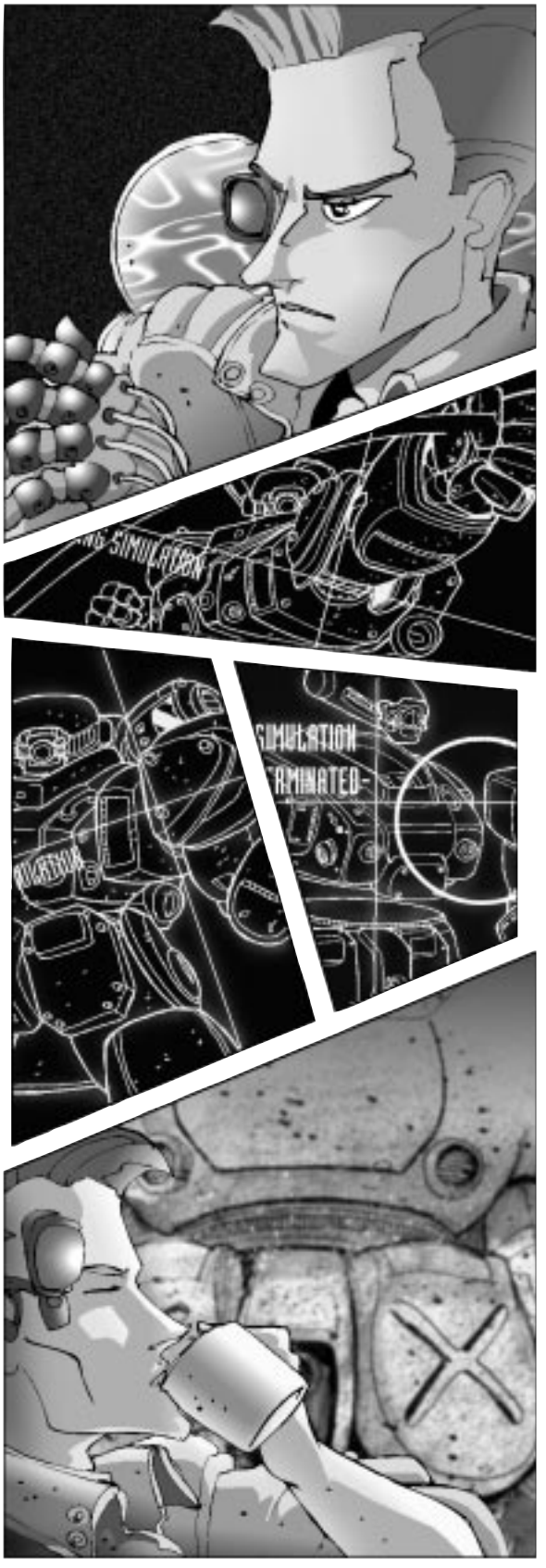

Chief Technician Grant poured himself another cup of steaming *cawfee* and once more turned his attention toward the CAD screen. It was late at night, but Grant was used to working long hours anyway. He preferred to think when the R&D department was empty and free of distractions.

The display showed the complex shoulder linkage he had been working on for the last week. The new system was supposed to allow a Gear's arm to flex three more degrees off the axis than the older design, but for some reason it kept breaking down. Grant was at a loss to solve the problem. "I know it's got something to do with the shock-absorbing sheaths," he mumbled, "But what?" He just couldn't pinpoint the exact trouble, to his unending frustration. Perhaps it was the composite material of the sheath?

Grant modified another parameter with a flick of his index finger. A tiny sensor embedded in the workstation's surface picked up the gesture and activated the computer with a barely audible beeping sound. Grant sat back and watched. The holographic display slowly changed as yet another stress simulation was launched.

A computer-generated Heavy Gear formed in mid-air, suspended about 30 centimeters above the surface of the holoviewer. It immediately started running and waved its autocannon about, aiming and firing on other illusory machines. The simulated shoulder link, oddly visible through the vehicle's imaginary surface, was glowing a deep, reassuring green.

"Come on baby, don't you let me down now." For a brief moment, Grant thought he had succeeded. Then the wire-framed Gear attempted to fire at an imaginary target to its left. At two degrees past the axis, the shoulder link abruptly changed color and snapped clean off, bringing the simulation to a stop. The computer announced calmly "Sheath failure. Try again?"

Grant cursed loudly and glanced at the half-completed prototype in the hangar just outside his office. He looked at the production schedule on the wall display to his left and cursed again. Grant got out of the small office. He paused in front of the silent machine. "Sorry boy, but I guess you'll just have to watch that shoulder."

The guys in Sales would *not* be happy to learn about this.

7.1 INTRODUCTION

This chapter covers the generation process for the vehicle statistics used in the game. One does not have to go through the construction system to play: pregenerated vehicles are provided in Chapter 10. However, to many, designing new vehicles and testing them is definitely an enjoyable part of the game.

The Silhouette vehicle generation system is quite liberal. It is meant to provide interesting, "real" vehicle designs instead of just mere sets of game statistics pulled out of charts and complex formulas. It is based on the concept that given a certain technological level, one can design a vehicle to almost any specification. There are no artificial space or weight limits placed on the components: if the vehicle *must* have a certain piece of equipment, the engineers will find a way to make it fit — even if they have to drill a hole through the hood to let that turbocharger through...

However, while it is *theoretically* possible to build a tank that will sport heavy armor and weapons while still performing like a race car, there is a catch: the cost. That one tank will probably cost more — in resources, time and money — than an entire brigade of regular tanks, and since it is so complex, it will probably be riddled with unavoidable defects (see *Lemon Rules*, page 130). Guidelines and technological limits are included and must be followed to prevent such abuses, but one could still build monsters if left unchecked. When technical limitations are provided, make sure they are respected.

Since this system was created to handle **any** vehicle type, it is non-linear in nature and does involves some calculations. These have been broken down into several easily manageable formulas for ease of play and reference. The trick is to not let yourself be intimidated by the few calculations necessary (see the *Roots and Exponents* text, next page).

It is assumed that the reader has already read the rules and is reasonably familiar with them. In any case, all relevant game terms are fully defined in the Glossary (page 231).

7.2 VEHICLE CONCEPT

This is the first step in designing a vehicle, although it is not part of the construction process per se. Decide what kind of vehicle you are designing. What is its task? What does it look like? How does it move? What kind of armament would it carry, if any?

Jot down some statistics on paper (size, speed, weapons, special systems, etc). Remember to ask yourself if a scout Gear would really be carrying a tank gun, or if a tank could really move at 200 kph on broken terrain. Remember that the costs increase exponentially, so make sure to use only what you need.

Compare the stat values to those provided for real vehicles. This is called the "reality test." Make sure you stay within the technological limits. Once this is done, you are ready to calculate the statistics of your new design.

DESIGNERS' NOTE

Sharp-eyed players will notice that no limits have been placed on the number of weapons and equipment carried by a vehicle. This is intentional and is meant to simplify the game and the construction system.

So what is preventing engineers from mounting twelve heavy autocannons on a single Heavy Gear? Nothing, except common sense. After all, the Gear would need a *huge* engine to move it (possible, but very costly) and the autocannons would have to be special recoiless ultralight models (which means higher costs). Anyway, the pilot could use no more than one or two autocannons (unless he is willing to take a -12 penalty on all his actions). And just watch that Offensive Threat Value skyrocket!

Remember, nothing in life is free. Not even payload.

One final note: although this system can be used for any kind of vehicle, the information needed to build flying and space-capable vehicles has been left out for the moment. The adjustments to the construction rules will be introduced, in a later supplement, at the same time as the flying rules.

