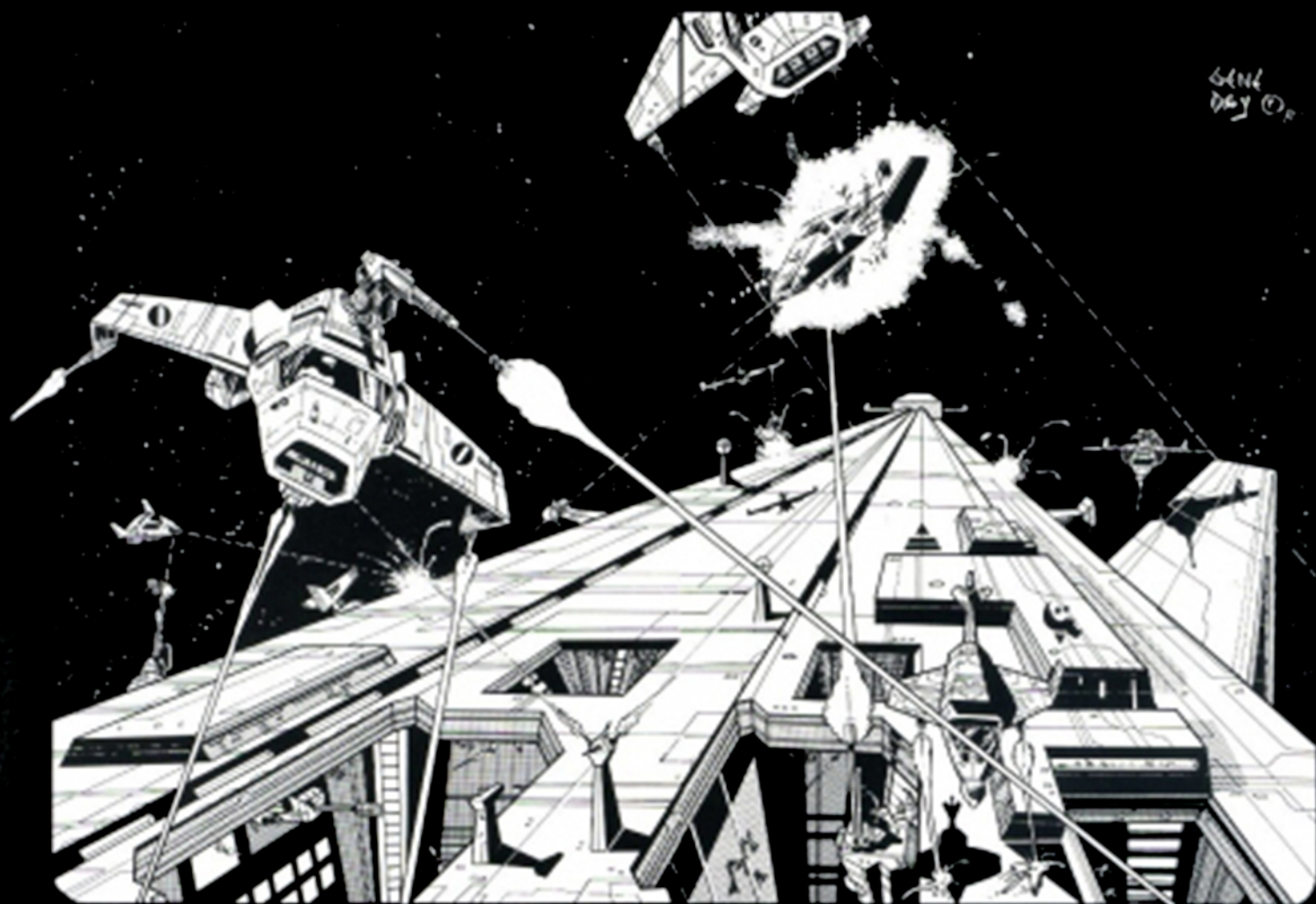


SPACE OPERA GROUND & AIR EQUIPMENT



Edward E. Simbalist
A. Mark Ratner



Fantasy Games Unlimited, Inc.

SPACE OPERA
GROUND & AIR
EQUIPMENT

Edward E. Simbalist
A. Mark Ratner



Fantasy Games Unlimited, Inc.

U.S. Copyright Notice

Copyright 1981 Edward E. Simbalist and A. Mark Ratner.

All rights to this book are reserved. No part of this book may be used or reproduced in any manner whatsoever without permission, except in the case of brief quotations embodied in critical articles or reviews.

Cover art and interior illustrations are copyright 1981 by Gene Day.

For information contact Fantasy Games Unlimited Inc., P.O.Box 182, Roslyn, N.Y. 11576 U.S.A.

CONTENTS

1.0 Armored Vehicles	2
2.0 EW & ECM	12
3.0 Anti-Aircraft Fire	12
4.0 Aircraft Rules	13
4.1 Air and StarFighter Combat	14
4.2 Bombing & Strafing	15
4.3 Planetary Bombardment	15
5.0 Military Aircraft	16
5.1 Air-to-Air Missiles	21
5.2 Air-to-Surface Missiles	21
5.3 Bombs	21
6.0 StarFighters	21
7.0 Warheads	24
7.1 Nuclear Weapons	25
7.2 Portable Rocket and Missile Launchers	28
7.3 Calliopes	30
7.4 Grenade Launchers and Grenades	31
7.5 Scramblers	31
7.6 Direct Fire Cannon	31
7.7 Flamers	32
7.8 Area Jammers	33
7.9 Xenon Nuclear Reaction Damper Field	33
8.0 Hit Location	33
8.1 Vehicle/Aircraft Combat Damage	33
8.2 Casualties to Vehicle Crews & Passengers	34
9.0 Warhead & Heavy Weapon Penetration Tables	35
10.0 Scatter Effects: Explosive Rounds	38
10.1 Warhead Hits	38
10.2 Dazing	38

EDITORIAL INTRODUCTION

Most readers of **Space Opera** have probably wondered about one of two things; what more can be added to the already extensive lists of equipment? or what happened to Flamers, Scramblers and other heavy weapons? The answer to both of these questions is in **Ground & Air Equipment**. When **Space Opera** was completed, it was decided that the heavy military equipment was only of interest to those players with characters in military or mercenary service. For most PCs the heavy equipment under consideration would be outside the realm of their needs or abilities.

But, for those of you with the requirements for use of military equipment, this is it. Tanks and other armored vehicles, combat aircraft and air combat rules, StarFighters, and heavy weaponry with all the additional rules needed to use these additional weapons and weapons systems.

We wish only to add that for those of you with a strong interest in armored vehicles and in 'micro-armor', a license has been granted to T-Rex of Fort Worth, Texas to manufacture and distribute an approved line of **Space Opera** micro-armor, usable with the rules contained in **Ground & Air Equipment** or with a planned set of micro-armor rules specifically designed to be compatible with the **Space Opera** systems. Those interested should contact Fantasy Games Unlimited or T-Rex at 3618 Dexter, Fort Worth, Texas 76107.

1.0 AFV ARMoured VEHICLES

A wide range of military vehicles are available for use in **Space Opera**. The units are all rated so that they are compatible with the systems used in **Space Marines**.

Combat vehicles fall into the following categories:

Tanks: The early AFVs of Tech/5 and Tech/6 cultures are classed as the familiar 'tank,' a well-armoured tracked vehicle armed with a high-velocity, turret-mounted cannon.

Assault Gun: A limited traverse tank gun mounted in the hull of an armoured, tracked chassis so that it can fire directly to the front.

APC: Armoured personnel carrier. Such units are tracked, with designation APC(T), or else they are hovercraft, with designation APC(H). A few might be gravsleds.

ATV: Armoured all-terrain vehicle. Such units are scoutcars—light armoured cars employed for reconnaissance. Such units are tracked, with designation ATV (T), hovercraft, with designation ATV (H), or gravsleds, with designation ATV (G). Cross-country performance is very good.

GSU: Continental Seige Units are massive, tracked armoured fighting vehicles typically employed by the Terran and Azuriach armed forces.

MBU: Main Battle Units are the future equivalents of the heavy tank. They may be tracked, with designation MBU (T); hovercrafts, with designation MBU (H); or gravsleds, with designation MBU (G).

CRU: Combat Reconnaissance Units are the future equivalents of the light tank. Like the MBUs, they may be tracked, hovercraft, or gravsleds. In actual fact, they are front line fighting units and can often hold their own in a firefight and thus are not employed only to scout the enemy's positions.

TMU: Tactical Missile Units are APG modifications with the capacity to launch guided missiles from PML ('Portable' Missile Launcher) mounts on top of the hull or fixed in a small turret or cupola on top of the vehicle.

HoverScouts: The HoverScout is a light hovercraft employed by a few starcultures for high-speed reconnaissance and for operations in very difficult terrain.

