

*Vehicles:
Design and Operation*

TRAVELLER
Science-Fiction Adventure ☺
in the Far Future

A Classic Traveller Supplement

The deck gratings rang as Jamison raced to the main hatch, cocking his submachinegun. He reached the opening just as the thieves vaulted into the back of a waiting hover van. The vehicle began sliding greasily across the pavement, speed building as the driver spun the fans up; dust and grit spraying across the landing platform. Jamison fired in short bursts, slugs tearing through the tough fabric of the skirts and sparking as they punched through the vehicle's thin sides and into the drive fans. The van slid drunkenly as the pressure dropped in the plenum chamber, scraping the edge of the parking bay berm as the driver fought to regain control.

Introduction:

Vehicles is a supplement to Traveller books 1 through 4 and is intended to provide a quick and easy system for designing, operating, and fighting vehicles in the far future. This is the first of a series of three articles dealing with vehicles. The second article will cover specialized military operations, and the third article will deal with large vehicles and aircraft.

The emphasis is on playability, simplicity, and compatibility with the core Traveller rules. Traveller books 1 and 3 are required for the use of these rules. Players wishing to build armed vehicles will require the weapon data from Book 4: *Mercenary*.

These rules are divided into three sections: Design, Operations, and Combat. Commonly used tables have been combined for ease of reference and a design worksheet is included. A step-by-step vehicle design guide, including a filled-out worksheet is also included.

The Traveller universe is a rich and varied setting with endless possibilities. Referees and players are encouraged to add on to, modify, or change any of these rules to suit their own playing style and views.

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1.0 Design

1.01 Preliminaries:

Define the purpose of the vehicle and the tech level at which it will be constructed.

1.02 Bodies:

Select a body size. Body sizes are specified in units called spaces. Bodies can range in size from 2 to 40 spaces. Larger vehicles are possible, but care should be taken to control armor values to maintain play balance. For the purpose of calculating vehicle volume as cargo, 4 spaces are equal to one D-ton.

There is no cost for bodies.

1.03 Drive:

There are 6 basic forms of drive: wheels, tracks, watercraft, rotorcraft (helicopters and ducted fans), air cushion and anti-gravity. These systems are also available in high-speed options. Consult the drive table and calculate the cost and volume (in spaces) of the desired system for the selected body size.

1.04 Power System:

Power systems come in 3 types; extended duration (fusion and antimatter plants), standard duration (internal combustion, electric, etc.) and a modified system reserved for rotorcraft. Extended duration power systems require fueling once a month. Standard duration systems require refueling or recharging more frequently.

Both internal and external combustion systems will only operate in atmosphere types 4 to 9. They are designed for a single, specific atmosphere type. Modifications to allow multi-environment operation increase the cost by 25%.

The performance data for external combustion systems assume the use of high-energy fuel, such as coal. If a low-energy fuel, such as wood, is substituted, vehicle performance and duration will be reduced by 25%.

Extended duration: The duration of advanced electric power systems can be extended to 1 week. This requires adding 50% (rounded down) to the space requirement with a minimum of 1 space. There is no added cost.

Batteries, internal combustion and rotorcraft systems may have their duration doubled. This requires adding 50% (rounded down) to the space requirement with a minimum of 1 space. External combustion systems use high-bulk fuel. Their duration may be extended 2 hours for each 50% space requirement added. Additional fuel may be carried as cargo.

Consult the power systems table and calculate the cost and volume required for the drive system selected.

1.05 Performance:

Basic vehicle performance may be improved. Rotorcraft may not be improved. For these improvements, modify the drive system, and then recalculate the power system from the new figure.

Enhanced: Increase drive system space and cost by 50% - speed increases 50% for ground vehicles, speed multiplied by 5 for grav vehicles.

Boosted: Double drive system space and cost - speed doubled for ground vehicles, speed multiplied by 10 for grav vehicles.

Downgraded: weaker, cheaper drives are available. Reduce drive system space and cost by 25%, speed decreases by 25%, speeded divided by 2 for grav vehicles.

1.06 Accommodations:

Crew and passenger accommodations can be selected from the accommodations table. Extended accommodations are available at TL 6 and provide full life support for the duration of the power system. They may support double occupancy on an emergency basis for a limited time.