7.3 TACTICAL AND STRATEGIC STATS

The following sixteen (16) steps are the generation system proper. In addition to the rulebook, some scratch paper, a pen and a calculator will also be needed.

ROOTS AND EXPONENTS

Although Silhouette is a fairly simple rule system, some math was bound to creep in. Roots and exponents, for example, were needed because of the non-linear nature of the construction system. Fortunately, most calculators have both the root and exponent functions, or at the very least the exponent function (refer to the calculator's manual if needed). If the calculator used is of the latter type, roots are still possible: just invert the exponent (see examples below). The following format is used throughout the chapter: squares are exponent 2 and cubes are exponent 3. Higher levels of exponents are not used.

EXPONENT OF NUMBER = NUMBER^{EXPONENT}

examples: square of 2 = 2^2 = 2 x 2 = 4 cube of 2 = 2^3 = 2 x 2 x 2 = 8

ROOT OF NUMBER = NUMBER$^{(1/ROOT\ NEEDED)}$

examples: square root of 16 = $\sqrt{16}$= $16^{(1/2)}$ = 4 cube root of 8 = $\sqrt[3]{8}$= $8^{(1/3)}$ = 2

7.3.1 STEP ONE: CHOOSE NUMBER OF CREW

How many individuals are required to operate the vehicle? Large crews improve a vehicle's combat efficiency, but they also increase expense and vehicle size. Large vehicles often need sizable crews while small vehicles cannot cram many people inside. Don't forget that human crew can be replaced by automated systems (see *Perks*, page 144).

- ***Minimum number of crew per ten Size points (or part thereof): 1***
- ***Maximum number of human crew for Heavy Gears: 1***

DESIGN EXAMPLE: STEP ONE

Kurt is designing a mass-produced, soldier Heavy Gear to form the basis of his forces. Since all Heavy Gears are single-man vehicles, Kurt writes down "Crew: 1." He considers adding some automated systems, but decides against it to keep costs down.

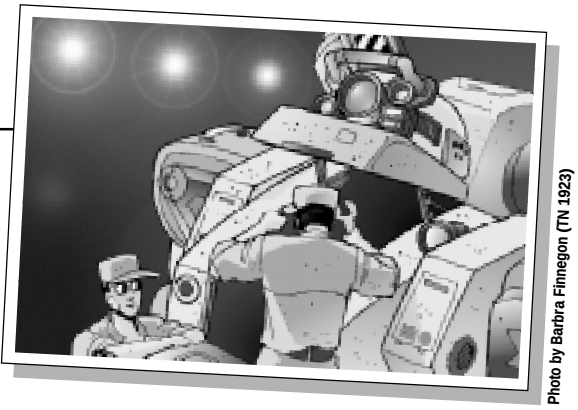

Photo by Barbra Finnegon (TN 1923)

7.3.2 STEP TWO: SELECT MOVEMENT SYSTEMS

How does your vehicle move? Choose one or more possible movement systems from the following list. Each have their own advantages and disadvantages (see *Tactical Combat* for movement and terrain penalties). Note that wheeled vehicles are assumed to be equipped with large wheels and strong suspension for rough terrain and thus are grouped with tracked vehicles in the Ground movement type. Ordinary wheeled vehicles such as cars generally have the Poor Off-Road Capability Flaw to represent the simpler nature of their drive system (see *Flaws*, page 150).

TYPICAL VEHICLE MOVEMENT SYSTEMS

Walker	Multi-legged walking vehicle
Ground	Wheeled or tracked vehicle
Hover	Hoverfan, thrust or magnetically floating vehicle
Naval	Conventional water vessels and hydrofoils
Submarine	Underwater craft of all sorts

A vehicle can have more than one movement system. Many Heavy Gears have wheels or treads in their feet to "skate" along clear ground; some ground vehicles are fully capable of operating like a boat (although they had better be watertight; see *Perks*, page 144). Few vehicles have more than two movement systems, although it is possible to mount more than two — the cost simply outstrips the added flexibility.

Now choose a top speed for each movement mode in MP. Divide these values in half to obtain the combat speed of each movement mode, rounding up. To obtain the vehicle's speed in kilometers per hour, use the following conversion rates. Always round off MP scores.

- ***50 m scale hex MP X 6 = speed in kilometers per hour***
- ***Speed in kilometers per hour/6 = 50 m scale hex MP***

MAXIMUM SPEED TABLE

Walker	Sizes 1-7	72 kph/12 MPs
	Size 8+	48 kph/8 MPs
Ground	Walker Secondary Mov.	90 kph / 15 MPs
	Sizes 1-5	240 kph/40 MPs
	Sizes 6-8	180 kph/30 MPs
	Size 8+	144 kph/24 MPs
Hover	Sizes 1-3	240 kph/40 MPs
	Sizes 4-5	210 kph/35 MPs
	Size 6+	180 kph/30 MPs
Naval	Hull	90 kph/15 MPs
	Hydrofoil	180 kph/30 MPs
Submarine	Sizes 1-3	120 kph/20 MPs
	Sizes 4+	90 kph/15 MPs

These values are the maximum speed possible for new designs. This is primarily a game balance tool for tactical combat — special vehicles can exceed them in a roleplaying setting. The speed values above are assumed to be under optimum conditions (flat, clear ground/water).

DESIGN EXAMPLE: STEP TWO

Kurt wants his Heavy Gear to have both walker and ground movement modes. He wants his Gear to have a walking top speed of 42 kph (or 7 MPs) and a rolling top speed of 72 kph (or 12 MPs). This means that his Gear will have the following top combat speeds: 21 kph walking (4 MPs) and 36 kph rolling (6 MPs). Kurt writes down "Combat Speed: Walking 4 MPs (24 kph)/Ground 6 MPs (36 kph)" on one line and "Top Speed: Walking 7 MPs (42 kph)/Ground 12 MP (72 kph)" on the next line.

Photo by Ellister T. Shandis (TN 1912)

7.3.3 STEP THREE: SELECT MANEUVERABILITY

Assign the vehicle a maneuver score. This is how maneuverable and agile the vehicle is. Positive values denote nimbleness while negative values indicate a slower reaction time or poor turn radius. Zero is a generic "average" rating for Heavy Gears, but more often than not, other vehicles are assigned lower values.

DESIGN EXAMPLE: STEP THREE

Kurt wants his Heavy Gear to have an average maneuverability, so he writes down "Maneuverability: 0."

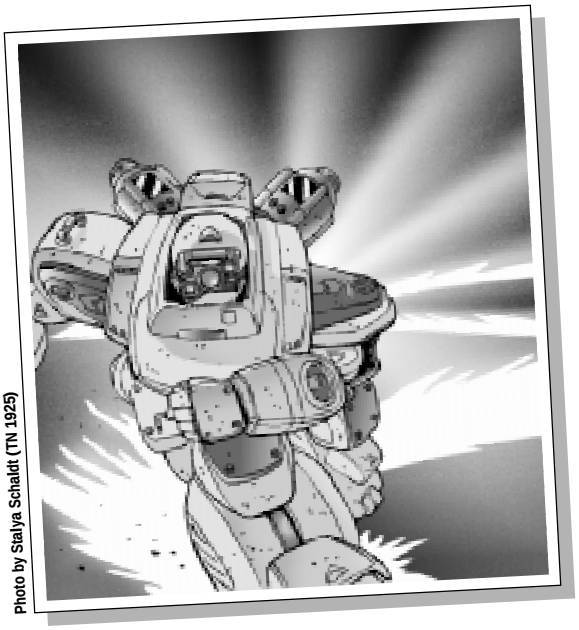

Photo by Stalya Schaldt (TN 1925)