Gravsleds: Some starcultures, particularly the IRSOL and the 'Bugs,' use gravfield powered vehicles almost exclusively. Terran, Azuriach, and Mercantile League GEM ('ground effects machines' or hovercraft) often have gravpods mounted as well to permit operations in vacuum and thin atmosphere conditions which would prevent standard hovercraft from functioning at all.

GEM: Ground effects machines or hovercraft have superb cross-country performance but they will not perform in thin atmospheres or vacuum. All GEM units except those designated GEM/Grav are therefore equipped with 'Slow Track' caterpillar treads which are let down for operations in such conditions.

The following tables present the basic specifications for each of the 133 vehicle types currently distinguished for use with **Space Opera** in a combat role.

Nationality: The starculture/race distinguished in **Space Opera** and **Space Marines** universes. The StarMaster is not limited in that he can choose to disregard these groupings and invent cultures of his own, with the AFVs allocated as he sees fit. 'Primitive' and 'Early' AFVs represent a more or less common pattern of military development on pre-FTL planets. Tech/5 AFVs correspond to the best World War II fighting vehicles. Tech/5-6 AFVs represent equipment similar to that on Terra to about 1970-1980. Tech/6 AFVs are those anticipated in the next decade or so, while Tech/6-7 AFVs are 'transitional' units marking the first stages of a technological jump to a starfaring cultural status—the weapon systems of the early 21st century.

Tech Level: The technological level of the producing culture.

Mass: The 'weight' of the AFV in tonnes (1000 kg or 2200 lbs.).

Crew: The number of men required to operate the AFV with maximum efficiency. Typically, an AFV will have a driver, a gunner, and a commander. Additional crew will serve in roles which assist in fighting the vehicle—Communications/EW/ECM, additional gunner, etc. MekPurr AFVs are highly cybernetized and computers run most of the equipment, with the MekPurr 'commander' electronically interfaced in direct linkage with the command computer so that he can monitor all systems and direct the vehicle with a minimum of manual movements. Similar systems are used in a somewhat more limited form in most other advanced AFVs.

Maintainance Times = hr. per 5t of mass, if servicing is carried out by a Tech/5. Add 1 hour per 5t for each expertise level he is below expertise/5; reduce the maintainance time by -10% for each expertise level he is over Tec/5 expertise. The same penalties and bonuses apply for Techs who are working on vehicles above or below the technological level at which they were trained. A technician from a Tech/7 culture, for instance, would require an additional 2 hours per 5t of vehicle mass if working on a Tech/9 vehicle.

Cargo: Most AFVs can carry 500 kg of 'cargo' per man in the crew. In the case of CSUs, this number is raised to 1000 kg or it. APCs are designed to carry either cargo or passengers. The capacity of such units is it per passenger allocated. For instance, a Terran 'Armadillo' has a crew of 2+25, meaning it carries 2 crewmen and up to 25 passengers. For each passenger less, it can carry 1 tonne of cargo. If a passenger is aboard, it can carry 1/2 cargo or 500 kg. Thus, if all 25 passengers were aboard, the 'Armadillo's' cargo capacity would be $25t/2 = 12.5t$.

Spares & Parts: All new vehicles come with 10% of their cost in spares and parts. Discounted and used vehicles come with 10% of their cost in spares and parts, so one can have from 1% to 10% of the discounted value in parts to make repairs.

Hydrox Fuel: A Hydrogen/Oxygen fuel generator will produce fuel from water by electrolysis. Such units may be obtained at CR 10 000. They are sun-powered, so 'free' fuel is possible. The unit will provide km/t of fuel in 1 hour. Nuclear-powered units can be acquired at CR 75 000 and can refuel any vehicle in 10 minutes. Such units require CR 5000 worth of fuel every 500 hours of operation. Both units have a Breakdown No. of 1/4.

Filtered & Sealed Vehicles: All Tech/6-7 AFVs are assumed to have filter systems that will prevent poison gases and radioactive dust, etc., from being drawn into the vehicle or, at least, not before some warning occurs so that special protective measures can be taken. All Tech/7+ AFVs are sealed against the external environment. They are capable of sustaining the rated number of occupants for 72 hours plus 24 hours per Tech level over Tech/7. Additional life-support endurance can be obtained at a cost of CR 1000 per man-day of life support.

Travel Mode: The means by which the AFV is propelled along the ground. The various speed designations (Slow Tracked, Medium Tracked, etc.) refer to the vehicles speeds given in **Space Opera** and **Space Marines**.

Range: The distance that an AFV, can traverse between refuelings. All Tech/5 to Tech/6-7 AFVs employ some form of internal combustion or turbine engine utilizing petroleum fuels. Cost of such fuels = CR 5 per 100 km/t. That is, a vehicle of 10t mass will travel 100 km on CR 5 * 10 = CR 50 worth of fuel. All Tech/7+ AFVs have hydrox-turbo engines which use hydrogen fuel or some chemical equivalent (and which can consume petroleum fuels in a pinch). Cost of hydrogen fuel = CR 2.5 per 100 km/t. For an additional 10% of the cost of the vehicle (Maximum CR 100 000), a rechargeable PowerCell motor can also be installed, with the same range as given for the hydrox-turbo engine. It should be noted that the hydrox-turbo unit is self-contained and is not air-breathing, so it can operate in thin atmosphere and vacuum conditions. If players desire, a fusion/plasma reactor which generates electrical power can be installed at 20% of the vehicle cost, with a maximum of CR 200 000. The FRU will not break down if properly maintained and serviced. Cost of FRU fuel = CR 500 + CR 100 x mass of the vehicle in tonnes for 1000 hr. continuous operation. Energy weapons obtain double ammunition 'stowage' because an FRU can be used to provide the equivalent number of rounds normally carried in the vehicle.

EW/ECM: Electronic Warfare and Electronic Counter Measures factors represent the quality of the various sensor and computer battle analysis systems on board the AFV. Where a range of EW/ECM is given, as in 6-9, the EW/ECM 6 factor is the Tech/7 level, with +1 added per Tech level above Tech/7. Earlier equipment or deficient equipment can be updated at a cost of CR 25 000 to the maximum levels given for that particular AFV. The EW/ECM maximums can be exceeded, but at triple the cost, until a maximum factor of EW/ECM 13 is reached. However, a Tech/7 culture cannot produce an EW/ECM factor above 10, a Tech/8 cannot exceed 11, etc. The factor includes computer systems, so the costs can rise quite rapidly.

HUD Targeting: Provided that enemy ECM does not 'stymie' one's EW systems, the bonus given is added to the direct-fire hit probability percentages as given in the combat rules in **Space Opera** and **Space Marines**. The targeting bonus represents the advantage acquired from the 'heads-up' display systems in the AFV—battlecomputer analysis and weapon control.

Damage Cap.: The amount of damage from heavy weapons penetrations which the vehicle can withstand before being rendered totally inoperative.

Rad. Shield: The anti-radiation defense provided by the hull and by force fields against the effects of radiation outside the vehicle. See 7.1, Nuclear Weapons for further details.

BattleScreens: The force field defenses provided by TMXD generators mounted in the hull of the vehicle. Add +1 to the defensive field against projectile/missile weapons of equivalent Tech level, and +2 against projectile/missile weapons of lower Tech levels. Note: Explosion = Missile.

Guns: The armaments mounted in various locations in the vehicle. All cupola guns are capable of anti-aircraft fire, as are all turret-mounted PMLs and 20mm weapons, with the HUD bonus applied. Calliopes are effective against anti-tank gun explosive (HE) rounds and all specialized rounds (FAE, CBR, etc.), but not AP and Gauss rounds. They can also be used to intercept and explode incoming PRL 'bazooka' and 'recoilless rocket' rounds, but not PML rounds. Grenades are exploded in the air if they pass through a Calliope field.

Armour: The protection provided against penetrations by projectiles, missiles, and energy bolts by the hull of the vehicle. Add +1 to the rating against projectile/missile weapons of equivalent Tech level, and +2 against projectile/missile weapons of lower Tech levels. Note that explosion=missile.

Cost: All vehicle costs are given in MegaCredits (CR 1,000,000). Veterans can obtain discounts on equipment, as outlined in *Space Opera*, for retirement benefits, plus -1% per Merchant expertise level. However, CSUs are not available for general purchase, and it may happen that 'surplus' equipment will be obsolete types from lower tech levels, with current units not for private sale except in starcultures like the Mercantile League - where private armies are the rule.

Breakdowns: All AFVs have a possibility of breaking down. First of all, they all have a 1/4 probability (roll each breakdown on 1d20) of having start-up problems. Secondly, maintenance of the multi-systems must be done every third refueling, with a +1% chance of a serious multi-system breakdown every 10 km over x3 range if proper maintenance has not been performed. Third, if a major penetration occurs, there is a possibility that a breakdown occurs.