Passengers are any personnel not operating a vehicle system, such as troops.

Armed vehicles require a crew position for each gunner. A gunner may control more than 1 weapon, but may only fire 1 weapon each turn.

Vehicle drivers may fire light and minor weapons in front body mounts only.

Armed vehicles with multiple weapons mounted in other than front body mounts must have a commander. Commanders may fire minor weapons only. Commanders may use other skills such as Tactics, Recon, Leadership, etc. while operating a vehicle. Other crew members may not.

Calculate the cost and volume requirement of all accommodations.

1.07 Cargo:

Cargo can be carried at the rate of 500 kilograms per space. Unused passenger accommodations can carry 250 kilograms each.

Calculate the volume requirements for cargo capacity. Cargo space has no cost.

1.08 Armor:

Consult the armor table and select the level of armor protection desired for the vehicle. Two formulas are provided to calculate the cost and volume requirements for armor. The first formula determines the spaces needed to achieve a given armor value. The second formula determines the armor value that can be fit into a given number of spaces.

Rotorcraft may not be armored.

Unarmored vehicles have a default armor value of 2.

1.09 Weaponry:

Select any desired weaponry from the weapons table. Rotorcraft may not mount main weapons, or any weapons in other than front body mounts or a single turret.

Each weapon must be installed in a mount. There are 2 types of mount available; body and turret. Body mounts have a 90-degree arc of fire from a designated side. Body mounts are considered to be pintel mounts for minor weapons, hull mounts for others.

Hull mounts can be more difficult to aim than turreted weapons. Vehicles with hull mounted weapons are considered to be moving at a minimum of Slow speed whenever they engage a new target. Subsequent fire at the same target is handled normally.

Weapons may be mounted in turrets. Turret mounts may fire in any direction. Minor weapons mounted in turrets are considered to be coaxial if operated by the gunner or ring/pintel/cupola mounted if operated by the commander.

Turrets take up one space plus the space of all installed weapons. Turrets DO count against the space limit of the vehicle body. Cost is Cr10,000 per space.

Calculate the cost and volume requirements for weapons and mounts.

1.10 Extras:

Additional systems may be added at the discretion of the designer, using either a straight cost, or cost-per-space basis. These would include vehicle computers, filtration systems, vision enhancement systems, etc. There is no space requirement for these systems.

2.0 Operations

2.01 Preliminaries:

These rules are intended to operate with either the range band system of Books 1 and 4, or a 15-meter square grid system as defined in *The Traveller Book*.

They may also be used without a grid by converting the 15 meter square to a convenient scale, such as 30mm or 1 inch.

2.02 Movement:

These rules are not comprehensive. Given the wide variety of situations Travellers may find themselves in, it is up to the referee to apply common sense to each situation.

Safe vehicle operation is affected by a number of factors. The Control Table lists the maximum safe operating speeds for several different conditions. Roll the indicated number or higher on 2D6 to avoid mishap whenever higher speeds or violent maneuvers are attempted while these conditions apply.

DM: +1 per level of vehicle skill, -1 for each marginal condition that applies (cumulative)

Ideal conditions assume good weather, a clear travel surface, unrestricted visibility and little or no traffic. Normal conditions are moderate traffic and an adequate travel surface. Marginal conditions can be poor weather, heavy traffic, a poor travel surface, nap-of-earth flight, or operating a damaged vehicle. Dangerous conditions can be combinations of the above or special circumstances of weather or terrain.

2.03 Long Distance Travel:

For all vehicles, roll 4+ on 2D6 per day of travel to avoid a mishap. DM's: +relevant skill; +2 if Dexterity 8+; also consult the Terrain, Weather, and Speed DM Tables. A roll of 2 is always a mishap, and a roll of 12 is never a mishap, regardless of DM's.

If a rotorcraft or grav vehicle mishap occurs, roll 4+ on 2d6 to avoid crashing; in Bad weather, roll 8+ to avoid crashing; and in Extreme weather, roll 10+ to avoid crashing.

If a watercraft mishap occurs in Bad weather, roll 8+ on 2d6 to avoid sinking; in Extreme weather, roll 10+ to avoid sinking.

The exact nature of a mishap is left to the referee, but a suggested default is one roll on the Minor Penetration table.