TYPICAL MANEUVER SCORE

Vehicle Type	Typical Maneuver Score
Walker Vehicles	+3 to -3
Ground Vehicles	+2 to -3
Hover Vehicles	+1 to -4
Naval Vessels	-2 to -10
Submarine Vessels	-2 to -10

TYPICAL VEHICLE

Maneuver Score	Typical Vehicle
+3	Very advanced, top-of-the-line Heavy Gear prototype
+2	Nimble Scout Heavy Gear, Dirt Bike
+1	Nimble Heavy Gear, Motor Bike, Dirt Buggy
0	Heavy Gear, Nimble Car, Nimble Hovercraft
-1	Assault Heavy Gear, Car, Hovercraft
-2	Nimble Strider, Car
-3	Large Strider, Truck, Tug Boat
-4	Large Hovercraft, Large Truck
-5	Patrol Boat
-6	Small Naval Vessel or Landship
-8	Large Naval Vessel or Landship
-10	Supertanker

7.3.4 STEP FOUR: SELECT ARMOR RATING

Choose the Armor Rating of your vehicle. Even if you do not imagine your vehicle as being armor plated, you must still assign your vehicle an Armor Rating. This represents the sheer mass of the material stopping the damage. This rating defines how resistant to damage your vehicle will be. No vehicle can have an Armor Rating below 1.

Just like weapon damage multipliers, armor progression is not linear, that is, Armor 10 is not just twice as strong as Armor 5, it is *four* times as strong. Do not forget that the Armor Rating does not only represent the thickness and angle of the armor plating, but also the general resistance of every component in the vehicle.

For the military enthusiasts, the Armor Rating of a vehicle is related, as per the following formula, to a very approximate real world armor equivalent in millimeters of armor-grade rolled steel. As a note of interest, most modern tanks have Armor Ratings between 14 and 25 (between 200 to 600 mm equivalence).

- ***Base Armor Rating = $\sqrt{}$(mm of armor-grade steel)***

The number of damage points required to produce Light Damage, Heavy Damage and Overkill results are equal to once, twice and three times the base armor rating, respectively.

TYPICAL ARMOR RATINGS

Civilian Vehicle	1 to 8
Utility Vehicle	3 to 8
Heavy Gear	10 to 20
Armored Personel Carrier	10 to 20
Large Strider	15 to 30
Tank	20 to 40
Typical Car	2 to 4
Typical 6-wheel Truck	6
T-72 Tank (20th Century)	16
Challenger Tank (20th Century)	22
M1A1DU Tank (20th Century)	25
Battleship (20th Century)	50 to 150

DESIGN EXAMPLE: STEP FOUR

Kurt wants his Gear to have armor that is comparable to a 20th century T-72 tank. After a bit of reflection, he decides to make his Gear's armor just a bit weaker than that of the T-72. Noting that the T-72 has a base armor rating of 16, Kurt writes down "Base Armor Rating: 15" (or about the equivalent of 225mm of steel plate).

7.3.5 STEP FIVE: SELECT WEAPONS

Choose the weapons that your vehicle will be armed with, if any. Also, choose the arc of fire of each weapon. The following table is an abbreviated version of the vehicular weapon section. For more detail about the different weapon systems and their characteristics, the reader is invited to refer to the *Weapons* section (page 132).

Weapon descriptions are intentionally left vague. Only the actual game effects (as identified by the weapon's code, such as LAC, LRP/24 and so on) are rigidly defined. It is up to the designer to assign both name and form to his vehicle's armament. The actual location of the weapons has no bearing on the game mechanics — again, designer's choice.

Don't forget to add ammunition for each weapon. Check the Maximum Ammunition Load table to know how many shots can be carried for each weapon. Transporting a lot of ammunition for a given gun makes it bigger and heavier, raising the Minimum Size required to carry it. For example, a Heavy Gear (Size 6) cannot carry more than 160 shots for its autocannon (Min. Size 4, +2 for ammo). To add more ammo, the vehicle's size must be raised.

DESIGN EXAMPLE: STEP FIVE

Kurt chooses his Gear's weapons: a hand-held 25mm Riley M222 light autocannon (LAC), a shoulder-mounted 52mm RP-109 "Pepperbox" rocket pack (LRP/24), and a 44mm Mk IV grenade launcher (APGL). Three hand grenades (HG) and a vibroknife (VB), both hip-mounted, will complete the armament. He notes all of these weapons down, along with their cost. He also adds a few extra ammo packs.