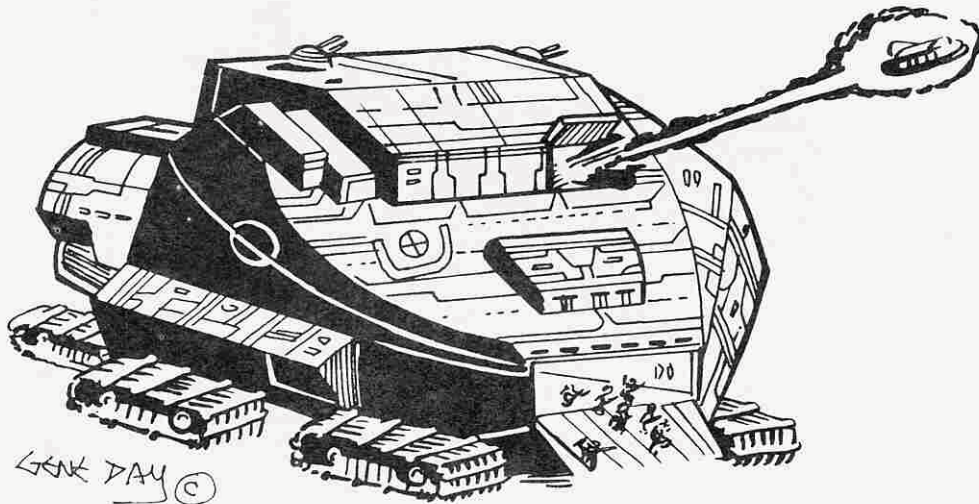
Azuriach TMU 'Ocelot'

Nationality	'Primitive'	'Primitive'	'Primitive'	Primitive'	'Primitive'	'Primitive'	'Primitive'	'Primitive'
AFV Type	Hv. Tank	Mdm. Tank	Lt. Tank	Assault Gun	Half Track	Hv. Tank	Mdm. Tank	Lt. Tank
Tech Level	5	5	5	5	5	5-6	5-6	5-6
Mass	65t	45t	15t	25t	8t	50t	35t	15t
Crew	5	5	4	4	2 + 10	4	4	4
Travel Mode	Slow Track	Mdm. Track	Mdm. Track	Mdm. Track	Mdm. Wheel	Mdm. Track	Mdm. Track	Mdm. Track
Range	350 km	350 km	350 km	350 km	350 km	500 km	500 km	500 km
EW/ECM	—	—	—	—	—	1	1	1
HUD Targeting	—	—	—	—	—	—	—	—
Damage Cap.	15	12	9	9	7	18	15	12
Rad Shield	-3	-2	-1	-1	-1	-5	-4	-3
BattleScreens	—	—	—	—	—	—	—	—
Armor Front	+3	+1	AFV	+1	B	+4	+3	+1
Armor Side	+2	+1	AFV	AFV	B	+3	+2	+1
Armor Top	A	B	C	C	—	A	A	B
Turret Front	+3	+2	AFV	+1	—	+5	+4	+2
Turret Side	+2	+1	AFV	AFV	—	+3	+2	+1
Turret Top	A	B	C	C	—	A	A	B
Turret Guns	AO 'E'	AP 'F'	20 mm	—	—	AP 'C'	AP 'D'	AP 'E'
	.30 MMG	.30 MMG	.30 MMG	—	—	.30 MMG	.30 MMG	or AP 'F'
Cupola Gun	.50 HMG	.50 HMG	.50 HMG	—	.50 HMG	.50 HMG	.50 HMG	.50 HMG
Hull Gun	.30 MMG	.30 MMG	.30 MMG	.30 MMG	—	.30 MMG	.30 MMG	.30 MMG
Cost (MCR)	0.145	0.125	0.085	0.1	0.03	0.185	0.155	0.125

Nationality	'Primitive'	'Early'	'Early'	'Early'	'Early'	'Early'	'Early'	'Early'
AFV Type	APC (T)	Hv. Tank	Mdm. Tank	Lt. Tank	APC (T)	TMU (T)	Ack-Ack	Hv. Tank
Tech Level	5-6	6	6	6	6	6	6	6-7
Mass	15t	50t	35t	15t	15t	15t	15t	60t
Crew	2 + 18	4	4	4	2 + 18	4	4	4
Travel Mode	Mdm. Track	Mdm.Track	Mdm.Track	Mdm.Track	Mdm.Track	Mdm.Track	Mdm.Track	Mdm.Track
Range	500 km	750 km	750 km	750 km	750 km	750 km	750 km	1000 km
EW/ECM	—	2	2	2	—	2	2	3
HUD Targeting	—	+3%	+3%	+3%	—	+3%	+3%	+5%
Damage Cap.	10	20	18	15	10	10	10	20
Rad. Shield	-3	-6	-5	-4	-4	-4	-4	-7
BattleScreens	—	—	—	—	—	—	—	Standard
Armor Front	AFV	+5	+3	+2	AFV	AFV	AFV	+5
Armor Side	—	+3	+3	+1	AFV	AFV	AFV	+4
Armor Top	B	A	A	A	B	B	B	+1
Turret Front	—	+5	+4	+3	AFV	AFV	AFV	+6
Turret Side	—	+3	+3	+1	AFV	AFV	AFV	+4
Turret Top	—	A	A	A	B	B	B	+1
Turret Guns	—	Gauss 'C'	Gauss 'D'	Gauss 'E'	20 mm	Hv. PRL 'F'	4 20mm M61	Gauss 'C'
	—	—	—	Gauss 'F'	AP 'F'	—	—	or Laser+75 Laser*100
Cupola Gun	.50 HMG	20mm M61	20mm M61	20mm M61	.50 HMG	.50 HMG	7.62 MMG	20mm Inf.R
Hull Gun	7.62 MMG	7.62 MMG	7.62 MMG	7.62 MMG	7.62 MMG	7.62 MMG	—	10mm Cone
Cost (MCR)	0.05	0.235	0.2	0.165	0.65	0.65	0.1	MG 0.3

Nationality	'Early'	'Early'	'Early'	'Early'	'Early'
AFV Type	Mdm.Tank	Lt.Tank	APC (T)	TMU (T)	Ack-Ack
Tech Level	6-7	6-7	6-7	6-7	6-7
Mass	50t	20t	15t	15t	50t
Crew	4	4	2 + 18	4	4
Travel Mode	Fast Track	Fast Track	Mdm.Track	Mdm.Track	Mdm.Track
Range	1000 km	1000 km	1000 km	1000 km	1000 km
EW/ECM	3	3	—	3	3
HUD Targeting	+5%	+4%	—	+5%	+5%
Damage Cap.	18	15	10	10	18
Rad. Shield	-6	-5	-5	-5	-6
BattleScreens	standard	—	—	—	—
Armor Front	+4	+2	AFV	AFV	AFV
Armor Side	+3	+2	AFV	AFV	AFV
Armor Top	A	A	A	A	A
Turret Front	+5	+3	AFV	AFV	AFV
Turret Side	+3	+2	AFV	AFV	AFV
Turret Top	+1	A	A	A	A
Turret Guns	Gauss 'd'	Gauss 'E'	20mm M61	2 PML 'E'	4 20mm InfR
	or Laser*50	or Laser*20	—	—	2 40mm InfR or Calliope
Cupola Gun	20mm InfR	20mm M61	10mm Cone MG	20mm InfR	—
Hull Gun	10mm Cone	10mm Cone	—	10mm Cone	—
Cost	0.235	0.195	0.65	0.1	0.1

