DM is for single shot fire with multiple pellets/bullets. If fired on autofire setting, double autofire DM.
** High recoil weapon.

Magazine: Number and type of rounds in a loaded magazine.
Effective, Long, Extreme: Range of weapon in cm (penetration) + autofire DM at the 3 ranges. C is contact.
Weight: Weight of weapon/loaded magazine in grams.
Price: Price of weapon/loaded magazine in Cr.
Targets: Number of targets engaged. If two are given, the first is for single shot, the second for automatic fire.
Dex Mods: Dexterity mods. Used for *Traveller* only.

STANDARD ENERGY WEAPONS

TL	*Type*	*Input*	*Effective*	*Long*	*Extreme*	*Weight*	*Price*
10	A	8.0	126 (44)/1 (28)	252 (31)/1 (15)	504 (6)/–	400	32,000
11	A	6.6	126 (44)/1 (28)	252 (31)/1 (15)	504 (6)/–	200	26,400
	B	15.7	194 (54)/3 (38)	388 (42)/2 (26)	776 (15)/1 (1)	470	62,800
12	RP-A	11.3	126 (44)/1 (28) +2	252 (31)/1 (15) +2	504 (6)/– +2	80	22,800
	B	13.5	194 (54)/3 (38)	388 (42)/2 (26)	776 (15)/1 (1)	189	54,000
	C	32.0	300 (64)/4 (48)	600 (51)/3 (24)	1200 (24)/1 (8)	448	128,000
	X	31.0	450 (67)/4 (51)	900 (56)/3 (40)	1800 (32)/1 (16)	434	186,000
13	RP-A	22.7	126 (44)/1 (28) +3	252 (31)/1 (15) +3	504 (6)/– +3	34	22,800
	RP-B	26.9	194 (54)/3 (38) +2	388 (42)/2 (26) +2	776 (15)/1 (1) +2	81	54,000
	C	32.0	300 (64)/4 (48)	600 (51)/3 (24)	1200 (24)/1 (8)	192	128,000
	X	31.0	450 (67)/4 (51)	900 (56)/3 (40)	1800 (32)/1 (16)	186	186,000
	Y	44.0	527 (71)/5 (55)	1054 (59)/3 (43)	2108 (36)/1 (20)	264	264,000
14	RP-A	31.7	126 (44)/1 (28) +4	252 (31)/1 (15) +4	504 (6)/– +4	20	16,000
	RP-B	37.7	194 (54)/3 (38) +3	388 (42)/2 (26) +3	776 (15)/1 (1) +3	47	37,700
	RP-C	44.8	300 (64)/4 (48) +2	600 (51)/3 (24) +2	1200 (24)/1 (8) +2	112	89,700
	RP-X	43.6	450 (67)/4 (51) +2	900 (56)/3 (40) +2	1800 (32)/1 (16) +2	109	131,000
	Y	30.9	527 (71)/5 (55)	1054 (59)/3 (43)	2108 (36)/1 (20)	154	185,000
	Z	61.7	750 (79)/7 (63)	1500 (68)/5 (52)	3000 (45)/2 (29)	308	370,000
15	RP-A	63.5	126 (44)/1 (28) +5	252 (31)/1 (15) +5	504 (6)/– +5	14	16,000
	RP-B	75.3	194 (54)/3 (38) +4	388 (42)/2 (26) +4	776 (15)/1 (1) +4	33	37,700
	RP-C	89.7	300 (64)/4 (48) +3	600 (51)/3 (24) +3	1200 (24)/1 (8) +3	78	89,700
	RP-X	87.3	450 (67)/4 (51) +3	900 (56)/3 (40) +3	1800 (32)/1 (16) +3	76	131,000
	RP-Y	61.8	527 (71)/5 (55) +2	1054 (59)/3 (43) +2	2108 (36)/1 (20) +2	108	185,000
	Z	61.7	750 (79)/7 (63)	1500 (68)/5 (52)	3000 (45)/2 (29)	216	370,000

Notes to Standard Energy Weapons

Type: Standard classes of energy weapons. A, B, and C are plasma guns; X, Y, and Z are fusion guns. RP is rapid pulse.
Input: Required power input in megawatts.
Effective, Long, Extreme: Range in cm (penetration value)/burst size in cm (fragmentation penetration) + hit DM.
Weight: in kg.
Price: in Cr.