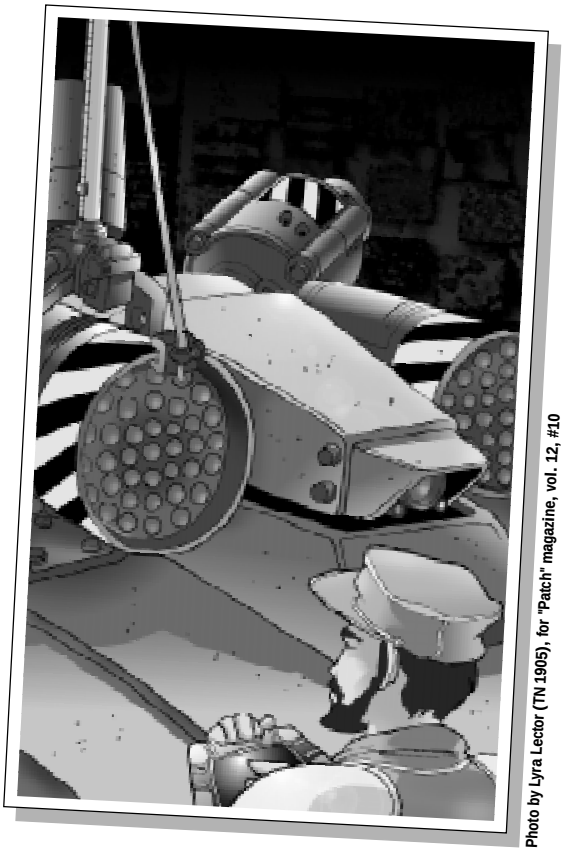

Photo by Lyra Lector (TN 1905), for "Patch" magazine, vol. 12, #10

HEAVY GEAR VEHICLE WEAPON LIST

Name	Code	Rating	Range	Dam.	Acc.	RoF	Ammo (ea.)	Min. Size	Special
Anti-Personnel G.L.	APGL	29	1/2/4/8	x3	-1	0	0.10	2	Anti-Inf., Indirect Fire, AE=0
Anti-Personnel Mortar	APM	95	2/4/8/16	x4	0	0	0.36	3	Anti-Inf., Ind. Fire, AE=0, Min Rg 2
Deployable Pack Gun	DPG	58	2/4/8/16	x8	-1	+2	0.15	3	Disposable
Frag. Cannon	FGC	195	1/2/4/8	x7	+1	0	0.75	5	Anti-Inf., Frag Ammo
Heavy Autocannon	HAC	220	3/6/12/24	x12	0	+1	0.68	5	-
Heavy Field Gun	HFG	1945	8/16/32/64	x28	0	0	7.78	10	Indirect Fire
Heavy G.L.	HGL	529	2/4/8/16	x20	-1	+1	1.63	5	Indirect Fire
Heavy Guided Mortar	HGM	632	5/10/20/40	x20	-1	0	12.60	5	Guided, Ind. Fire, Min Range 5
Heavy Machine Gun	HMG	59	1/2/4/8	x4	0	+3	0.09	3	Anti-Inf.
Light Autocannon	LAC	108	2/4/8/16	x8	0	+2	0.28	4	-
Light Field Gun	LFG	915	5/10/20/40	x22	0	0	3.65	8	Indirect Fire
Light G.L.	LGL	316	1/2/4/8	x15	-1	+2	0.90	4	Indirect Fire
Light Guided Mortar	LGM	304	3/6/12/24	x15	-1	0	6.05	4	Guided, Ind. Fire, Min Range 3
Light Machine Gun	LMG	52	1/2/4/8	x3	0	+4	0.05	3	Anti-Inf.
Medium Autocannon	MAC	163	3/6/12/24	x10	0	+1	0.51	4	-
Snub Cannon	SC	524	1/2/4/8	x28	-1	0	2.10	6	-
Anti-Tank Missile	ATM	1956	3/6/12/24	x25	+1	0	39.12	6	Guided, Indirect Fire
Heavy AT Missile	HATM	3075	5/10/20/40	x30	+1	0	61.50	9	Guided, Indirect Fire
Heavy Rocket Pack/24	HRP/24	596	3/6/12/24	x20	-1	+3	1.71	5	Indirect Fire
Heavy Rocket Pack/48	HRP/48	623	3/6/12/24	x20	-1	+4	1.71	5	Indirect Fire
Inc. Rocket Pack/10	IRP/10	339	1/2/4/8	x13	-1	+1	1.02	4	Indirect Fire, Slow Burn Incendiary
Inc. Rocket Pack/20	IRP/20	363	1/2/4/8	x13	-1	+2	1.02	4	Indirect Fire, Slow Burn Incendiary
Inc. Rocket Pack/30	IRP/30	390	1/2/4/8	x13	-1	+3	1.02	4	Indirect Fire, Slow Burn Incendiary
Light Rocket Pack/8	LRP/8	194	1/2/4/8	x12	-1	+1	0.58	3	Indirect Fire
Light Rocket Pack/16	LRP/16	209	1/2/4/8	x12	-1	+2	0.58	3	Indirect Fire
Light Rocket Pack/24	LRP/24	226	1/2/4/8	x12	-1	+3	0.58	3	Indirect Fire
Light Rocket Pack/32	LRP/32	245	1/2/4/8	x12	-1	+4	0.58	3	Indirect Fire
Med. Rocket Pack/9	MRP/9	425	2/4/8/16	x18	-1	+1	1.33	4	Indirect Fire
Med. Rocket Pack/18	MRP/18	469	2/4/8/16	x18	-1	+3	1.33	4	Indirect Fire
Med. Rocket Pack/36	MRP/36	494	2/4/8/16	x18	-1	+4	1.33	4	Indirect Fire
Chassis Reinfor.	CR	Veh. Size	0/0/0/0	+1 Dam.	0	0	n/a	n/a	Physical Attack Only
Hand Grenade (1)	HG		0/0/0/0	x15	-1	0	11	2	Anti-Infantry
Heavy Bazooka	HBZK	634	2/4/8/16	x25	0	0	2.53	5	-
Heavy Laser Cannon	HLC	623	5/10/20/40	x20	+1	0	2.48	5	-3 Dam. per r.b.
Heavy Particle Acc.	HPA	672	3/6/12/24	x15	+1	0	2.68	8	-1 Dam. per r.b., Haywire
Heavy Railgun	HRG	3339	10/20/40/80	x35	0	0	13.35	12	-
Light Bazooka	LBZK	234	2/4/8/16	x15	0	0	0.93	4	-
Light Laser Cannon	LLC	483	5/10/20/40	x16	+1	0	1.93	5	-2 Dam. per r.b.
Light Particle Acc.	LPA	270	2/4/8/16	x10	+1	0	1.07	6	-1 Dam. per r.b., Haywire
Light Railgun	LRG	603	5/10/20/40	x14	0	+2	1.93	7	-
Medium Bazooka	MBZK	409	2/4/8/16	x20	0	0	1.63	4	-
Rapid-Fire Bazooka	RFB	278	1/2/4/8	x14	0	+2	0.79	4	-
Sniper Laser Cannon	SLC	371	5/10/20/40	x12	+1	0	1.48	4	-1 Dam. per r.b.
Vibroblade	VB	16	0/0/0/0	x8	0	0	n/a	3	Physical Attack Only

MAXIMUM AMMUNITION LOAD TABLE

Weapon's Base	Increase in Weapon's Minimum Size					
Minimum Size	**0**	**+1**	**+2**	**+3**	**+4**	**+5**
1	625	2500	10,000	40,000	160,000	640,000
2	80	320	1280	5120	20,480	81,920
3	25	100	400	1600	6400	25,600
4	10	40	160	640	2560	10,240
5	5	20	80	320	1280	5120
6	3	12	48	192	768	3072
7	2	8	32	128	512	2048
8 to 9	1	4	16	64	256	1024
10 to 19	1	3	9	27	81	243
20+	1	2	4	8	16	32

7.3.6 STEP SIX: SELECT SENSORS

We now equip the vehicle with its electronic equipment. Choose the range (in km) and the quality of your vehicle's sensor array. A generic military sensor array has a score of 0. Poor or incomplete sensor systems are rated with negative values (minimum value is -5). High quality sensors have positive ratings. If your vehicle has no sensors, write down "N/A" in both entries and add the No Sensor Flaw (see *Flaws*, p. 150).

Standard battlefield vehicles normally have sensor ranges of at least 2 km. Scout vehicles will tend to have longer-range sensors. Sensor ranges are rarely greater than 7 or 8 km — mainly because that is about how far the horizon is on an Earth-sized planet when seen from a Heavy Gear.

DESIGN EXAMPLE: STEP SIX

Kurt wants his vehicle to have average quality sensors, so he writes down "Sensors: 0." He chooses to give his Gear only short range sensors (about 2km) to reduce the costs, so he adds "Sensor Range: 2 km" beside his previous entry.

7.3.7 STEP SEVEN: SELECT FIRE CONTROL

This computer handles all of the vehicle's weapon systems. Choose your vehicle's fire control score. A generic military fire control mechanism has a score of 0. High quality systems have positive values while ancient or low grade systems have negative scores (minimum value of -5 — a simple metal sight). If your vehicle has no weapons, write down "-5" in the Fire Control entry.

DESIGN EXAMPLE: STEP SEVEN

Kurt assigns his Gear an adequate but otherwise unremarkable mass-produced fire control system. He writes down "Fire Control: 0."