2.04 Tactical Movement:

Abstract movement: simple encounters, such as chases can be handled in an abstract manner as detailed under the Air/Raft skill description in Book 1.

Range band system: each vehicle is allowed a move of 1 for each 10kph of speed. Vehicles changing direction, i.e. going from opening range to closing range, must stop for one turn before continuing in the new direction. Changing direction while traveling at speeds greater than the safe operating speed is a violent maneuver.

Grid system: each vehicle is allowed a move of 1 for each 10kph of speed. If using a square grid, movement on the diagonal costs 15kph per square. Vehicles changing direction, i.e. going from opening range to closing range, must stop for one turn before continuing in the new direction. Changing direction while traveling at speeds greater than the safe operating speed is a violent maneuver.

Accidents: mishaps while operating a vehicle may result in accidents ranging from a scraped fender to a head-on collision. Referees will need to assess these individually, but as a guideline, use the minor penetration table for most collisions, and the major penetration table for more

serious ones. In each case, all occupants will have to roll to avoid injury. Roll Strength or less on 2D6 to avoid injury. Severity of injuries will be linked to the severity of the crash.

Given the wide variety of terrain types that may be encountered, some judgment will be required by the referee. For example, soft, boggy ground might be rough terrain to ground vehicles, good surface to air cushion vehicles, and impassable to walkers.

2.05 Maintenance:

All vehicles require maintenance, many will require repairs.

Each vehicle requires a number of maintenance points equal to the number of spaces devoted to drives, power systems and weapons. Maintenance points are provided by skilled mechanical and electronic technicians. Skill level 1 provides 50 maintenance points with each additional skill level adding 5 points, thus a character with Mechanical-3 can provide 60 maintenance points. Vehicles not receiving adequate maintenance are subject to breakdowns, the frequency and severity of which are up to the individual referee.

Repairs: vehicles that have broken down or suffered damage in combat or accidents require repair. A suggested roll to successfully repair a system is 8+ subject to DM's for skill, availability of tools, etc.

Attempts to repair breakdowns or disabled systems require a number of hours equal to their maintenance points, with parts costing 2 to 12% of the system cost.

Attempts to repair destroyed systems require double their maintenance point cost in hours with parts costing 20 to 120% of the system cost.

Example: the *Simoon* recon skid (described later) has a total of 20 spaces devoted to drives, power systems and weapons; therefore it requires 20 maintenance points. A platoon of 5 vehicles would require 100 points, and could be kept serviced by 2 mechanic-1's.

If the *Simoon's* rail gun was disabled, it would require 2 hours per repair attempt with a total parts cost of from Cr162 to Cr972.

If the gun was destroyed, repairing it would require 4 hours per repair attempt with a total parts cost of from Cr1,620 to Cr9,720.

Tinkering: Characters with the appropriate skill may modify vehicles to increase maximum speed. Roll 8+ (mechanical, electronic, or vehicle skill) for each week of work. Success increases vehicle speed 10%. Cost is 2D6 x Cr100 for parts (Cr1000 for grav vehicles). Maximum increase is equal to base skill. Vehicles enhanced in this manner may be more difficult to control. Rotorcraft may not be modified.

3.0 Combat

3.01 Preliminaries:

Vehicles combat uses a range matrix and the base 8+ to hit roll similar to those in Books 1 and 4. Instead of a weapon's matrix, a penetration system is used. A number of factors peculiar to vehicular combat are also introduced.

3.02 Range Matrix:

Consult the Range Matrix. Cross-index the attacker's fire control tech level with the appropriate range. Apply DM's for movement and target status as listed below.

Movement DM's: Vehicles are considered to be moving Fast if speed in kph > TL²; Slow if moving at all. Light and minor weapons use the same movement modifiers as main weapons. TAC missile launchers must be stationary to fire up to TL9, may fire while moving Slow from TL10-12, and may fire while moving Fast at TL13+.

Moving target penalty: If the target speed in kph is greater than TL², -1; TL³, DM -2.

Grav vehicles and rotorcraft may execute pop-ups from behind cover in lieu of other movement in a turn. Vehicles performing pop-ups fire as if moving Slow and are fired at as if moving Fast. When flying nap-of-earth, grav vehicles and rotorcraft are limited to TL x 10 + 40kph.