Weight and price are for a vehicle-mounted weapon, and do not include fire control. Ranges given for a tech level 13 Y-gun exceed the capability of tech level 13 fire control.

RECOILLESS RIFLES

TL	*Bore*	*Effective*	*Long*	*Extreme*	*HE*	*HEAP*	*Flechette*	*Set-up*	*Crew*	*Weight*	*Price*
6	6 cm	45	90	400	9/1/1	20	–	0	2	20/2.5	9000/100
6	8 cm	80	160	550	13/2/2	30	–	2	2	100/8	13000/320
6	10 cm	125	250	800	16/2/3	40	–	3	3	200/16	16000/640
7	6 cm	100	200	400	10/1/2	30	2/5	0	2	30/3.5	15000/140
7	8 cm	150	300	600	14/2/2	35	2/15	2	2	150/11	18000/440
7	10 cm	200	400	800	17/2/3	40	2/25	3	3	300/22	24000/960

Effective, Long, Extreme: Range in cm.
HE: Contact penetration/burst size in cm/fragmentation penetration.
HEAP: Penetration.
Flechette: Flechette penetration/danger space in cm.
Set-up: Set-up time in turns.
Weight: Weight of weapon/ammunition in kg.
Price: Price of weapon/one round of ammunition in Cr. Ammunition prices listed are for a round of HE; HEAP costs 1.5 times the price listed; flechette costs twice the price listed.
Type: 6 cm recoilless rifles are infantry weapons; others are light crew-served weapons.
Signature: Recoilless rifles are automatically spotted when they fire.
Fire Control: These weapons do not require fire control.

Recoilless rifles may not fire from inside a building or bunker.

CREW SERVED WEAPONS: SLUG THROWERS

TL	*Weapon*	*Shots*	*Effective*	*Long*	*Extreme*	*Set-up*	*Targets*	*Sig.*	*Weight*	*Price*
5	Medium machinegun	100	40 (3) +4	75 (2) +3	120 (2) +1	0	8	+2	9.5/2.5	1500/120
6	Light machinegun	100	35 (3) +4	70 (2) +3	100 (2) +2	0	2	+2	5.5/2.5	1200/120
6	Heavy machinegun	100	50 (6) +3	100 (5) +2	150 (3) +1	2	4	+2	15/10	3000/250
7	5.5mm gatling gun	2500	30 (2) +7	60 (2) +5	100 (1) +3	4	16	+5	70/31	12,350/2250
7	7mm gatling gun	2500	40 (3) +7	75 (2) +5	120 (2) +3	4	16	+5	100/62	15,500/3000
8	5.5mm gatling gun	5000	30 (2) +8	60 (2) +6	100 (1) +3	4	16	+5	80/62	19,500/4500
8	7mm gatling gun	5000	40 (3) +8	75 (2) +6	120 (2) +3	4	16	+5	100/125	23,500/6000
10	VRF gauss gun	30000	150 (21) +8	300 (19) +6	450 (17) +3	10	16	+4	2000/300	200,000/6000

Shots: Number of rounds in a single belt (for machineguns) or hopper (for all others).
Effective, Long, Extreme: Range in cm (penetration) + auto fire DMs.
Set-up: Turns required to set up.
Targets: Number of targets engaged.
Sig.: Signature DM.
Weight: Weight of weapon/loaded belt or hopper in kg.
Price: Price of weapon/loaded belt or hopper in Cr.
Volume: Volume in m^3 equals weight in kg divided by 1000.
Crew: All weapons have a crew of 2 if towed or carried, 1 if vehicle mounted.
Type: The light machinegun is an infantry weapon. The medium machinegun is a high-recoil infantry weapon. The VRF gauss gun is a heavy crew-served weapon. All others are light crew-served weapons.
Dexterity Mods: Used only with *Traveller.* All weapons have a dexterity mod of 6 (-2) 10 (+2).
Fire Control: These weapons do not require fire control.