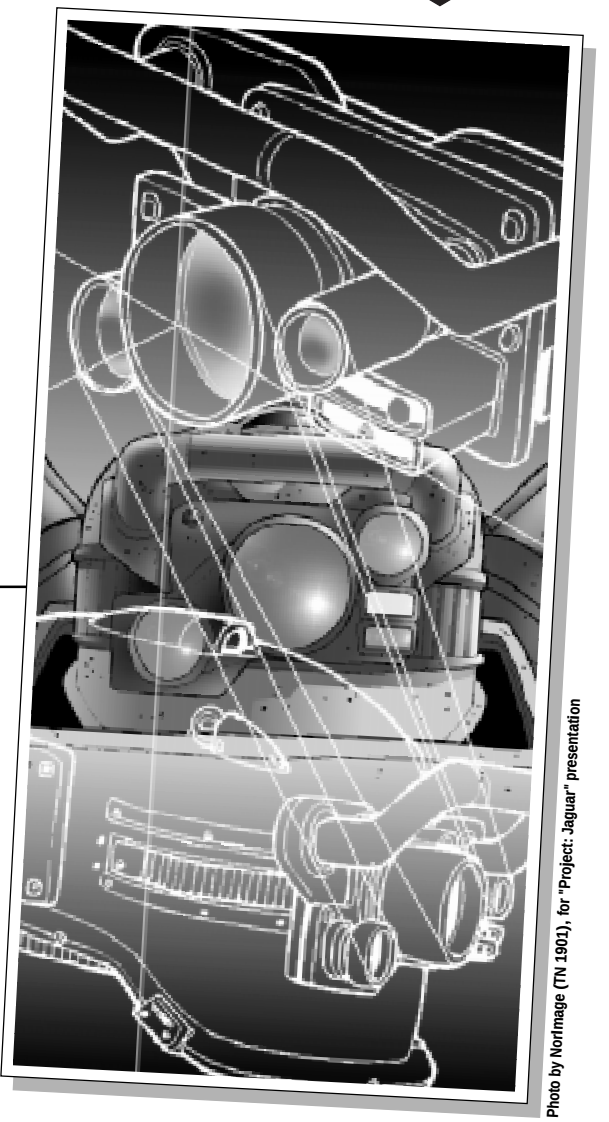

Photo by Nor!mage (TN 1901), for "Project: Jaguar" presentation

7.3.8 STEP EIGHT: SELECT COMMUNICATIONS

Choose the range (in km) and quality of your vehicle's communications array. A generic military communications system has a score of 0. Poor systems are rated with negative values (minimum is -5). High quality systems have positive ratings. If your vehicle has no communication system, write down "N/A" in both entries.

Communication systems normally have a range of at least 10 km. Note that a communication system can also serve as an entertainment system and play back standard data disks.

DESIGN EXAMPLE: STEP EIGHT

Kurt wants his Gear to have a servicable military communication system. 10 km seems like a good range for his comm system. He writes down "Communications: 0, Communications Range: 10 km."

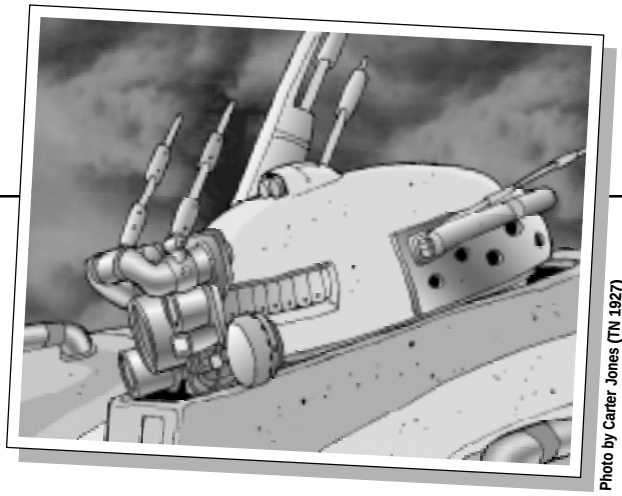

Photo by Carter Jones (TN 1927)

7.3.9 STEP NINE: SELECT DEPLOYMENT RANGE

Choose the Deployment Range (in km) of your vehicle. This is the maximum distance it can cover without refueling or maintenance. This stat has no real purpose in Tactical Combat, but is extremely important in the RPG. It can also be used to establish scenarios.

High performance machines will only be able to cover small distances before refueling or servicing. Others will have large fuel tanks and/or rugged systems that allows them to travel further. It really depends on the individual machine, so no "standard" value is given. Remember that the Deployment Range *is* factored into the total cost.

DESIGN EXAMPLE: STEP NINE

Kurt wants his Gear to have a good operating range for extended operations. He thinks 500 km is a good range (most modern tanks can cover between 300 to 600 km) so he writes down "Deployment Range: 500 km."

7.3.10 STEP TEN: SELECT PERKS AND FLAWS

Look over the Perks and Flaws list. Select the ones you want your vehicle to have. Remember that numerous Perks can make a vehicle very complex, increasing the odds that defects will occur. A complete and detailed explanation of each Perk and Flaw is provided in *Perks* (p. 144) and *Flaws* (p. 150).

The minimum cost of the combined Perks and Flaws of a vehicle is 0. If the total cost is negative, consider it as being equal to zero.

DESIGN EXAMPLE: STEP TEN

Kurt ponders what Perks and Flaws his Gear will have. First, as a fully humanoid Heavy Gear, the vehicle should have arms. Kurt selects two Rating 6 Manipulator Arms, so the Gear will have hands for fine manipulation. He notices that these arms often have optional reinforcement to allow punching. Since the Gear's high maneuverability and good speed make it an excellent close combat vehicle, he keeps this option in mind.

Since most of Terra Nova is covered with deserts, it seems sensible to make the Gear sand-proof with Hostile Environment Protection: Desert. This will add filters and dust covers to all vital mechanisms. As a final touch, the Easy to Modify Perk is added to represent the simple, no-nonsense design of the machine, useful for a front-line combatant.

Kurt looks over the Flaws list in an attempt to lower costs, but since he intends to use his new Gear as a major building block of his army, he plays it safe and foregoes the Flaws entirely.

Photo by Carter Jones (TN 1926), cover of "Gear Yourself", vol. 2, #5

PERKS QUICK REFERENCE TABLE

PERK NOTE:

Perks with the designation AUX are defined as auxiliary systems for damage purposes.

Perks with the designation R have a rating. This rating is listed next to the Perk on the data sheet.

Name	Cost
Advanced Controls	10
Airdroppable	4
Ammo/Fuel Containment System	4
Amphibious	5
Aquatic Sensors AUX	2 (if only aquatic sensors) or 2 + 1/2 of range in km of sensor (if normal + aquatic)
Artificial Intelligence R	25 + 25 x rating
Audio System AUX	0.5
Automation R	10 + rating
Autopilot AUX	5
Backup Communications System	4
Backup Fire Control	5
Backup Life Support	2
Backup Sensors	5
Battle Arm R	0.2 x Rating for each arm
Cargo Bay	square root (volume in cubic meters)
Crew Accommodations	10 + number of crewmembers (military) or 20 + number of crewmembers x 2 (luxury)
Easy to Modify	10
Ejection System AUX	1 + (number of bonus actions due to crew)
ECM AUX R	rating x 2
ECCM AUX R	rating x 2
Emergency Medical	0.1 x number of crew and passengers
Fire Resistant	8
Geological Sensor AUX	4
Haywire Resistant	10
HEAT-Resistant Armor R	rating
High Towing Capability	5 (double) or 15 (triple)
Hostile Environment Protection	
Desert	1
Extreme Heat	4

Name	Cost
Extreme Cold	3
High Pressure	4 (High Pressure) or 10 (Extreme Pressure)
Underwater	2
Improved Off-Road Ability	6
Improved Rear Defence	10
Jump Jets AUX R	maximum jumping distance in hexes x size
Laboratories R	10 + 10 x rating (per lab)
Life Support AUX	2 (limited) or 5 (full)
Loudspeakers AUX	1 (or 2 for really powerful speakers)
Manipulator Arm R	0.5 x Rating for each arm
Micro-Labs	5 (per micro-lab)
Mining Equipement AUX	5 (light duty) or 20 (heavy duty)
Passenger Accommodations	10 + number of passengers (military) or 30 + number of passengers x 3 (luxury)
Passenger Seating	$\sqrt{(3 + \text{number of passengers})}$
Reinforced Armor R	rating (per arc of attack)
Reinforced Chassis	6
Reinforced Crew Compartment	4
Reinforced Location Armor R	0.5 x rating, rounded up
Rugged Movement Systems	5
Satellite Uplink AUX	10
Shielded Weapons	5
Searchlight AUX	1 per 50m range
Sick Bay	maximum number of patients x 2
Sniper Systems	5 per weapon linked to the system
Stealth AUX R	rating x 3
Target Designator AUX	5 + base range in hexes
Tool Arm R	0.3 x Rating for each arm
Vehicle Bay AUX	Bay's Size x 5
Weapon Link	1 per weapon in the link (per link)
Wide Angle Searchlight AUX	2 per 50m range

FLAWS QUICK REFERENCE TABLE

FLAW NOTE:

Flaws with the designation R have a rating. This rating is listed next to the Flaw on the data sheet.