Static targets, such as buildings, or vehicles that have not moved for 2 consecutive turns are attacked with a DM of +3.

Target size (spaces): 5 to 10 +1, 11 to 20 +2, >20 +3

Targets in cover receive a DM of -2.

Hull mounts can be more difficult to aim than turreted weapons. Vehicles with hull mounted weapons are considered to be moving at a minimum of Slow speed whenever they engage a new target. Subsequent fire at the same target is handled normally.

In order to simulate the effects of counter-measures and point defense systems, TAC missiles have an additional modifier based on tech level. Subtract the tech level of the target from the tech level of the missile. This is applied as a DM in addition to those listed above.

Inactive targets, such as buildings, are treated as tech level 5 for this rule.

In all cases and regardless of DM's, an unmodified roll of 2 always misses and an unmodified roll of 12 always hits. If a hit is scored, proceed to the Penetration Table.

3.03 Personal Weapons vs. Vehicles:

Small-arms fire against vehicles is conducted in accordance with the combat rules in Books 1 and 4. Vehicles are considered to be armored in mesh for hit determination.

If a hit is scored on an armored vehicle, consult the Personal weapons chart to determine the firing weapon's penetration value. If the vehicle is unarmored, consider it to have an Armor of 2.

If a hit is scored, proceed to the Penetration Table.

3.04 Vehicle Weapons vs. Personnel:

Vehicle weapons fired at personnel targets use a damage resolution system to that in the "Field Artillery" section of Book 4.

Main weapons have an effect radius equal to their tech level in meters. Light weapons have an effect radius equal to ½ their tech level (rounded up) in meters. Minor weapons use the group hits from auto-fire rules. For guns and high energy weapons, use the rule in Book 4. For lasers, use the following rule: lasers have a base chance of 8+ to hit any personnel within their effect radius using the target characteristic DM's of a laser rifle and inflicting 6D of damage.

Main weapons are considered to be guns from TL5 to 7, guns, lasers, or mass drivers (rail or coil

guns) from TL8 to 9, Plasma guns from TL10 to 12 and fusion guns from TL13 up. Light weapons are considered to be auto-cannons from TL5 to 8, pulse lasers or VRF Gauss guns from TL9 to 10, rapid-pulse plasma guns from TL11 to 13 and rapid-pulse fusion guns from TL14 up. Minor weapons are considered machineguns from TL's 5 to 8, laser or gauss rifles from TL9 to 11, PGMP-12's from TL12 to 13, and FGMP-14's at higher TL's.

3.05 Penetration and Damage:

Vehicles that have sustained a hit roll on the penetration table.

Roll 1D6. Add the firing weapon's penetration and subtract the target vehicle's armor rating.

Consult the Penetration Table if the result is either a minor or major penetration.

Crew and passengers may attempt to bail out of a destroyed vehicle. Roll Dexterity or less on 2D6. Characters failing this roll suffer 2D6 hits per turn, increasing by 1D6 for every turn after the first.

Crew/passenger and weapon hits are assigned randomly. If a vehicle has no weapons, treat as a crew/passenger hit.

Grav vehicles and rotorcraft may be forced down. Roll 10+ to avoid a crash. Crashed vehicles use the accident rule in the Operations section.

3.06 New Weapons:

Ground-mounted TAC missile launchers: these are equivalent to vehicle-mounted TAC missiles.

Missile cost is: $TL^2 \times Cr10$, weight is: $TL \times 5kg$, pen = $TL \times 3$.

Launcher cost is: missile cost $\times TL Cr$, launcher weight is missile weight $\times 10$.

Available at TL6+.

Man-portable versions are available: cost is: $TL^2 \times Cr10$, weight is: $TL \times 2.5kg$, pen = $TL \times 3$.

These function as normal TAC missiles with a -1DM.

Available at TL7+.

Unguided rocket launchers are available starting at TL6. These cost $TL \times Cr10$, weigh $TL \times 1kg$, and have the firing characteristics of a RAM HEAP grenade. Pen = $TL \times 2$.