GRENADE LAUNCHERS

TL	*Weapon*	*Shots*	*Effective*	*Long*	*Extreme*	*Weight*	*Price*	*HEAP*	*HE*	*Flechette*	*Dex Mods*
6	7cm ATRL	1	10	22	35	6/1.5	200	24/8	–	–	7 (-2) 10 (+1)
6	8cm ATRL	1	12	25	37	8/2.4	250	28/10	–	–	7 (-2) 10 (+1)
6	9cm ATRL	1	15	27	40	9/3.3	300	32/12	–	–	7 (-2) 10 (+1)
6	Disposable ATGL	1	10	20	25	7	50	31	–	–	8 (-2) 11 (+1)
7	4 cm GL	1	10	20	50	3/0.2	200	15/5	7/3	–	8 (-3) 11 (+1)
7	4 cm Auto GL	16	10+3	20+2	50+1	6/8	1400	15/85	7/48	–	7 (-2) 10 (+1)
7	Disposable ATGL	1	20	40	60	3	100	36	–	–	8 (-3) 11 (+1)
8	4 cm RAM GL	3	25	50	100	4/1.4	400	24/50	7/30	2/100	7 (-2) 10 (+1)
8	4 cm RAM Auto GL	20	25+4	50+3	100+2	8/9	2200	24/350	7/200	2/700	6 (-2) 9 (+1)
9	4 cm RAM GL	3	25	50	100	4/1.4	400	28/60	9/40	2/120	7 (-2) 10 (+1)
9	4 cm RAM Auto GL	20	25+4	50+3	100+2	8.5/9	2200	28/400	9/270	2/800	6 (-2) 9 (+1)
10	4cm RAM GL	3	37	75	150	6/16	500	32/60	9/40	3/120	6 (-2) 9 (+1)
10	4 cm RAM Auto GL	20	37+4	75+3	150+2	9/12	3000	32/400	9/270	3/800	6 (-1) 9 (+1)
11	4 cm RAM GL	3	37	75	150	6/1.6	600	36/60	11/40	3/120	6 (-2) 9 (+1)
11	4 cm RAM Auto GL	20	37+4	75+3	150+2	9/12	3000	36/400	11/270	3/800	6 (-1) 9 (+1)

Weapon: An ATRL is an antitank rocket launcher. A GL is a grenade launcher. A disposable launcher is thrown away after firing once.
Shots: Number of rounds in a magazine.
Long, Effective, Extreme: Ranges in cm + auto fire DMs of auto launchers.
Weight: Weight of launcher/magazine in kilograms.
Price: Price of launcher in Cr.
HEAP, HE, Flechette: Penetration of the round/price of a loaded magazine of the type of grenade indicated, in Cr.
Dexterity Mods: Dexterity mods. Used only with Traveller.
Other information: Flechette rounds have a hit DM of +4 (in addition to any auto fire DM) and may be fired only at effective range. At tech levels 8-9, they have a danger space of 10cm; at tech levels 10-11, they have a danger space of 15cm.
HE: At tech level 7, the rounds have a fragmentation penetration of 1 and no burst size; at tech levels 8-10, they have a fragmentation penetration of 2 and a burst size of 1 cm; at tech level 11, they have a fragmentation penetration of 2 and a burst size of 2cm.
Signature: All ATRLs have a signature of +3. The tech level 7 4cm GL and auto GL have a signature of +1. All others have a signature of +2.
Number of targets: All automatic launchers may engage 2 targets; all others may engage 1 target.
Crew: ATRLs have a crew of 2; all others are individual weapons. All are infantry weapons.

RIFLE GRENADES

TL	*Type*	*Effective*	*Long*	*Extreme*	*Weight*	*HEAT*	*HE*	*Flechette*
6	4cm	2.5	5	10	.2	6/6	5/4	–
6	6cm	2.5	5	10	.6	18/12	9/8	–
7	4cm	5	10	15	.4	22/5	7/3	–
7	6cm	5	10	15	.6	27/10	11/7	–
8	4cm RAM	25	37	50	.4	24/16	7/11	2/32
9	4cm RAM	25	37	50	.4	28/20	9/13	2/40
10	4cm RAM	37	75	150	.5	32/20	9/13	3/40
11	4cm RAM	37	75	150	.5	36/20	11/13	3/40
13	4cm RAM	37	75	150	.5	38/20	13/13	4/40