Nationality	Terra	Terra	Terra	Terra	Terra	Terra	Terra
AFV Type	CSU	CSU	CSU	CSU	MBU (T)	MBU (T)	MBU (T)
Code Name	Thor	Odin	Valhalla	Ragnarok	Crusader	Saracen	Chieftain
Tech Level	7	8	9	10	7	8	9
Mass	100t	150t	250t	500t	50t	50t	50t
Crew	4	4	4	4	3	3	3
Travel Mode	Mdm.Track	Mdm.Track	Mdm.Track	Mdm.Track	Fast Track	Fast Track	Fast Track
Range	5000 km	5000 km	5000 km	5000 km	2500 km	2500 km	2500 km
EW/ECM	10	11	12	13	10	11	12
HUD Targeting	+10%	+12%	+15%	+15%	+10%	+12%	+15%
Damage Cap.	40	50	75	100	30	30	30
Rad. Shield	-12	-12	-12	-12	-10	-10	-10
BattleScreens	+6	+7	+9	+10	+3	+4	+5
Armor Front	+7	+8	+9	+10	+5	+6	+6
Armor Side	+6	+7	+8	+10	+4	+4	+4
Armor Top	+3	+3	+4	+5	+1	+1	+2
Turret Front	+8	+9	+10	+10	+6	+7	+7
Turret Side	+7	+8	+9	+10	+4	+5	+6
Turret Top	+3	+3	+4	+5	+1	+1	+2
Turret Guns	Blast*150 Blast MMG	Blast*175 Blast MMG	Blast*200 Blast MMG	2 Blast*200 Blast MMG	Blast*75 Blast MMG	Blast*100 Blast MMG	Blast*125 Blast MMG
Cupola Guns	2 Blast HMG Hv. PML 'C'	2 Blast HMG Hv. PML 'C'	4 Blast HMG Hv. PML 'C'	4 Blast*20 Hv. PML 'C'	2 Blast HMG Hv. PML 'D'	2 Blast HMG Hv. PML 'D'	2 Blast HMG Hv. PML 'D'
Hull Guns	4 Blast MMG Hv. Flamer	4 Blast MMG Hv. Flamer	4 Blast MMG Hv. Flamer	4 Blast MMG Hv. Flamer	1 Blast MMG —	1 Blast MMG —	1 Blast MMG Hv. Flamer
Calliope	x6 Hv.	x6 Hv.	x6 Hv.	x6 Hv.	x6 Mdm.	x6 Mdm.	x6 Mdm.
Anti-Personnel	4 APGV 'H'	4 APGV 'H'	4 APGV 'H'	4 APGV 'H'	4 APGV 'G'	4 APGV 'G'	4 APGV 'G'
Cost (MCR)	2.5	3	3.5	5	0.75	0.9	1



Nationality	Terra	Terra	Terra	Terra	Terra	Terra	Terra
AFV Type	MBU (T)	MBU (H)	MBU (H)	CBU (H)	CBU (H)	HoverScout	HoverScout
Code Name	Bolo	Spartan	Conqueror	Comanche	Zulu	Whippet	Greyhound
Tech Level	10	9	10	9	10	7-8	9-10
Mass	75t	50t	75t	25t	25t	8t	10t
Crew	3	3	3	3	3	3 + 3	3 + 3
Travel Mode	Fast Track	GEM/Grav	GEM/Grav	GEM/Grav	GEM/Grav	GEM/Grav	GEM/Grav
Range	2500 km	2500 km	2500 km	2500 km	2500 km	2000 km	2000 km
EW/ECM	13	12	13	11	12	10-11	12-13
HUD Targeting	+15%	+15%	+15%	+15%	+15%	+15%	+15%
Damage Cap.	35	25	30	20	20	15	15
Rad. Shield	-12	-10	-10	-8	-8	-6	-6
BattleScreens	+6	+4	+6	+2	+3	+1	+2
Armor Front	+7	+5	+6	+3	+4	+1	+2
Armor Side	+5	+5	+6	+2	+4	+1	+1
Armor Top	+2	+1	+2	+1	+1	A	A
Turret Front	+7	+6	+7	+4	+5	+1	+2
Turret Side	+6	+5	+6	+2	+4	+1	+1
Turret Top	+2	+1	+2	+1	+1	A	A
Turret Guns	Blast*125 Blast MMG	Blast*100 Blast MMG	Blast*125 Blast MMG	Blast*50 Blast MMG	Blast*75 Blast MMG	Blast*20 —	Blast*20 —
Cupola Guns	2 Blast HMG Hv. PML 'D'	2 Blast HMG Hv. PML 'D'	2 Blast HMG Hv. PML 'D'	2 Blast HMG Hv. PML 'D'	2 Blast HMG Hv. PML 'D'	Blast HMG Lt. PML 'E'	Blast HMG Lt. PML 'E'
Hull Guns	Blast MMG Hv. Flamer	Blast MMG Hv. Flamer	Blast MMG Hv. Flamer	Blast MMG Hv. Flamer	Blast MMG Hv. Flamer	—	—
Calliope	x6 Mdm.	x6 Lt.	x6 Mdm.	x6 Lt.	x6 Lt.	—	—
Anti-Personnel	4 APGV 'H'	4 APGV 'H'	4 APGV 'H'	—	—	—	—
Cost (MCR)	1.25	1	1.35	0.4	0.5	0.085	0.1

Nationality	Terra	Terra	Terra	Terra	Terra	Terra	Terra
AFV Type	CRU (T)	CRU (T)	CRU (T)	TMU (H)	APC (T)	APC (T)	APC (H)
Code Name	Kiowa	Cossack	Lancer	Scorpion	Truck	Armadillo	Saladin
Tech Level	7	8	9-10	7-10	7-10	8-10	9-10
Mass	25t	25t	25	25t	10t	25t	25t
Crew	3	3	3	3	2 + 10	2 + 25	2 + 25
Travel Mode	Fast Track	Fast Track	Fast Track	GEM/Grav	Fast Track	Fast Track	GEM/Grav
Range	2000 km	2000 km	2500 km	2500 km	2000 km	2000 km	2500 km
EW/ECM	10	11	12-13	10-13	10-13	11-13	12-13
HUD Targeting	+10%	+12%	+15%	+10%	+5%	+7%	+10%
Damage Cap.	20	20	20	20	20	20	20
Rad. Shield	-8	-8	-8	-8	-6	-8	-8
BattleScreens	+1	+2	+3	+1	+1	+2	+2
Armor Front	+3	+4	+4	+1	+1	+2	+2
Armor Side	+2	+2	+3	+1	+1	+2	+2
Armor Top	+1	+1	+1	B	B	A	A
Turret Front	+4	+5	+5	+1	—	—	—
Turret Side	+3	+3	+3	+1	—	—	—
Turret Top	+1	+1	+1	B	—	—	—
Turret Guns	Blast*50 Blast MMG	Blast*50 Blast MMG	Blast*75 Blast MMG	Hv. PML 'C' Hv. PML 'D'	— —	— —	— —
Cupola Guns	Blast HMG	Blast HMG	Blast HMG	Blast HMG	Blast HMG	Blast HMG	Blast HMG
Cost (MCR)	0.275	0.3	0.35	0.125	0.075	0.1	0.125

Nationality	Mercantile	Mercantile	Mercantile	Mercantile	Mercantile	Mercantile	Mercantile
AFV Type	MBU (T)	MBU (T)	CRU (T)	CRU (T)	CRU (H)	CRU (H)	HoverScout
Code Name	Defiant	Expediter	Sentinel	Ranger	Ferret	Comet	Wolfhound
Tech Level	7-9	10	7-9	10	7-9	10	7-10
Mass	50t	75t	25t	25t	25t	25t	8t
Crew	3	3	3	3	3	3	3 + 3
Travel Mode	Fast Track	Fast Track	Fast Track	Fast Track	GEM/Grav	GEM/Grav	GEM/Grav
Range	2000 km	2000 km	2000 km	2000 km	2500 km	2500 km	3500 km
EW/ECM	8-10	11	8-10	11	8-10	11	8-11
HUD Targeting	+10%	+12%	+10%	+12%	+10%	+12%	+10%
Damage Cap.	25	20	20	20	15	20	12
Rad. Shield	-10	-10	-7	-8	-7	-8	-6
BattleScreens	+2	+4	+2	+3	+2	+3	+1
Armor Front	+5	+6	+3	+4	+3	+4	+1
Armor Side	+4	+5	+2	+3	+3	+4	+1
Armor Top	+1	+2	AFV	+1	AFV	+1	A
Turret Front	+5	+7	+3	+4	+3	+4	+1
Turret Side	+4	+5	+2	+4	+3	+4	+1
Turret Top	+1	+2	AFV	+1	AFV	+1	A
Turret Guns	Blast*75 Blast MMG	Blast*125 Blast MMG	Blast*50 Blast MMG	Blast*75 Blast MMG	Blast*50 Blast MMG	Blast*75 Blast MMG	2 Blast*20 —
Cupola Guns	2 Blast HMG Hv. PML 'D'	2 Blast HMG Hv. PML 'D'	Blast HMG Hv. PML 'D'	Blast HMG Hv. PML 'D'	Blast HMG Hv. PML 'D'	Blast HMG Hv. PML 'D'	Blast HMG Lt. PML 'F'
Cost (MCR)	0.75	0.95	0.265	0.325	0.385	0.475	0.085