Name	Cost
Annoyance	-0.2 per Annoyance
Defective Active Sensors R	-rating
Defective Fire Control R	-rating x 2
Exposed Auxiliary Systems	-5
Exposed Crew Compartment	-5
Exposed Fire Control Systems	-4
Exposed Movement System	-5
Extreme Overheating	-10
Fragile Chassis	-5
Hazardous Ammo/Fuel Storage	-5
Highly Flammable	-7

Name	Cost
Inefficient Controls	-9
Large Sensor Profile R	-rating x 2
No Sensors	-6
Overheating	-5
Poor Off-Road Ability	-1
Poor Towing Capability	-4
Random Shutdown R	-0.5 x Rating
Sensor Dependent	-6
Vulnerable to Haywire Effects	-9
Weak Facing	-(0.25 x base armor rating) (per defensive arc)
Weak Point R	0.5 x Rating, rounded down

7.3.11 STEP ELEVEN: CALCULATE THREAT VALUE

Calculating the Threat Value of a vehicle is a rather lengthy process involving numerous steps. First, you must calculate the separate Offensive Score, Defensive Score and Miscellaneous Score values of the vehicle (Step 11a, 11b and 11c below). If any of these scores is less than one, the score becomes one (1).

These three scores are combined together using the following formula to determine the vehicle's total Threat Value. This allows the player to change some equipment or values without having to recalculate the whole vehicle. Round the scores and the final Threat Value off to the nearest whole number.

THREAT VALUE =
(Offensive Score + Defensive Score + Misc Score) ÷ 3

A NOTE ON THREAT VALUE

The system of Threat Values enables the players to establish scenarios without the help of a Gamemaster. However, it is not the ultimate, perfect system (such a system may, alas, never exist). This is why a vehicle's Threat Value is further broken down into Offensive, Defensive and Miscellaneous Values. These three "sub-values" point out the strength and weaknesses of each vehicle design, making it much easier to balance out scenarios according to the mission at hand.

• Step Eleven-A: Calculate Offensive Score

Look up the weapon ratings for all your vehicle's weapons. If the vehicle has arms that can punch, square one-half of the punch's damage multiplier (the arm's size) to calculate the weapon rating of each punching arm (see below).

IMPORTANT NOTE:

If a weapon has either a Fixed Forward (FF) arc or is turret mounted (T arc), its weapon rating is altered. Weapons with FF arcs have a x0.6 multiplier applied to their Weapon Threat Rating while weapons with T arcs have a x1.8 multiplier applied to their Rating (this includes the cost of the turret, so no additional cost is applied).

WEAPONS WITH FF ARC =
Weapon Threat Rating x 0.6

WEAPONS WITH T ARC =
Weapon Threat Rating x 1.8

PUNCH RATING =
(damage multiplier of arm x 0.5)²

OFFENSIVE MULTIPLIER =
Total Weapon Rating of All Weapons +
Punch Rating for each arm (if applicable) + Ammo

OFFENSIVE SCORE =
Targeting System Multiplier* x Offensive Multiplier

* Do NOT use the actual targeting system value. Instead, look up the targeting system value on the Targeting Multiplier Systems table and use the multiplier given by the table.

TARGETING SYSTEM MULTIPLIER

Fire Control Score	Multiplier
+5	x700
+4	x120
+3	x24
+2	x6
+1	x2
0	x1
-1	x0.5
-2	x0.333
-3	x0.25
-4	x0.2
-5	x0.167

Vehicles with high Offensive Threat Values are especially good at dishing out damage. On open terrain and in face-to-face confrontations, they are very likely to come out on top.

• Step Eleven-B: Calculate Defensive Score

Use the following formula to calculate your vehicle's Defensive Score. The Defensive Score includes anything that might help the vehicle survive on the battlefield, such as speed, maneuverability and armor.

DEFENSIVE MULTIPLIER =
(Armor Rating)² + (fastest movement speed in kph ÷ 25†)³ + (sum of speeds of all other movement modes in kph ÷ 6)²

DEFENSIVE SCORE =
Maneuver Multiplier* x Defensive Multiplier

†Vehicles whose **only** movement mode is Ground divide the speed by 40 instead of 25.

* Do NOT use the actual maneuver value. Instead, look up the maneuver value on the Maneuver Multiplier table (next page) and use the multiplier given by the table.

Vehicles with high Defensive Threat Values are especially good at avoiding damage or surviving it. Their strong point is defending objectives and escaping enemy forces.

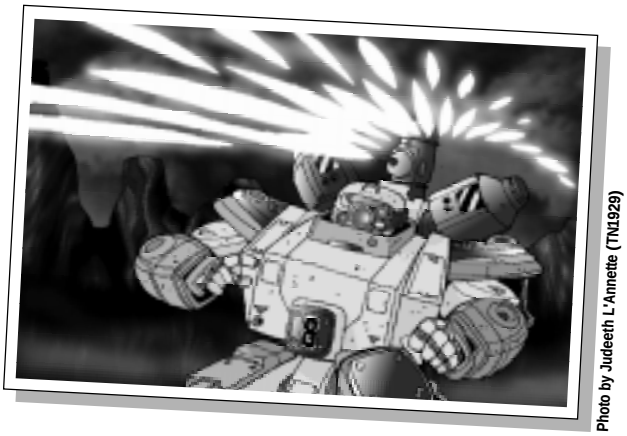

Photo by Judeeth L'Annette (TN1929)

MANEUVER MULTIPLIER

Maneuver Score	Multiplier
+10	5500000
+9	550000
+8	60000
+7	7500
+6	1000
+5	180
+4	36
+3	9
+2	3
+1	1.5
0	1
-1	0.667
-2	0.5
-3	0.4
-4	0.333
-5	0.286
-6	0.25
-7	0.222
-8	0.2
-9	0.182
-10	0.167

- Step Eleven-C: Calculate Miscellaneous Score

Use the formula listed in next column to calculate your vehicle's Miscellaneous Score. The Perk/Flaw Point Total referred to in the formula is the total cost of all of the vehicle's Perks and Flaws. Remember that the minimum cost of Perks and Flaws is zero.

MISCELLANEOUS SCORE =
(Total Actions granted by Crew)³
+ (Communication Range in km ÷ 10)³
+ (Sensor Range in km ÷ 2)³
+ (Deployment Range in km ÷ 50)²
+ (Sensor Score + Communications Score + Total Perk/Flaw cost)² †

† The minimum value for the sum of Sensor Score + Communications Score + Total Perk/Flaw is 0. If the total is less than zero, then use zero instead.

DESIGN EXAMPLE: STEP ELEVEN

Kurt pulls out his trusty calculator and starts to work out his Gear's Offensive Score. He adds the weapon ratings of each of his Gear's weapons: 108 (for the Light Autocannon) + 226 (for the LRP/24) + (29 x 0.6) (for the fixed AP Grenade Launcher) + vibroknife (16 points) = 367.4. He decides to add the punching option to both arms, at a cost of $(6 \times 0.5)^2 = 9$ points, 60 shots for the autocannon (16.8 points), 24 rockets (13.9), 6 shots for the APGL (0.6 points), and 3 grenades (11 points each), bringing his Offensive score to 449.7. Since his Targeting System Multiplier is 1, his final Offensive score is 449.7.