Effective, Long, Extreme: Ranges in cm.
Weight: Weight in kg.
HEAT, HE, Flechette: Penetration and price in Cr of a grenade of the listed type.
Dexterity Mods: Tech level 6-9 grenades have dexterity mods of 7 (-2) 11 (+1); Tech level 10-13 grenades have dexterity mods of 6 (-2) 10 (+1). Used only with *Traveller.*
Flechette: Flechette grenades have a hit DM of +4 and may be fired only at effective range. At tech levels 8-9, they have a danger space of 10 cm; at tech level 10+, they have a danger space of 15 cm.
HE: Tech level 6-7 4 cm grenades have a fragmentation penetration of 1; all others have a fragmentation penetration of 2. Tech level 6-7 grenades have no burst size; tech level 8-10 grenades have a burst size of 1 cm; tech level 11+ grenades have a burst size of 2 cm.
Signature: RAM grenades have a signature of +2; all others have a signature of +0.
Number of targets: All grenades may engage one target.
Use: Tech level 6-9 grenades may be fired from rifles, auto rifles, and assault rifles. Tech level 10+ grenades may be fired from ACRs or gauss rifles.

HAND GRENADES

Tech Level	*Penetration HEAP*	*HE*
5	–	7/1
6	12	7/1
7	18	9/1
9	21	11/2
11	22	13/2
13	23	15/3

HE penetration is contact/fragmentation.

All hand grenades weigh 1 kg. HEAP grenades cost Cr 15 and HE grenades cost Cr 10.

Hand grenades have an effective range of 2 cm, a long range of 5 cm and no extreme range. They have a dexterity mod of 7 (-2) 11 (+1), a signature DM of +1, and may engage one target.

Smoke grenades have a range of 5 cm, weigh 1 Kg and produce an initial smoke cloud 1 cm x 1 cm. Incendiary grenades cost Cr 20 and burn for two turns. Chemical smoke grenades cost Cr 10 and burn 4 turns.

MESON ACCELERATORS

Meson accelerators are available at tech level 15. They cost Cr 10,000,000, weigh 15 tons, and have a volume of 15 m^3. Burst size is 10 cm. They require a crew of 6 and 250 megawatts of input.

BOMBS

Bombs are available in the same types as CPR gun rounds. They have the same characteristics as a mortar round (including price). Available bombs and the mortar rounds to which they correspond are listed below.

Weight	*Bore Size*
50	19
100	24
250	30

Weight: in kg.
Bore size: in cm.

DAMPER BOXES

Weight	*Price*	*Capacity*
1	1.0	3
2	1.1	6
3	1.2	9
4	1.3	12
5	1.4	15
6	1.5	18
7	1.6	21
8	1.7	24
9	1.8	27
10	1.9	30

Weight: in tons.
Price: in millions of Cr.
Capacity: Interior capacity in tons. Volume is 4 times weight.
Damper boxes are available at tech level 13+.

NUCLEAR DAMPERS

TL	*Weight*	*Price*
13	42	18
14	14	18
15	8	18

Weight: in tons. Volume in m^3 equals weight.
Price: in millions of Cr.
These values are for one unit; two units are needed for a complete damper. Each unit requires a power input of 250 megawatts.

NUCLEAR WARHEADS

Yield	*Crater*	*Induced*	*Primary*	*Secondary*	*Tertiary*	*Size*
.1	2.5	3	3/5	10/15	20/30	17
.5	2.5	3.5	3/6	15/18	33/36	18
1	4	4	3/6	21/24	42/42	19
2	5	6	6/9	30/30	54/54	20
5	5	8	15/12	48/42	66/60	21
10	6	9	18/12	54/48	72/66	22
20	6	10	30/24	54/48	90/72	23
50	7	12	42/30	75/60	120/90	24
100	10	14	48/42	75/60	126/108	25

Yield: Warhead size in kilotons.
Crater: Diamer of crater in cm.
Induced: Radius of induced radiation area in cm.
Primary, Secondary, Tertiary: Radius of blast area for air/ground burst.
Size: Minimum bore size of a weapon capable of firing the round in cm. The listed size is for tech level 6 warheads; at higher tech levels, subtract the following from the minimum bore size listed: tech level 7, -2 cm; tech level 8, -4 cm; tech levels 9-10, -6 cm; tech levels 11-12, -7 cm; tech levels 13-14, -8 cm; tech level 15, -9 cm.
Weight: A nuclear round weighs the same as an HE round for the weapon.
Price: Yield times Cr 10,000 plus (in all but mass drivers) the price of an HE round.
Storage: Nuclear rounds must be stored in damper boxes or shielded compartments. A shielded compartment takes up 4 times the volume and weighs 3 times as much as the round it stores. It costs Cr 10,000 times its volume in m^3.