Nationality	Mercantile	Mercantile	Mercantile	Mercantile	Azuriach	Azuriach	Azuriach
AFV Type	APC (T)	APC (H)	APC	ATV	CSU	CSU	MBU (T)
Code Name	BobCat	Trekker	Sioux	Rover	Griffin	Dragon	Star I
Tech Level	7-10	7-10	7-10	7-10	9	10	7
Mass	15t	20t	8t	12t	100t	150t	50t
Crew	2 + 12	2 + 18	2 + 10	3 + 3	4	4	3
Travel Mode	Fast Track	GEM/Grav	Mdm. Wheel	Fast Wheel	Mdm.Track	Mdm.Track	Fast Track
Range	2500 km	3000 km	2000 km	2000 km	3000 km	3000 km	2000 km
EW/ECM	6	6	6	6	11	12	9
HUD Targeting	+7%	+7%	+7%	+7%	+12%	+15%	+10%
Damage Cap.	20	15	12	12	40	50	25
Rad. Shield	-5	-5	-5	-5	-10	-12	-9
BattleScreens	Standard	Standard	Standard	+1	+6	+7	+3
Armor Front	+1	+1	+1	+2	+6	+7	+5
Armor Side	+1	+1	+1	+1	+6	+7	+3
Armor Top	A	A	A	A	+2	+2	+1
Turret Front	+1	+1	+1	+2	+7	+8	+5
Turret Side	+1	+1	+1	+1	+6	+7	+3
Turret Top	A	A	A	A	+2	+2	+1
Turret Guns	20mm InfR	20mm InfR	20mm InfR	Blast*20	Blast*125 Blast MMG	Blast*150 Blast MMG	Blast*75 Blast MMG
Cupola Guns	Blast HMG	Blast HMG	Blast HMG	Lt. PML 'F' Blast HMG	Hv. PML 'D' 2 Blast HMG	Hv. PML 'D' 2 Blast HMG	Hv. PML 'D' 2 Blast HMG
Hull Guns	—	—	—	—	Blast MMG	Blast MMG	Blast MMG
Calliope	—	—	—	—	x8 Hv.	x8 Hv.	x8 Mdm.
Anti-Personnel	—	—	—	Hv.Scrambler	APGV 'G'	APGV 'G'	APGV 'G'
Cost (MCR)	0.095	0.15	0.08	0.125	2.5	3	0.75

Nationality	Azuriach	Azuriach	Azuriach	Azuriach	Azuriach	Azuriach	Azuriach
AFV Type	MBU (T)	MBU (T)	MBU (T)	MBU (H)	MBU (H)	MBU (H)	MBU (H)
Code Name	Star II	Star III	Star IV	Tiger I	Tiger II	Tiger III	Tiger IV
Tech Level	8	9	10	7	8	9	10
Mass	50t	50t	50t	60t	60t	60t	60t
Crew	3	3	3	3	3	3	3
Travel Mode	Fast Track	Fast Track	Fast Track	GEM	GEM/Grav	GEM/Grav	GEM/Grav
Range	2500 km	2500 km	2500 km	2500 km	2500 km	2500 km	2500 km
EW/ECM	10	11	12	9	10	11	12
HUD Targeting	+12%	+12%	+15%	+10%	+12%	+12%	+15%
Damage Cap.	25	25	25	20	20	20	25
Rad. Shield	-9	-10	-10	-9	-9	-10	-10
BattleScreens	+4	+5	+6	+3	+4	+5	+6
Armor Front	+5	+6	+6	+5	+5	+6	+6
Armor Side	+4	+5	+6	+3	+4	+5	+6
Armor Top	+1	+2	+3	+1	+1	+2	+2
Turret Front	+5	+6	+7	+5	+5	+6	+7
Turret Side	+4	+5	+6	+3	+4	+5	+6
Turret Top	+1	+2	+3	+1	+1	+2	+2
Turret Guns	Blast*75 Blast MMG Hv. PML 'D'	Blast*100 Blast MMG Hv. PML 'D'	Blast*125 Blast MMG Hv. PML 'D'	Blast*75 Blast MMG Hv. PML 'D'	Blast*75 Blast MMG Hv. PML 'D'	Blast*100 Blast MMG Hv. PML 'D'	Blast*125 Blast MMG Hv. PML 'D'
Cupola Guns	2 Blast HMG	2 Blast HMG	2 Blast HMG	2 Blast HMG	2 Blast HMG	2 Blast HMG	2 Blast HMG
Hull Guns	Blast MMG —	Blast MMG Hv. Flamer	Blast MMG Hv. Flamer	Blast MMG —	Blast MMG —	Blast MMG Hv. Flamer	Blast MMG Hv. Flamer
Calliope	x8 Mdm.	x8 Mdm.	x8 Mdm.	x8 Mdm.	x8 Mdm.	x8 Mdm.	x8 Mdm.
Anti-Personnel	APGV 'G'	APGV 'G'	APGV 'G'	APGV 'G'	APGV 'G'	APGV 'G'	APGV 'G'
Cost (MCR)	0.85	0.9	1	0.9	1	1.25	1.325

Nationality	Azuriach	Azuriach	Azuriach	Azuriach	Azuriach	Azuriach	Azuriach
AFV Type	CRU (T)	CRU (T)	CRU (T)	CRU (H)	CRU (H)	CRU (H)	HoverScout
Code Name	Panther I	Panther II	Panther III	Leopard I	Leopard II	Leopard III	Lynx
Tech Level	7-8	9	10	7-8	9	10	7-10
Mass	20t	20t	20t	25t	25t	25t	10t
Crew	3	3	3	3	3	3	3 + 3
Travel Mode	Fast Track	Fast Track	Fast Track	GEM	GEM/Grav	GEM/Grav	GEM
Range	2000 km	2000 km	2500 km	2000 km	2500 km	2500 km	2500 km
EW/ECM	9-10	11	12	9-10	11	12	9-12
HUD Targeting	+10%	+12%	+15%	+10%	+12%	+15%	+10%
Damage Cap.	20	20	20	15	15	18	12
Rad. Shield	-8	-8	-9	-8	-8	-9	-6
BattleScreens	+3	+4	+5	+3	+4	+5	+1
Armor Front	+3	+4	+5	+3	+4	+5	+2
Armor Side	+2	+3	+4	+2	+3	+4	+1
Armor Top	+1	31	31	31	31	31	A
	+1	+1	+1	+1	+1	+1	+1
Turret Front	+4	+5	+6	+4	+5	+6	+2
Turret Side	+3	+3	+4	+3	+3	+4	+1
Turret Top	+1	+1	+1	+1	+1	+1	A
Turret Guns	Blast*50 Blast MMG	Blast*75 Blast MMG	Blast*75 Blast MMG	Blast*50 Blast MMG	Blast*75 Blast MMG	Blast*75 Blast MMG	Blast*20 —
Cupola Guns	Blast HMG Lt. PML 'E'	Blast HMG Lt. PML 'E'	Blast HMG Lt. PML 'E'	Blast HMG Lt. PML 'E'	Blast HMG Lt. PML 'E'	Blast HMG Lt. PML 'E'	Blast HMG —
Hull Guns	Blast MMG	Blast MMG	Blast MMG	Blast MMG	Blast MMG	Blast MMG	—
Anti-Personnel	APGV 'G'	APGV 'G'	APGV 'G'	APGV 'G'	APGV 'G'	APGV 'G'	APGV 'G'
Cost (MCR)	0.325	0.375	0.425	0.35	0.4	0.475	0.1

Nationality	Azuriach	Azuriach	Azuriach	Azuriach	Azuriach	GPR	GPR
ATV Type	APC (T)	APC (T)	APC (H)	TMU (T)	TMU (H)	MUB (T)	MBU (T)
Code Name	Weasel	Fox	Martin	Ocelot	Puma	Flame	Blaze
Tech Level	7-10	7-10	7-10	7-10	7-10	7-8	9-10
Mass	10t	25t	10t	10t	10t	50t	50t
Crew	2 + 11	2 + 25	2 + 11	3	3	3	3
Travel Mode	Fast Track	Fast Track	GEM	Fast Track	GEM	Mdm.Track	Mdm.Track
Range	2000 km	2000 km	2000 km	2000 km	2000 km	1500 km	2000 km
EW/ECM	9-12	9-12	9-12	9-12	9-12	6-7	8-9
HUD Targeting	+10%	+10%	+10%	+10%	+10%	+7%	+10%
Damage Cap.	20	20	20	20	15	20	25
Rad. Shield	-6	-6	-6	-6	-6	-6	-7
BattleScreens	standard	standard	standard	+1	+1	+2	+4
Armor Front	+1	+2	+1	+1	+1	+5	+6
Armor Side	+1	+1	+1	+1	+1	+4	+5
Armor Top	A	A	A	A	A	+1	+2
Turret Front	—	—	—	+1	+1	+5	+6
Turret Side	—	—	—	+1	+1	+4	+5
Turret Top	—	—	—	A	A	+1	+2
Turret Guns	—	—	—	Hv. PML 'D'	Hv. PML 'D'	Blast*50	Blast*75
Cupola Guns	Blast HMG	Blast HMG	Blast HMG	Blast HMG	Blast HMG	Blast MMG	Blast MMG
Hull Guns	—	—	—	—	—	Blast HMG	Blast MMG
Cost (MCR)	0.075	0.1	0.1	0.1	0.125	Hv. Flamer	Hv. Flamer