Vehicle Design Sheet

Vehicle: _____

TL ____, disp. ____ tons, Cr _____

Vehicle type:			TL:
System		Spaces	Cost
Body:			n/a
Drive:			
Power:			
extended duration:			
modified performance:			
Accommodations:			
Crew:			
Passengers:			
Cargo:			n/a
Armor:			
Weapon 1:			
mount:			
crew:			
Weapon 2:			
mount:			
crew:			
Weapon 3:			
mount:			
crew:			
Turret:			
Totals:		0	0

Performance	Cruise speed	Max speed	Off-road	Rough terrain

Fire Control	Slow (any)	Fast (>TL^2)	Very Fast (>TL^3)
Speed in kph/penalty			

Weapon	Med.	Long	V. Long	Distant	HE Radius

Design Example:

Concept: Air-cushion recon vehicle, TL9

It's easiest to design military vehicles by selecting weapons and crew first. This vehicle will have a turreted rail gun, 2 TAC missiles and a Gauss SAW for the commander. The crew will be driver, gunner, and commander.

Light weapon: 2 spaces, Cr8,100 (TL² x Cr100), penetration 18 (TL x 2)
TAC missiles: 2 spaces (1 each), Cr16,200 (Cr8,100 ea.), penetration 27 (TL x 3)
Minor weapon: 1 space, Cr4,050 (TL² x Cr50), penetration 9 (TL)

These weapons require turret space. Turrets take up 1 space plus the space of all installed systems. Cost is Cr10,000 per space.

Turret: 1 space, Cr10,000.
Turret systems: 5 spaces, Cr50,000

As a rule of thumb, military vehicles should be 40 spaces.

Body size: 40 spaces, no cost.

Once the body size is determined, we can install drives and power.

Air-cushion: 10 spaces (body x .25), Cr100,000
Fusion: 5 spaces (50% of drive), Cr1,500,000

The crew goes in next. Since this vehicle may operate in extreme environments, we'll use extended accommodations.

3 crew, extended accommodations: 9 spaces, Cr30,000.

*No cargo, so the remaining 7 spaces will go to armor. Since we know the available spaces, we'll use the second formula to determine armor value: $Sp / (B * F) = Av$*

$10 / (40 * .018) = 13.8$, rounded to 14.

Armor: 10 spaces, Cr25,000.

This vehicle, named the *Simoon*, has been detailed on the design worksheet on the next page.

Sample Vehicle Design Sheet

Vehicle: Simoon Air-cushion Recon Skid

TL 9, disp. 10 tons, Cr1,708,550

Vehicle type: recon skid			TL: 9
System		Spaces	Cost
Body:		< 40 >	n/a
Drive: air-cushion		10	100000
Power: fusion		5	1500000
extended duration:			
modified performance:			
Accommodations:			
Crew: driver		3	1000
Passengers:		n/a	n/a
Cargo:			n/a
Armor:		10	25000
Weapon 1: railgun		2	8100
mount: turret			20000
crew: gunner 1		3	1000
Weapon 2: TAC missiles		2	16200
mount: turret			20000
crew: gunner 1		n/a	
Weapon 3: Gauss SAW		1	4050
mount: turret			10000
crew: commander		3	1000
Turret:		1	10000
Totals:		40	1716350

Performance	Cruise speed	Max speed	Off-road	Rough terrain
Atmo. 4 or 5	50kph	75kph	50kph	n/a
Atmo. 6 or 7	100kph	150kph	100kph	n/a
Atmo. 8+	150kph	225kph	150kph	n/a

Fire Control	Slow (any)	Fast (>TL^2)	Very Fast (>TL^3)
Speed in kph/penalty	-1	>80kph/-2	>729 kph/-3

Weapon	Med.	Long	V. Long	Distant	HE Radius
Railgun	+2 (9)	+1 (9)	0 (9)	-3 (5)	5m
TAC missile	-6 (27)	+3 (27)	+3 (27)	+3 (27)	n/a
Gauss SAW	+3 (5)	0 (5)	-2 (5)	-4 (3)	Group hits