COLLAPSING ROUNDS

Yield	*Penetration*	*Price*	*Size*
.001	70/7/12	1500	2
.002	74/8/13	3500	3
.005	76/9/14	5000	3.5
.010	82/10/15	10000	4
.050	94/12/17	25000	6
.100	97/12/18	50000	7

Collapsing rounds are available at tech level 13+. They must be carried in damper boxes.

Yield: Warhead size in kilotons.
Penetration: Contact penetration/burst size in cm/fragmentation penetration.
Price: in Cr.
Size: Minimum bore size of a weapon capable of firing the round.
Weight: Rounds weigh 2 times the weight of a normal round of the minimum size plus the weight of a round of the firing weapon.

MELEE WEAPON TABLE

Weapon	*Price*	*Weight*	*Str Mods*	*Attack*	*Range*	*Defense*	*Pen*
Claws	–	–	–	0	1	-1	3
Teeth	–	–	–	0	1	0	4
Horns	–	–	–	0	2	-1	5
Hooves	–	–	–	0	2	0	4
Stinger	–	–	–	0	1	0	5
Thrasher	–	–	–	0	3	-1	8
Hands	–	–	6 (-2) 9 (+1)	0	1	-1	1
Club	found	variable	5 (-3) 8 (+2)	0	1	0	2
Dagger	10	.25	4 (-2) 8 (+2)	+1	1	-1	2
Blade	50	.35	5 (-2) 9 (+1)	+1	1	-2	3
Foil	100	.50	5 (-1) 10 (+1)	+2	2	-2	3
Cutlass	100	1.3	7 (-1) 10 (+1)	+2	2	-2	3
Sword	150	1.0	6 (-2) 10 (+1)	+2	2	-3	4
Broadsword	300	2.5	8 (-4) 12 (+2)	+1	3	-2	7
Hand ax	50	.5	7 (-2) 11 (+2)	+1	2	-1	6
Battleax	200	3.0	8 (-4) 12 (+2)	0	3	0	8
Bayonet	10	.25	5 (-2) 9 (+1)	0	3	-1	3
Spear	10	1.5-3	5 (-1) 9 (+1)	0	3	-1	3
Halberd	75	2.5	6 (-2) 10 (+2)	0	4	-2	5
Pike	40	2.5	7 (-3) 10 (+1)	0	5	0	2
Staff/cudgel	10	1.0	5 (-2) 8 (+2)	0	2	-1	2

Price: in Cr.
Weight: in kg.
Str Mods: Strength mods. Used only with *Traveller.*

FIELD TELEPHONES

Type	*Weight*	*Price*
Field Telephone	2	40
Switchboard	20	500
Switchboard (TL 8+)	15	400
Master switchboard	40	1500
Master switchboard (TL 8+)	30	1000
1 km roll of wire	20	50

Field telephones are available at tech level 5+. At tech level 8+, switchboards do not require an operator.

Weight: in kg. Volume in m^3 equals weight divided by 1000.

Price: in Cr.

RADIOS

		Weight at Tech Level										
Price	*Power*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
50	1	10	1	.1	.1	.1	.1	.1	.1	.1	.1	.1
75	5	20	2	.2	.1	.1	.1	.1	.1	.1	.1	.1
100	10	30	3	.3	.2	.1	.1	.1	.1	.1	.1	.1
150	20	40	4	.4	.3	.2	.1	.1	.1	.1	.1	.1
200	30	50	5	.5	.4	.3	.2	.1	.1	.1	.1	.1
225	40	60	6	.6	.5	.4	.3	.2	.1	.1	.1	.1
250	50	70	7	.7	.6	.5	.4	.3	.2	.1	.1	.1
300	100	85	8.5	.85	.7	.6	.5	.4	.3	.2	.1	.1
350	200	100	10	1	.85	.7	.6	.5	.4	.3	.2	.1
400	300	115	12	1.2	1	.85	.7	.6	.5	.4	.3	.2
450	400	130	13	1.3	1.2	1	.85	.7	.6	.5	.4	.3
500	500	150	15	1.5	1.3	1.2	1	.85	.7	.6	.5	.4
1000	1000	220	22	2.2	1.5	1.3	1.2	1	.85	.7	.6	.5
5000	5000	300	30	3	2.2	1.5	1.3	1.2	1	.85	.7	.6

Price: in Cr. At tech level 5, triple price; at tech level 6, double price.
Weight: in kg. Volume in m^3 is weight in kg divided by 500.