Nationality	GPR	GPR	GPR	GPR	GPR	GPR	GPR
AFV Type	CRU (T)	CRU (T)	CRU (H)	CRU (H)	TMU (T)	TMU (H)	APC (T)
Code Name	Bison	Bison II	Bear	Bear II	Bulldog	Bullpup	Crate
Tech Level	7-8	9-10	7-8	9-10	7-10	7-10	7-10
Mass	25t	25t	25t	25t	10t	10t	12t
Crew	3	3	3	3	3 + 7	3 + 7	2 + 10
Travel Mode	Fast Track	Fast Track	GEM	GEM/Grav	Fast Track	GEM/Grav	Fast Track
Range	1500 km	2000 km	2000 km	2500 km	1500 km	2000 km	1500 km
EW/ECM	6-7	8-9	6-7	8-9	6-9	6-9	6-9
HUD Targeting	+7%	+10%	+7%	+10%	+7%	+10%	+5%
Damage Cap.	12	15	12	15	10	10	10
Rad. Shield	-5	-6	-5	-6	-5	-6	-5
BattleScreens	+1	+2	+1	+2	standard	+1	standard
Armor Front	+3	+4	+3	+4	+1	+1	AFV
Armor Side	+3	+4	+3	+4	+1	+1	AFV
Armor Top	+1	+1	+1	+1	B	B	B
Turret Front	+3	+4	+3	+4	+1	+1	—
Turret Side	+3	+4	+3	+4	+1	+1	—
Turret Top	+1	+1	+1	+1	B	B	—
Turret Guns	Blast*50	Blast*50	Blast*50	Blast*50	Hv. PML 'D'	Hv. PML 'D'	—
Cupola Guns	Blast MMG	Blast MMG	Blast MMG	Blast MMG	—	—	—
Cost (MCR)	0.285	0.315	0.3	0.35	0.09	0.125	0.06

Nationality	GPR	GPR	GPR	GPR	Ranan	Ranan	Ranan
ATV Type	APC (T)	APC (H)	ATV (T)	ATV	MBU (T)	CRU (T)	MTU (T)
Code Name	Boxcar	Bus	BushCat	Cab	Hoodlum	Hood	Hit Man
Tech Level	7-10	7-10	7-10	7-10	7-10	7-10	7-10
Mass	25t	12t	6t	6t	50t	15t	8t
Crew	2 + 20	2 + 10	3 + 3	3 + 3	3	3	3
Travel Mode	Mdm.Track	GEM	Fast Track	Fast Wheel	Mdm.Track	Mdm.Track	Mdm.Track
Range	1500 km	1500 km	1000 km	1000 km	1000 km	1000 km	1000 km
EW/ECM	6-9	6-9	6-9	6-9	4-7	4-7	4-7
HUD Targeting	+5%	+5%	+5%	+5%	+7%	+7%	+5%
Damage Cap.	15	10	8	8	20	15	8
Rad. Shield	-5	-5	-4	-4	-6	-5	-4
BattleScreens	standard	standard	standard	standard	standard	standard	standard
Armor Front	AFV	AFV	AFV	AFV	+4	+1	+1
Armor Side	AFV	AFV	AFV	AFV	+3	+1	+1
Armor Top	A	B	B	B	+1	A	A
Turret Front	—	—	AFV	AFV	+4	+1	+1
Turret Side	—	—	AFV	AFV	+3	+1	+1
Turret Top	—	—	B	B	+1	A	A
Turret Guns	—	—	Blast*20	Blast*20	Blast*50	Blast*20	Hv. PML 'D'
or	—	—	20mm InfR	20mm InfR	40mm InfR	20mm InfR	—
Cupola Gun	Blast HMG	Blast HMG	Blast HMG	Blast HMG	Blast HMG	Blast HMG	Blast HMG
Hull Gun	—	—	—	—	Blast MMG	Hv. Flamer	—
Cost (MCR)	0.095	0.085	0.045	0.0275	0.25	0.175	0.15

Nationality	Ranan	MekPurr	MekPurr	MekPurr	Mertun	Mertun	Mertun
AFV Type	APC (T)	MBU (H)	CRU (H)	CRU (T)	Wpn.Sled	Wpn.Sled	Wpn.Sled
Code Name	Coffin	SabreTiger	CyberTank	Kitten	Darter	Dasher	Dodger
Tech Level	7-10	7-10	7-10	7-10	7-10	7-10	7-10
Mass	10t	50t	25t	20t	10t	10t	10t
Crew	2 + 15	1 + 2 Mek	1 + 1 Mek	1 + 1 Mek	1-2	1-2	1-2
Travel Mode	Mdm.Track	GEM/Grav	GEM/Grav	Fast Track	Grav	Grav	Grav
Range	1000 km	5000 km	3000 km	2000 km	3000 km	3000 km	3000 km
EW/ECM	2-5	10-13	9-12	8-11	5-9	5-9	5-9
HUD Targeting	—	+15%	+15%	+12%	+10%	+10%	+10%
Damage Cap.	12	30	20	20	12	12	12
Rad. Shield	-4	-12	-12	-10	-5	-5	-5
BattleScreens	—	+6	+4	+2	+2	+2	+2
Armor Front	AFV	+6	+4	+3	+1	+2	+2
Armor Side	AFV	+6	+4	+3	+1	+1	+1
Armor Top	B	+2	+1	+1	A	A	A
Turret Front	—	+7	+4	+3	+1	+2	+2
Turret Side	—	+6	+4	+3	+1	+1	+1
Turret Top	—	+2	+1	+1	A	A	A
Turret Guns	—	Blast*125	Blast*75	Blast*50	2 Blast*20	Gauss 'C'	Hv. PML 'C'
	—	Blast MMG	Blast MMG	Blast MMG	—	—	Mdm.PML 'E'
Cupola Guns	Blast HMG	4 Blast HMG	2 Blast HMG	2 Blast HMG	2 Blast HMG	2 Blast HMG	2 Blast HMG
	—	Hv. PML 'D'	Mdm.PML 'E'	Mdm.PML 'E'	—	—	—
Calliope	—	x6 Hv.	x6 Mdm.	x6 Lt.	—	—	—
Cost (MCR)	0.05	1.35	0.5	0.4	0.125	0.175	0.165



Blarad CRU 'Titan'

Nationality	Mertun	IRSOL	IRSOL	IRSOL	Blarad	Blarad	Blarad
AFV Type	Wpn.Sled	BattleSled	BattleSled	BattleSled	MBU (T)	CRU (T)	TMU (T)
Code Name	Dagger	Hoplite	Hind	Hare	Trojan	Titan	Terror
Tech Level	7-10	7-10	7-10	7-10	7-10	7-10	7-10
Mass	10t	25t	15t	15t	50t	25t	10t
Crew	1-2	3	3	3 + 10	3	3	3
Travel Mode	Grav	Grav	Grav	Grav	Fast Track	Fast Track	Fast Track
Range	3000 km	5000 km	5000 km	5000 km	1500 km	2000 km	2000 km
EW/ECM	5-9	10-13	10-13	10-13	7-10	6-9	6-9
HUD Targeting	+10%	+15%	+12%	+10%	+10%	+10%	+7%
Damage Cap.	12	25	15	15	25	20	15
Rad. Shield	-5	-12	-10	-10	-10	-8	-8
BattleScreens	+2	+5	+1	+1	+3	standard	standard
Armor Front	+2	+4	+2	+1	+5	+3	AFV
Armor Side	+2	+4	+2	+1	+5	+3	AFV
Armor Top	A	+1	A	A	+2	+1	A
Turret Front	+2	+4	+2	+1	+6	+3	AFV
Turret Side	+2	+4	+2	+1	+5	+3	AFV
Turret Top	A	+1	A	A	+2	+1	A
Turret Guns	Blast*75	Blast*75	Blast*50	Blast*20	Blast*100	Blast*75	Blast*20
	—	—	—	—	Blast MMG	Blast MMG	Hv.PML 'D'
Cupola Guns	2 Blast HMG	2 Blast HMG	Blast HMG	Blast HMG	2 Blast HMG	Blast HMG	Blast HMG
	—	Hv. PML 'C'	Lt. PML 'E'	Lt. PML 'E'	—	—	—
Calliope	x9 Lt.	x8 Lt.	x8 Lt.	x8 Lt.	x6 Mdm.	x6 Lt.	—
Cost (MCR)	0.19	0.425	0.35	0.2	0.75	0.4	0.1