He moves on to his Gear's Defensive Score. He enters his Gear's numbers in the Defense Multiplier formula. His calculations look like this: $15^2 + (72/25)^3 + (42/6)^2 = 297.9$. Since his Maneuver Multiplier is 1, his final Defensive Score is 297.9.

Kurt now starts calculating his Miscellaneous Score. He begins by calculating his total Perk/Flaw cost. He adds 3 + 3 (both arms) + 1 (Desert) + 10 (Easy to Modify) = 17. Kurt then uses this number to help him calculate his Miscellaneous score as follows: $1^3 + (10/10)^3 + (2/2)^3 + (500/50)^2 + (0+0+17)^2 = 392$.

To find his vehicle's final Threat Value, he takes the average of the three numbers. His calculations look like this: (449.7+297.9+392)/3 = 379.86. The Threat Value of his Gear is 380.

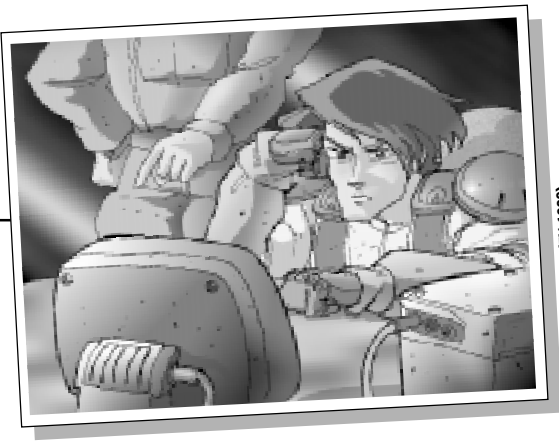

Photo by Nathan Forrest (TN 1929)

7.3.12 STEP TWELVE: CALCULATE DEFAULT SIZE AND COST

The Default Size score of a vehicle is calculated using the following formula. Round the Default Size to the nearest whole number.

DEFAULT SIZE =
$\sqrt[3]{\text{(Final Threat Value)}}$

The armor rating of a vehicle places certain constraints upon its minimum Default Size. If the Default Size is calculated at less than one-fifth of the Armor Rating, raise the Default Size to one-fifth (round up) of the Armor Rating.

If the Default Size of your vehicle is more than ten times its Armor Rating, you grossly underestimated the toughness of your vehicle and its structure is too flimsy to stay together. You must go back to Step Four, increase the vehicle's Armor Rating, and recalculate the vehicle's Threat Rating and Size (Steps Eleven and Twelve).

The Default Cost in Mark/Dinar (see *Equipment*, page 75) is equal to the final Threat Value times 1000. The final cost will be calculated in the appropriate monetary unit according to the vehicle's point of origin.

DESIGN EXAMPLE: STEP TWELVE

The Default Size of Kurt's vehicle is equal to the cube root of 380, or 7.24, rounded down to 7. This is well above its minimum of (15/5) = 3 (one-fifth of its base armor rating).

The Default Cost of his Gear is 380,000 Marks/Dinars.

7.3.13 STEP THIRTEEN: SELECT ACTUAL SIZE AND PRE-PRODUCTION COST

Your vehicle does not have to be the size generated by your calculations. It may be as large as twice the Default Size score or as small as one-fifth the Default Size score. There is no Threat cost involved in changing sizes within these limits because the advantages and disadvantages tend to cancel each other out. For example, a smaller vehicle will be easier to carry around, but a larger one will be cheaper to design (more room to work with!) and cause more damage in physical attacks.

If the Size of your vehicle is greater than twice its Armor Rating, you must reduce the vehicle's Size so that it is no greater than twice the vehicle's Armor Rating.

A vehicle must have at least one crew member per ten Size points or fraction thereof. The Automation and Artificial Intelligence Perks can also be used to substitute for living crew members.

Most Heavy Gears are Size 6 or 7, although they could probably go as low as Size 5.

The formula used to determine the maximum mass of each Size is as follows:

MASS (KG) =
((Size + 0.5) X 3) cubed

This yields the mass in kilograms (simply divide by 1000 to get a result in tons). The final mass is then rounded up.

The pre-production cost of a vehicle is calculated using the following formula.

PRE-PRODUCTION COST =
Default Cost x (Default Size ÷ Actual Size)

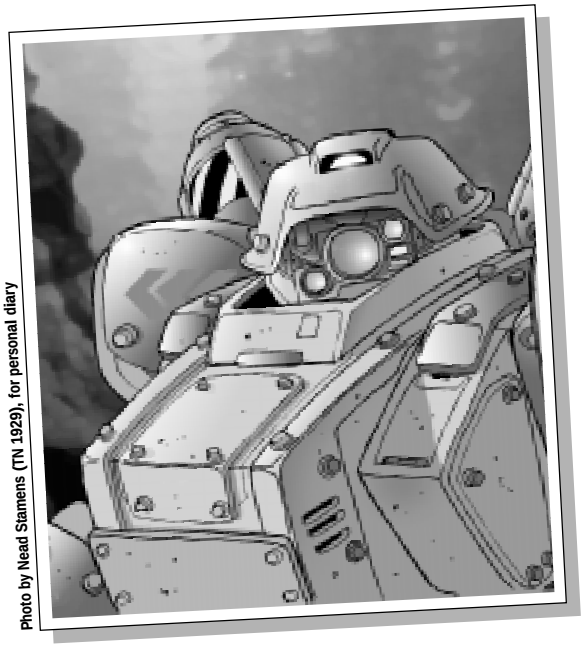

Photo by Nead Stamens (TN 1929), for personal diary

DESIGN EXAMPLE: STEP THIRTEEN

*Kurt looks up Size 7 on the Size to Mass Table in his ever-present **Heavy Gear** rulebook and finds that this represents between 7.4 and 10 tons. He imagines his Gear being a little lighter than that (if only to stuff more of them in the cargo holds of his transports), so he decides to make it Size 6. Since his Actual Size is lower than his Default Size, his Pre-Production Cost will be greater than his Default Cost. He multiplies his Default Cost (380,000) by 7 (Default Size) and divides this by 6 (Actual Size), arriving at a Pre-Production Cost of 443,333. Miniaturization does tend to raise the cost a little.*

SIZE TO MASS TABLE

Size	Mass in Tons	Size	Mass in Tons	Size	Mass in Tons
1	0-0.08	34	1001-1100	67	7901-8300
2	0.09-0.3	35	1101-1210	68	8301-8700
3	0.4-1.1	36	1201-1300	69	8701-9100
4	1.2-2.4	37	1301-1400	70	9101-9500
5	2.5-4.4	38	1401-1500	71	9501-9900
6	4.5-7.4	39	1501-1700	72	9901-10300
7	7.5-10	40	1701-1800	73	10301-10700
8	11-16	41	1801-1900	74	10701-11200
9	17-22	42	1901-2100	75	11201-11600
10	23-30	43	2101-2200	76	11601-12100
11	31-40	44	2201-2400	77	12101-12600
12	41-52	45	2401-2500	78	12601-13100
13	53-65	46	2501-2700	79	13101-13600
14	66-81	47	2701-2900	80	13601-14100
15	82-100	48	2901-3100	81	14101-14600
16	101-120	49	3101-3300	82	14601-15200
17	121-145	50	3301-3500	83	15201-15700
18	146-170	51	3501-3700	84	15701-16300
19	171-200	52	3701-3900	85	16301-16900
20	201-230	53	3901-4100	86	16901-17500
21	231-270	54	4101-4400	87	17501-18100
22	271-310	55	4401-4600	88	18101-18700
23	311-350	56	4601-4900	89	18701-19400
24	351-400	57	4901-5100	90	19401-20000
25	401-450	58	5101-5400	91	20001-20700
26	451-500	59	5401-5700	92	20701-21400
27	501-560	60	5701-6000	93	21401-22100
28	561-630	61	6001-6300	94	22101-22800
29	631-690	62	6301-6600	95	22801-23500
30	691-770	63	6601-6900	96	23501-24100
31	771-840	64	6901-7200	97	24101-25000
32	841-930	65	7201-7600	98	25001-25800
33	931-1000	66	7601-7900	99	25801-26600

7.3.14 STEP FOURTEEN: SELECT PRODUCTION TYPE AND LEMON ROLLS

Not every vehicle is made quite the same, even if they are of the same make, model, and variant. Every once in a while, someone screws up and a lemon is produced. Just how many mistakes get made depends on what kind of model the vehicle is.