RADIO DIRECTION FINDERS

Radio direction finders have the same weight and price as a 100 power radio. Indirect fire accuracy is +1 at tech level 5, and +1 for each higher tech level.

RADIO JAMMERS

Jammers are available in the same power categories as radios, at double the weight and price.

LASER COMMUNICATORS

Range	*Price*	*Weight*
5	1,200	2
10	2,000	4
20	3,000	6
50	5,000	8
100	11,000	10
1000	21,000	20

Laser communicators are available at tech level 7+.

Range: in km.
Price: in Cr.
Weight: in kg. Volume in m^3 equals weight divided by 500.

At tech level 7, double weight and price.

MASER COMMUNICATORS

Maser communicators are available at tech level 7+ at twice the weight and three times the price of a laser communicator. Note that at tech level 7, this means 4x weight and 6x price.

MESON COMMUNICATORS

Range	*Price*	*Weight*
100	1,000,000	.5
1000	5,000,000	2
10000	10,000,000	30

Meson communicators are available at tech level 15.
Range: in km.
Weight: in tons. Volume in m^3 equals weight.
Price: in Cr.

TARGET ACQUISITION RADAR

	Weight at Tech Level in Kg							
Power	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13+*
5	250	25	2.5	1.25	1	1	1	1
10	500	50	5	2.5	2	1	1	1
20	750	75	7.5	3.75	3	2	1	1
30	1000	100	10	5	4	3	2	1
40	1300	130	13	6.5	5	4	3	2
50	1500	150	15	7.5	6	5	4	3
100	2500	250	25	12.5	10	8	6	5
200	3500	350	35	17.5	15	10	8	6
300	4500	450	45	22.5	20	12	10	7
400	5500	550	55	27.5	25	14	12	8
500	6500	650	65	32.5	30	16	14	9
1000	10000	1000	100	50	40	18	16	10
5000	20000	2000	200	100	80	30	20	15

Price: Cr10,000 times weight. All weather radar costs Cr15,000 times weight. Volume in m^3 is weight in kg divided by 500.

COUNTERBATTERY RADAR

TL	*Mort/MRL*	*Hwtz/Gun*	*Acc.*
7	8+	10+	+2
8	6+	8+	+4
9	4+	6+	+6
10	2+	4+	+8
11+	0+	2+	+10

Mort/MRL, Hwtz/Gun: Die roll to locate mortars and MRLs, howitzers and guns.
Acc: Accuracy DM.
Weight and power are the same as target acquisition radar; price is Cr20,000 times weight.

TERRAIN FOLLOWING RADAR

Terrain following radar has the same characteristics as target acquisition radar.

RADAR DIRECTION FINDERS

Radar direction finders have the same characteristics as a 100 power target acquisition radar. Indirect fire accuracy is +3 at tech level 6, +1 for each higher tech level.

RADAR JAMMERS

Radar jammers are available in the same power categories as target acquisition radars. They weigh twice the listed weight and cost Cr15,000 times weight.

LADAR

Target acquisition and terrain following ladar are available at tech level 8+. Weight is the same as target acquisition radar of one tech level lower. Price is Cr10,000 times weight. All terrain following ladar has a power of 5.

VISION ENHANCEMENT

TL	*Device*	*Weight*	*Price*
5	Searchlight	10	100
6	Active IR scope	1	1000
6	Active IR seachlight	10	2000
6	Passive IR	.1	500
7	Light amplif. goggles	–	300
8	Thermal image	.5	20,000
8	Image enhancement	5	30,000
9	Thermal image goggles	–	20,000
9+	Image enhancement	1	30,000

Weight: in kg. Volume in m^3 is weight divided by 500.

Price: in Cr.

Passive IR has a range of 30 cm.