Nationality	Blarad	Blarad	Blarad	Rauwoof	Rauwoof	Rauwoof	Rauwoof
AFV Type	APC (T)	ATV (H)	ATV (G)	MBU (T)	MBU (H)	CRU (T)	CRU (H)
Code Name	Turtle	Tracker	Thumper	Vulcan	Vampire	Victor	Vigilant
Tech Level	7-10	7-10	7-10	7-10	7-10	7-10	7-10
Mass	12t	8t	8t	50t	50t	20t	20t
Crew	2 + 10	3 + 3	3 + 3	3	3	3	3
Travel Mode	Fast Track	GEM	Grav	Fast Track	GEM	Fast Track	GEM
Range	1500 km	1500 km	1500 km	1500 km	2000 km	1500 km	2000 km
EW/ECM	6-9	6-9	6-9	7-10	7-10	7-10	7-10
HUD Targeting	+7%	+10%	+10%	+10%	+10%	+10%	+10%
Damage Cap.	18	15	15	25	20	20	20
Rad. Shield	-7	-7	-7	-9	-9	-8	-8
BattleScreens	standard	standard	standard	+3	+2	standard	standard
Armor Front	AFV	AFV	AFV	+5	+5	+3	+3
Armor Side	AFV	AFV	AFV	+5	+4	+1	+1
Armor Top	A	A	A	+1	+1	A	A
Turret Front	—	AFV	AFV	+5	+5	+4	+4
Turret Side	—	AFV	AFV	+5	+4	+2	+2
Turret Top	—	A	A	+1	+1	A	A
Turret Guns	—	2 20mm InfR	2 20mm InfR	Blast*75	Blast*75	Blast*50	Blast*50
Cupola Guns	Blast HMG	Blast MMG	Blast MMG	Blast MMG	Blast MMG	Blast MMG	Blast MMG
Calliope	—	Blast HMG	Blast HMG	2 Blast HMG	2 Blast HMG	Blast HMG	Blast HMG
Cost (MCR)	0.08	0.075	0.095	x6 Mdm.	x6 Mdm.	x6 Lt.	x6 Lt.
				0.65	0.725	0.35	0.4



Nationality	Rauwoof	Rauwoof	Rauwoof	Rauwoof	Hissss'ist	Hissss'ist	Hissss'ist
AFV Type	TMU (T)	TMU (H)	APC (T)	ATV (G)	MBU (T)	CRU (T)	CRU (H)
Code Name	Viking	Viper	Vixen	Vagabond	Krag	Dagon	Skar
Tech Level	7-10	7-10	7-10	7-10	7-10	7-10	7-10
Mass	5t	5t	18t	8t	75t	15t	15t
Crew	2	2	2 + 18	2 + 4	3	3	3
Travel Mode	Fast Track	GEM	Fast Track	Grav	Slow Track	Mdm.Track	GEM
Range	1500 km	2000 km	1500 km	2000 km	1000 km	1000 km	1000 km
EW/ECM	7-10	7-10	7-10	7-10	3-6	3-6	3-6
HUD Targeting	+7%	+7%	+7%	+7%	+7%	+5%	+5%
Damage Cap.	10	10	10	10	30	10	10
Rad. Shield	-6	-6	-6	-6	-8	-6	-6
BattleScreens	standard	standard	standard	standard	+3	—	—
Armor Front	AFV	AFV	AFV	AFV	+6	+1	+1
Armor Side	AFV	AFV	AFV	AFV	+5	+1	+1
Armor Top	B	B	B	B	+1	A	A
Turret Front	AFV	AFV	—	AFV	+6	+1	+1
Turret Side	AFV	AFV	—	AFV	+5	+1	+1
Turret Top	B	B	—	B	+1	A	A
Turret Guns	Hv. PML 'D'	Hv. PML 'D'	—	20mm InfR	Blast*100	Blast*50	Blast*50
or	—	—	—	Blast*20	Gauss 'C'	Gauss 'E'	Gauss 'E'
or	—	—	—	—	Gauss 'D'	40mm InfR	2 20mm InfR
Cupola Guns	Blast HMG	Blast HMG	Blast HMG	Blast HMG	2 Blast HMG	Blast HMG	Blast HMG
	—	—	—	Lt.PML 'E'	Hv.Scrambler	Hv.Scrambler	Hv.Scrambler
Cost (MCR)	0.09	0.115	0.075	0.075	0.525	0.175	0.215

Nationality	Hissss'ist	Hissss'ist	Hissss'ist	Klackon	Klackon	Klackon	Klackon
Code Name	Krell	Klar	Vekka	Ruffian	Robber	Ripper	Rhino
AFV Type	TMU (T)	TMU (H)	APC (T)	MBU (T)	CRU (T)	TMU (T)	APC (T)
Tech Level	7-10	7-10	7-10	7-10	7-10	7-10	7-10
Mass	8t	8t	15t	100t	25t	15t	15t
Crew	3	3	2 + 18	5	3	3	1 + 20
Travel Mode	Mem.Track	GEM	Mdm.Track	Slow Track	Fast Track	Fast Track	Fast Track
Range	1000 km	1500 km	1000 km	1500 km	1500 km	1500 km	1500 km
EW/ECM	3-6	3-6	3-6	5-8	5-8	5-8	5
HUD Targeting	—	—	—	+7%	+5%	+5%	—
Damage Cap.	10	10	10	35	5	15	15
Rad. Shield	-4	-4	-4	-6	-4	-4	-4
BattleScreens	—	—	—	+3	standard	standard	—
Armor Front	AFV	AFV	AFV	+6	+3	+2	+1
Armor Side	AFV	AFV	AFV	+5	+3	+2	+1
Armor Top	A	A	A	+2	+1	+1	A
Turret Front	AFV	AFV	—	+6	+3	+2	—
Turret Side	AFV	AFV	—	+5	+3	+2	—
Turret Top	A	A	—	+2	+1	+1	—
Turret Guns	Hv. PML 'D' 20mm InfR	Hv. PML 'D' 20mm InfR	—	Blast*100 Hv. PML 'D'	Blast*50 Hv. Scrambler	Hv. PML 'D' Hv. Scrambler	—
Cupola Guns	Blast HMG	Blast HMG	Blast HMG	2 Blast HMG	Blast HMG	Blast HMG	Blast HMG
Cost (MCR)	0.075	0.1	0.055	0.575	0.225	0.1	0.065

Nationality	Whistler	Whistler	Whistler	Bug	Bug	Bug	Bug
Code Name	Falcon	Shrike	Goose	Thug	Punk	BugBox	Boss
AFV Type	MBU (H)	CRU (H)	APC (H)	WpnSled	WpnSled	GravSled	Command
Tech Level	7-10	7-10	7-10	7-10	7-10	7-10	7-10
Mass	50t	20t	10t	8t	4t	5t	3t
Crew	3	3	2 + 12	3	3	1 + 10 Bugs	1 + 1 Brain
Travel Mode	GEM/Grav	GEM/Grav	GEM/Grav	Grav	Grav	Grav	Grav
Range	2000 km	2000 km	2000 km	2000 km	1000 km	1000 km	1000 km
EW/ECM	6-9	6-9	6-9	—	—	—	6-9
HUD Targeting	+7%	+7%	—	—	—	—	+7%
Damage Cap.	25	15	15	6	3	3	3
Rad. Shield	-8	-6	-5	—	—	—	—
BattleScreens	+3	standard	standard	—	—	—	+3
Armor Front	+4	+1	AFV	B	C	D	+1
Armor Side	+4	+1	AFV	B	C	D	+1
Armor Top	+1	A	B	B	C	D	+1
Turret Front	+4	+1	AFV	B	C	—	+1
Turret Side	+4	+1	AFV	B	C	—	+1
Turret Top	+1	A	A	B	C	—	+1
Turret Guns	Blast*75	Blast*50	Blast*20	Blast*50	Blast*20	—	Blast*20
or	—	—	20mm InfR	40mm InfR	20mm InfR	—	—
or	—	—	—	2 20mm InfR	Mdm. PML 'E'	—	—
or	—	—	—	Hv.PML 'D'	Gauss 'E'	—	—
or	—	—	—	Gauss 'D'	Heavy Scrambler	—	—
Cupola Guns	2 Blast*20 Hv. PML 'D'	2 Blast HMG	Blast HMG	Blast HMG	Blast HMG	—	Blast HMG
Cost (MCR)	0.65	0.295	0.135	0.125	0.75	0.45	0.1

2.0 EW & ECM

Electronic Warfare (EW) and Electronic Countermeasures (ECM) play a significant role in future combat.

Most of the equipment for each nationality/race has been given an 'EW' rating. In all instances in which an EW/ECM determination is required, the player rolling the EW dice will apply the difference in the EW ratings as a DM or die modifier.

Jamming: Sensors can be jammed. While most sensor jamming will tend to be ignored in a combat scenario fought at close ranges, it can prove vital in a search/hide scenario or combat at long range. The appropriate jamming equipment is required (see ECM in the Equipment section of *Space Opera*). The method outlined in the description of the equipment can be used or, if preferred, a simple 1d20 can be rolled, with 15+ signifying that the sensor has been jammed. A +DM or -DM is applied, depending upon whether the jamming equipment is of superior EW or inferior EW to the sensors. The jammer can only foil an attempt to locate the person or equipment/vehicle carrying it. It can be assumed that most military equipment is fitted with jamming equipment as part of its ECM capability.