Choose what stage of production your vehicle is in. Is it a prototype which still needs to get all the kinks worked out? Is it a trusty old model that has been in mass production for years? Is it a limited edition model that is only assigned to elite units? Or is it a scratch-built vehicle that is being held together with baling wire and prayers? The production type will also define how much care is put into each unit built.

Note that this table is designed for vehicles of Size 1 to about 15. Larger vehicles, such as the monstrous Landships, rarely go past what could be considered the Early Production stage because of their extremely large and complex construction. The same phenomenon applies to spaceships as well.

PRODUCTION TYPES

Model Type	Definition	Model Dice	Indiv. Dice
Testbed Prototype	New Tech	12	2
Early Prototype	New Model	8	1
Late Prototype	New Model	4	1
Early Production	New Release	3	3
Limited Production	High End Model	1	2
Mass Production	Common Model	2	3
Scratch-Built	Patchwork Mess	N/A	10

In addition to the base model "lemon" dice, one die is added for every 5 Perks that you assigned to your vehicle.

Roll the total number of dice normally (i.e. highest number counts, additional sixes give +1). For each point over five on the dice, a Defect occurs. Fumbles are disregarded and are treated as a roll of one (1). When a new model is produced, its model dice are rolled and the defects common to all vehicles of this model are determined. In addition, each individual vehicle gets a set number of lemon dice. Write down this individual lemon dice number in your vehicle description. Whenever a vehicle of this type is introduced into a game or campaign, its individual lemon dice should be rolled.

Roll once on this table per defect. If multiple options are available, choose one.

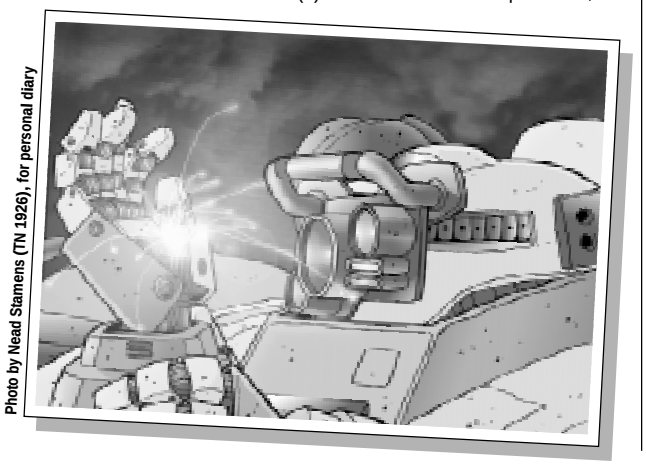

Photo by Nead Stamens (TN 1926), for personal diary

LEMON DEFECT TABLE

Die Roll	Defect
1	Structural Weakness (-1 maneuvering **or** -10% to armor, rounding up)
2	Electronic Glitch (-1 targeting **or** -1 sensors **or** -1 communications)
3	Movement System Defect (-1 maneuver **or** -10% speed (min 1 MP))
4	Vehicle has one Annoyance Flaw
5	Vehicle has one Flaw with a cost of between 0 and -2
6	Vehicle has one Flaw with a cost of -2 or worse

• Getting Rid of Defects

The "Model Lemon Defects" are basically errors in either design or construction, and as such cannot be eliminated unless the vehicle is totally redesigned back at the factory.

Individual defects are not so bad, however; they simply represent errors made on the assembly line. Unfortunately, repairing these amounts to taking the vehicle apart and putting it back together — correctly, this time. They are repaired like normal battle damage (see *Repairs*, page 112), but the repair time is doubled for each defect repaired (fixing two defects will take four times as long as a normal repair, etc.), and the difficulty is also doubled. A failed repair roll means the vehicle is stuck with the defect. A fumbled roll means an automatic additional Defect!

• Cursed Option

Optionally, the Annoyance Flaw can be refused in favor of choosing to have the Cursed Defect: effectively, the vehicle proves Murphy's Law whenever it is convenient for the Gamemaster. This can be used only in a roleplaying or integrated game.

Examples: A tank model that gets struck by lightning 10 times more often than other tanks. A stealth submarine whose hull, for some unknown reason, picks up and resonates nearby radio stations. A destroyer which is just plain jinxed ("It's haunted... Yeah, that's it!").

DESIGN EXAMPLE: STEP FOURTEEN

Kurt has already decided that his Gear is a mass production model. He rolls two dice for his model's "lemon dice" and obtains a 4. All vehicles of this model will have to roll three dice for individual flaws, but the base model is sound and has no design defects. Kurt sighs with relief.

7.3.15 STEP FIFTEEN: CALCULATE FINAL COST

Multiply the Pre-Production Cost of the vehicle with the Production Cost Multiplier to obtain the Final Cost of the vehicle. This is the cost for the fully loaded vehicle, with complete armament, ammunition and fuel.

If you wish to know the "empty" cost of the vehicle (without weapons and ammunition), simply remove the weapons and their ammo from the Offensive Score calculations and recheck the new Threat Value.

VEHICLE FINAL COST

Model Type	Production Cost Multiplier
Testbed Prototype	x100
Early Prototype	x20
Late Prototype	x5
Early Production	x1
Limited Production	x2
Mass Production	x0.5
Scratch-Built	x0.2

DESIGN EXAMPLE: STEP FIFTEEN

Since Kurt's Gear is a United Mercantile Federation mass production model, its final cost is 0.5 of the Pre-Production Cost. Half of 443,333 is 221,667, so the final cost of each battle-ready Gear of this model is 221,667 Marks.

Without its weapon complement and ammunition, Kurt's Gear sells for a mere 118,000 Marks. A bit useless, but cheap!

7.3.16 STEP SIXTEEN: NAME THE DESIGN

Christen your new creation. Try to choose a name that is evocative and that will please you. Most Northern leagues name their Gears after great mammals of Earth, mostly large cats and other wild animals. The Southerners prefer more Terranovan animals such as reptiles to name their Gears after.

Optionally, write down the vehicle's history and description. Why was it commissioned? By whom? Who was part of the original design team? Were there any unforeseen difficulties or did the development proceed smoothly? How long has the vehicle been in service, and how many were built? Once these questions are answered, you will have a well-defined, interesting vehicle to add to your forces.

You are now ready to take your new vehicle onto the battlefield.

DESIGN EXAMPLE: STEP SIXTEEN

Kurt now has to name his Heavy Gear. After pondering the name "Ranger" for a while, he decides to call it the "Hunter."

Photo by Yan Kondo (TN 1928), "Big Brother"