SOUND RANGING EQUIPMENT

TL	*Weight*	*Price*	*Accuracy*	*Roll to locate*	*Range*
7-8	500	20,000	-2	10+	10
9-10	1000	30,000	+2	8+	20
11+	1000	50,000	+6	6+	30

Weight: in kg.
Price: in Cr.
Range: in km.

FLASH RANGING EQUIPMENT

			Accuracy		*Roll to*
TL	*Weight*	*Price*	*Day*	*Night*	*Locate*
6-7	100	10,000	-4	0	10+
8-9	400	20,000	-1	+2	8+

Weight: in kg.
Price: in Cr.

ELECTRONIC COUNTERMEASURES (ECM) PACKAGE

Type	*Weight*	*Price*
Basic	10	50,000
Extensive	30	200,000

Available at tech level 7+.
Weight: in kg.
Price: in Cr.

MAP BOX

TL	*Price*	*Weight*
9	1500	5
10	1750	4
11	2000	3
12	2250	2
13+	2500	1

Weight: in kg.
Price: in Cr.

BATTLE COMPUTERS

TL	*Price*	*Weight*
7	200,000	100
8	150,000	50
9	100,000	20
10	100,000	19
11	100,000	18
12	100,000	17
13	100,000	16
14	100,000	15
15	100,000	14

Weight: in kg.
Price: in Cr.

ENGINEERING EQUIPMENT

TL	Description	Weight	Price
5	Wire cutters	.2	10
5	5 cm roll of barbed wire	50	20
5	Light earth moving equipment	10	50
6	Bangalore torpedo	8	50
6	Magnetic mine detector	5	100
6	Towed piledriver	500	800
6	Vehicle mounted piledriver	400	750
7	Towed mine laying equipment	500	1500
7	Vehicle mtd mine laying equipment	450	1400
8	Chemical mine sniffer	6	250

Weight: in kg.
Price: in Cr.

LINE CHARGES

TL	Type	Set-up	Weight	Price
6	Towed	6	150	550
6	Vehicle mounted	0	120	500
7	Towed	2	75	300
7	Vehicle mounted	0	60	270

Set-up: Set-up time in turns.
Weight: in kg.
Price: in Cr.

BULLDOZER

A bulldozer is a tracked vehicle equipped with a bulldozer blade. The blade and its associated hydraulic equipment weigh .5 ton and cost Cr 2000; the blade has an armor value of 15.

CRANES

A crane may be mounted on any vehicle if the addition of the crane and 2 tons of carried material would not make the vehicle's ground pressure greater than 8. A crane weighs .5 tons and costs Cr 800.

BRIDGES

TL	Length	Support	Men	Time	Weight	Price
5	1	40	60	20	10	2000
6	1	60	40	10	20	3000
6	2	30	60	15	30	5000
7	1	20	20	3	6	1000
7	2	10	30	5	10	1500
7*	2	50	1	10	36	8000

*This bridge is a vehicle-launched bridge. All others are pontoon bridges.

Length: Length of one section in cm.
Support: Weight the bridge will support in tons.
Men: Number of men required to emplace.
Time: Number of turns required to emplace.
Weight: in tons.
Price: in Cr.
Volume: A pontoon bridge's volume in m^3 equals its weight plus its support weight. A vehicle-launched bridge's volume is equal to its weight.

ASSAULT BOATS

Capacity	*Movement*	*Weight*	*Price*
6	2	10	100
12	10	100	300
20	10	200	500

Capacity: Number of men carried.
Movement: Water movement rate in cm.
Weight: in kg.
Price: in Cr.

DEMO POINT TABLE

Tech Level	*Demo Points*		
	Conv.	*Shaped*	*TDX*
5-6	10	–	–
7-8	15	60	–
9-10	20	80	10
11-12	25	100	15
13+	30	120	25

A conventional charge weighs 10 kg and costs Cr 50.

A shaped charge weighs 20 kg and costs Cr 100.

A TDX charge weighs 1 kg and costs Cr 150.