Design Tables

1.03 Drive Table:

Drive Type	Tech Level	Space Requirement	System Cost per space
Lt. Wheel	5	B* x 0.25 (min. 1)	Cr750
Std. Wheel	6	B x 0.25 (min. 1)	Cr1,000
Track	5	B x 0.25 (min. 1)	Cr1,000
Air-cushion	7	B x 0.25 (min. 1)	Cr10,000
Anti-gravity	8	B x .125 (min. 1)	Cr100,000
Legs	9	B x 0.25 (min 1)	Cr2000
Watercraft	4-9	B x 0.25 (min 1)	Cr1,000
Rotorcraft	6-9	B x 0.25 (min 1)	Cr10,000

* B = body size in spaces

1.04 Power Systems Table:

System Type	Tech Level	Spaces required	Cost: space=1	Cost: space=2+	Duration	Fuel
Antimatter	18	25% of Drive (min. 1)	Cr500,000	Cr375,000	1 year	Antimatter
Fusion	9	50% of Drive (min. 1)	Cr400,000	Cr300,000	1 month	Hydrogen
Adv. Electric	8	50% of Drive (min. 1)	Cr3,000	Cr2,250	1 day	Recharge
Int. combustion	5	50% of Drive (min. 1)	Cr2,000	Cr1,500	1 day	Hydrocarbons
Battery	7	50% of Drive (min. 1)	Cr5,000	Cr3,750	12 hours	Recharge
Ext. combustion	4	200% of Drive (min. 1)	Cr1,500	Cr1,000	4 hours	Hydrocarbons or organics
Rotorcraft	6-9	Equal to Drive (min. 1)	Cr5,000	Cr15,000	1.5 hours	Hydrocarbons

1.05 Performance Table:

Drive Type	Cruise Speed	Max Speed	Off-road Speed	Rough Terrain Speed
Lt. Wheel	100kph	150kph	10kph	n/a
Std. Wheel	100kph	150kph	40kph	20kph
Track	80kph	100kph	60kph	30kph
Air-cushion (1)	100kph	150kph	100kph	n/a
Anti-gravity	100kph	120kph	n/a	n/a
Legs	60kph	80kph	60kph	40kph
Watercraft	30kph	50kph	n/a	n/a (2)
Rotorcraft	200kph	300kph	n/a	n/a

(1) Air-cushion speeds are reduced by half in thin atmospheres (types 4 and 5) and increased by half in dense atmospheres (types 8 and above). Air-cushion does not work in Very Thin, Trace or Vacuum atmospheres (type 3 and below).

(2) Watercraft speeds can be reduced to half or less depending on water conditions.

Design Tables (cont'd)

1.06 Accommodations Table:

Crew position	2 spaces	No cost
Passenger station	1 space	No cost
Extended accommodations	+50% to total (rnd up)	Cr1000 per person

1.08 Armor Table:

Armor Type	Armor Factor (F)	Cost per space	Tech level available
Simple	.025	Cr1,250	4+
Alloy	.02	Cr1,500	6+
Composite	.018	Cr2,500	8+
Enhanced	.017	Cr5,000	10+
Exotic	.016	Cr10,000	12+
Enhanced Exotic	.015	Cr20,000	14+

Use one of the following formulas to determine armor space/cost:

$$B * F * Av = Sp$$

$$Sp / (B * F) = Av$$

B = total vehicle space, F = armor factor, Av = armor value, Sp = armor space requirement.

1.09 Weapon Table:

Weapon Type	Crew	Space	Cost Formula	Penetration Formula (5)
Heavy Main weapon (1)	2 (4)	8	TL ² x Cr5,000	Pen = TL x 4
Medium Main weapon (1)	2 (4)	6	TL ² x Cr1,000	Pen = TL x 3.5
Light Main weapon (1)	2 (4)	4	TL ² x Cr500	Pen = TL x 3
Light weapon (2)	1	2	TL ² x Cr100	Pen = TL x 2
Minor weapon (3)	1	1	TL ² x Cr50	Pen = TL
TAC missile	1	1 per missile	TL ² x Cr100	Pen = TL x 3

(1) Main weapons are considered to be guns from TL5 to 7, guns, mass drivers, or lasers from TL8 to 9, Plasma guns from TL10 to 12 and fusion guns from TL13 up. Round fractional penetrations down.

(2) Light weapons are considered to be auto-cannons from TL5 to 8, pulse lasers or VRF Gauss guns from TL9 to 10, rapid-pulse plasma guns from TL11 to 13 and rapid-pulse fusion guns from TL14 up.