DEMOLITION PENETRATION

Demo Points	*Conv.*	*Other*	*Demo Points*	*Conv.*	*Other*
1	30	30	250	52	62
2	33	34	330	53	64
3	35	37	430	54	65
4	36	38	550	55	67
5	37	39	730	56	68
7	38	41	950	57	70
9	39	43	1200	58	71
12	40	45	1550	59	73
15	41	46	2000	60	74
19	42	47	27,500	70	89
25	43	49	100,000 (.1 Kt)	74	97
30	44	50	375,000	80	104
40	45	51	500,000 (.5 Kt)	81	106
55	46	52	1,000,000 (1 Kt)	84	110
70	47	54	5,000,000 (5 Kt)	90	119
90	48	56	10,000,000 (10 Kt)	92	123
120	49	58	20,000,000 (20 Kt)	95	127
150	50	59	50,000,000 (50 Kt)	98	133
200	51	61	100,000,000	101	137

PERSONAL BODY ARMOR

Type	*TL*	*Price*	*Armor Value*
Jack	1	50	(1)
Mesh	4	150	2
Cloth	7	250	5
Flak jacket	7	100	3
Ablat	9	75	1 [6]
Reflec	10	1500	[10]
Combat environment suit	10	1000	6
Combat armor	11	20,000	8
Combat armor	12	30,000	10
Battle dress	13	200,000	10
Combat armor	14	60,000	18
Battle dress	14	350,000	18

A chameleon surface may be added to a combat environment suit, combat armor, or battle dress at tech level 12+, at an additional cost of Cr1000. Psionic shielding may be added to any armor at tech level 12+, at an additional cost of Cr4000. In addition, any radio weighing .1 kg may be added as a helmet radio for the basic cost of the radio.

Price: in Cr.

Armor Value: Values in ( ) apply only in melee; armor values in [ ] apply only against laser fire.

PERSONAL BREATHING DEVICES

TL	*Type*	*Price*
5	Filter mask	10
5	Compressor mask	100
5	Oxygen tanks	500
8	Vacc suit	10,000

Price: in Cr.

A vacc suit has an armor value of 5.

GRAV BELTS

Grav belts are available at tech level 12+. They cost Cr100,000 each and weigh 10 kg with the power off. Maximum speed is 200 cm; cruising rate is 150 cm; NOE rate is 50 cm.

TRAILERS

A trailer may be constructed with any capacity. It weighs .2 times its capacity and costs Cr50 times its capacity in tons plus Cr200.

CAMPAIGN GAME EQUIPMENT

Field Kitchen: Field kitchens are of modular design and will operate while loaded on any vehicle of the appropriate cargo capacity. *Weight:* 1 ton. *Volume:* 10 m^3. *Price:* Cr1000.

Vehicle Mechanic's Tool Set: Includes personal tools required to maintain and repair military vehicles. *Weight:* 50 kg. *Price:* Cr1500.

Weapon Technician's Tool Set: Includes personal tools required to maintain and repair weapons. *Weight:* 20 kg. *Price:* Cr1000.

Electronics Technician's Tool Set: Includes personal tools required to maintain and repair electronic devices. *Weight:* 5 kg. *Price:* Cr2000.

Workshop: Includes heavy tools required for major maintenance and repair of vehicles, weapons, and electronics. Designed as a modular unit to operate while loaded on any vehicle with sufficient cargo capacity. *Weight:* 2 tons. *Volume:* 16 m^3. *Price:* Cr50,000.

Medical Kit: A medic's personal kit. Includes bandages and an assortment of anti-trauma and anti-infection drugs. *Weight:* 10 kg. *Price:* Cr1000.

Company Casualty Clearing Station: Includes several cots, x-ray machines, limited surgical tools, and supplies of plasma, whole blood, and drugs. *Weight:* 500 kg at tech levels 5-6, 1500 kg at tech level 7+. *Volume* (when packed away on a vehicle): .4 m^3 at tech levels 5-6, 1.2 m^3 at tech level 7+. *Price:* Cr10,000 at tech level 5-6, Cr20,000 at tech level 7+.

Battalion Aid Station: Includes an extensive assortment of medical equipment, capable of complete treatment of light wounds and emergency surgery on serious wounds. *Weight:* 1000 kg at tech level 5-6, 3000 kg at tech level 7+. *Volume* (when packed away on a vehicle): 2 m^3 at tech level 5-6, 5 m^3 at tech level 7+. *Price:* Cr60,000 at tech level 5-6, Cr100,000 at tech level 7+.

Rule Book 3—Equipment