(3) Minor weapons are considered machineguns from TL's 5 to 8, light lasers or gauss SAW's from TL9 to 11, and rapid-pulse plasma guns from TL12 up.

(4) Crew is 2 until tech level 9, then drops to 1.

(5) Penetration of all weapons except TAC missiles is halved at Distant range.

Exceptions: energy weapons are not halved in atmosphere types 0 or 1. In atmosphere types 8 and above, they are halved at Very Long range, and quartered at Distant.

Operations Tables

2.02 Control Table:

Conditions	Max. Safe Speed	Control Roll
Ideal	Max Speed	5+
Normal	Cruise Speed	6+
Marginal	Off-road or NOE speed (1)	7+
Dangerous	Rough Terrain Speed or ¼ Cruise Speed (1)	8+

(1): Watercraft, rotorcraft, or grav vehicles only.

2.03 Long Distance Travel:

Terrain DM's:

Terrain	DM (1)	Example
Road	0	Road
Flat Off-road	-2	Plains
Moderate Off-road	-4	Hills
Difficult Off-road	-6	Crags, mountains

(1) Tracked vehicles halve all Terrain DM's; air-cushion vehicles halve the Flat and Moderate Off-road terrain DM's but cannot move through Difficult Off-road terrain at all.

Speed DM's:

Speed	DM
Cruise Speed	0
Max Speed or NOE	-2

Weather DM's:

Weather	DM	Example
Clear	0	A windless sunny day
Moderate	-1	Winds and moderate rainfall
Bad	-3	Storm
Extreme	-6	Hurricane

Combat Tables

3.02 Range Matrix:

Attacker's Fire Control TL	Medium	Long	Very Long	Distant	Movement Slow/Fast (3)
5-6	+2	+2	+1	0	-6/-8
7-10	+3	+3	+2	+1	-1/-2
11-13	+4	+3	+3	+2	0/-1
14-15	+6	+4	+4	+3	0/0
Light Weapons	+2	+1	0	-3	Per TL (1)
Minor Weapons	+3	0	-2	-4	Per TL (1)
TAC Missile	-6	+3	+3	+3	Not allowed (2)

- (1) Light and minor weapons use the same movement modifiers as main weapons.
- (2) TAC missile launchers must be stationary to fire up to TL9, may fire while moving slow from TL10-12, and may fire while moving fast at TL13+.
- (3) Vehicles are considered to be moving Fast if speed in kph > TL²; Slow if moving at all.

3.03 Personal Weapons:

Weapon Type	Penetration formula	Range Effects
Standard slug-throwers	Will not penetrate armor	n/a
Gauss weapons and weapons firing DS ammunition	Penetration = number of damage dice x 2	½ pen at distant range
High Explosive ammunition	Penetration = number of damage dice	Pen unaffected by range
HEAP ammunition	Penetration = number of damage dice x 2	Pen unaffected by range
High-energy weapons	Penetration = number of damage dice x 2	Use the dice reduction listed on the range matrix in book 4
HEAP RAM grenades	Penetration = number of damage dice x 3	Pen unaffected by range
Lasers	Penetration = number of damage dice x 2	Pen halved at very long and quartered at distant

3.04 Penetration Table:

Roll 1D6 + pen - armor value:

Dice	Effect
3 or less	No effect
4 to 7	Minor penetration
8 to 11	Major penetration
12+	Destroyed

Damage Effects Table:

Roll 1D6:

Dice	Minor penetration	Major penetration
1	Drive disabled: speed reduced to 1/2	Drive destroyed. No movement.
2	Drive disabled. No movement	1 weapon destroyed.
3	Power system disabled. No movement and no energy weapon fire. Hydrocarbon-fueled vehicles destroyed. Grav vehicles or rotorcraft forced down.	Power system destroyed. No movement and no energy weapon fire. Hydrocarbon-fueled vehicles destroyed. Grav vehicles or rotorcraft crash.
4	Crew/passenger hit. Use normal attack by weapon type.	1D6 Crew/passenger hits. Use normal attack by weapon type.
5	1 weapon disabled.	Vehicle destroyed.
6	1 electronic system damaged.	Vehicle destroyed.