Area Jammers: Specially equipped vehicles and aircraft (for some unknown reason, termed 'wild weasels') are capable of jamming all sensors in a given zone. These units are classes as an 'offensive' heavy weapon because of the havoc they can produce in the detection systems of the enemy.

Sneak Suits: A Sneak Suit can foil a sensor attempting to detect it, but has no effect on the sensor's ability to detect other personnel in its scanning zone.

AA Sensors: All 'AA' rated weapons have anti-aircraft sensors capable of locking onto a target if they are not jammed by the aircraft's ECM (at the EW rating of the aircraft). If the aircraft does not jam the sensor, the AA weapon must roll 7+, with EW adjustments, to successfully lock onto the target. Any unadjusted roll of 1 or 2 means that lock-on has failed, whatever the EW advantage. Once a lock-on is achieved, the aircraft may attempt to break it each subsequent turn with an ECM jamming attempt, by flying Nap of Earth ('on the deck') to interpose terrain to block the sensor beam, or by destroying the weapon. In practice, the aircraft could also attempt to get out of range. AA sensors give AA/MGs and Heavy Blasters or Lasers with AA capability a bonus to hit the target, while AA Missiles have an automatic DH Direct Hit if the lock-on is not jammed. (See Anti-Aircraft Fire.)

Missile Jamming: One of the most important functions of ECM is the jamming of incoming missiles before they reach their intended targets. Smart bombs count as missiles for jamming. The same procedure to effect jamming as outlined above for AA lock-on is used. However, 'snap-down' missiles enjoy a +2 EW bonus above national ratings because of the difficulty of jamming the 'snap-down' homing mode.

Premature Detonation of Missiles/Smart Bombs: An area jammer may be directed at a flight of missiles or a stick of smart bombs. An adjusted roll of 10 on 1d10 is required to prematurely detonate the missile or smart bomb before it reaches a target. If the missile/smart bomb has an EW higher than the jammer, a 10 still causes detonation. If the area jammer has a higher EW, the difference is added to the 1d10 roll as a DM, with 10+ adjusted results exploding the missile or smart bomb.

Area Jammer Detection: Any RDF Radio Direction Finder, Radar set, or vehicle or man-portable Sensor Defense SSD2 unit will be able to detect the position of an area jammer by its emissions. To locate an area jammer, roll 1d20 and add the searcher's EW rating, with an adjusted 15+ score indicating that the unit is pin-pointed. The jammer's EW is not considered in this instance. Only an area jammer foolish enough to stay in the same position instead of keeping in motion can be subjected to accurate area fire by artillery or direct-fire weapons. However, a unit in motion will only be generally located — not enough to provide accurate gunnery data, but sufficient to narrow the position of the area jammer down.

EW Detection: Sensor units will detect any object within range on a 1d20 roll of 2+, unless ECM jamming is attempted by counter-measures systems associated with specific units or an area jammer.

3.0 ANTI-AIRCRAFT FIRE

Only automatic weapons and anti-aircraft missiles can affect aircraft with any certainty of doing damage. Only if an aircraft is moving under 300 kmh (500m/6 seconds) can it be hit by non-automatic weapons, with the basic direct-fire probabilities applying.

Note that even though AA fire is performed by automatic weapons, they fire only once, not three times as for ground fire bursts aimed at specific targets. The bursts and number of AA weapons firing is taken into account in the hit probabilities. If a hit is scored, only one hit is assessed for the vehicle damage component of combat. For instance, a dual AA Heavy Blaster mount fires at an aircraft and hits it. Only one hit determination roll is made, and only one Heavy Blaster hit will be scored for purposes of determining damage to the aircraft.

When non-AA automatic weapons are firing, the calibre of the hit is that of the heaviest weapon. For instance, 9 Blast Rifles and a Blast LMG fire on an aircraft making a strafing run. If the aircraft is hit, Blast LMG damage occurs.

Most weapons can hit aircraft only at low altitudes. Automatic rifles, LMGs, MMGs, .50 HMGs, 20mm AutoCannon and M61 AutoCannon, 10mm and 20mm Infinite Repeaters, and Light Calliopes and Light PMLs can fire at low-flying aircraft.

Aircraft at medium altitude can be fired on by 10mm Laser HMGs, 15mm Blast HMGs, 40mm Infinite Repeaters, Medium Calliopes, and Medium PMLs.

Aircraft at high altitude can be fired on by 20mm Heavy Lasers, 20mm Heavy Blasters, AA mounted 20mm and 25mm Fusion Guns, Heavy Calliopes, and Heavy PMLs.

Specially mounted Blast and Laser Cannon can fire on craft at sub-orbital and low orbit altitude.

AA Automatic Weapon Fire: All specially mounted AA automatic weapons (usually MGs or Heavy Blaster 20mm autocannon mounted in vehicle cupolas on top of turrets or hulls) are designed for anti-aircraft fire. All AA weapons have a basic 10% chance of hitting an aircraft, to which is added +1% x gunner expertise and +5% per barrel of the weapon. If EW AA/Sensor 'lock-on' is achieved, the HUD hit % bonus is added to the hit probability.

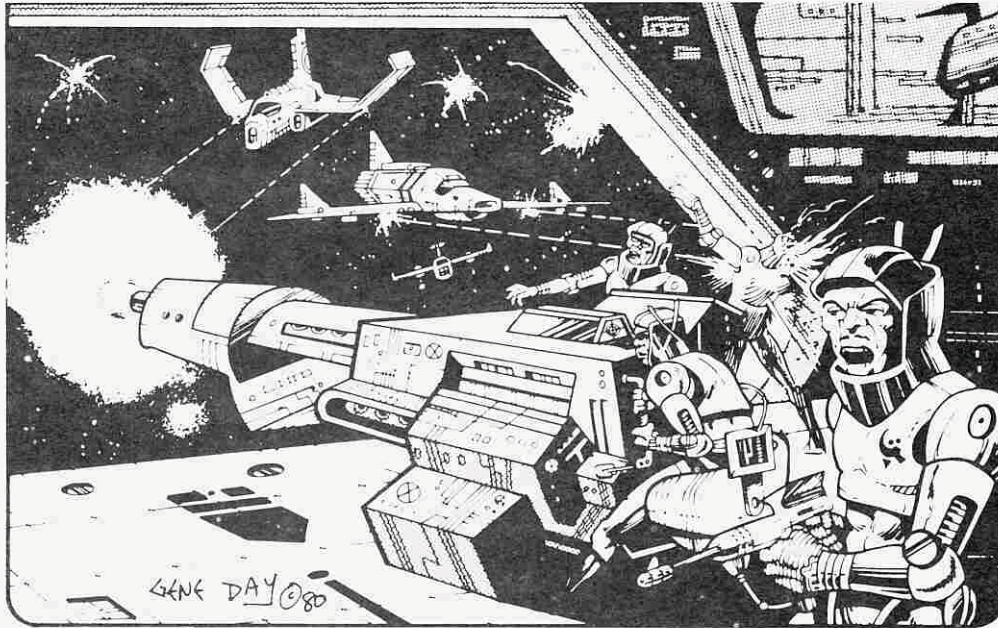
Non-AA Automatic Weapons: Automatic weapons without special AA capability are grouped into units of 10 weapons. Determine the hit probability by adding up the number of barrels firing. A 1d100 roll may be made for each group of 10 weapons, or they may be added together to achieve up to a 25% hit probability (requiring 25 barrels firing). Groups of weapons under 10 barrels fire at 1% hit probability per barrel, added together. Six MGs would thus have a probability of 6% to hit an aircraft, 10 have 10%, etc.

Evasive Flying: An aircraft can evade groundfire by automatic weapons. Evasion prevents the aircraft from firing weapons at ground or air targets 75% of the time. The hit probability of automatic ground weapons is reduced by -2% x expertise as a Combat Pilot and by -1% x air-to-air dogfight factor of the aircraft.

Anti-AA Sensor ECM: An aircraft's ECM gear (rated at EW of aircraft) can foil AA/Sensors to prevent a 'lock-on', which prevents AA Automatic weapons from applying HUD hit % bonuses, and which prevents homing and command guidance AA missiles from homing onto the target for a direct hit.

These anti-aircraft rules are also used by combat aircraft when dog-fighting.

AA Missiles: SAM (surface-to-air) and AAM (air-to-air) anti-aircraft missiles can be fired by PMLs and by combat aircraft. Anti-aircraft missiles are specially designed to home in on a target and 'dill' it with a direct hit, either head on if fired in front of the aircraft, or straight up the tailpipe and into the engines. For each missile fired, roll 1d20, with 6 or higher indicating a direct hit. The aircraft may attempt to jam the AA/Sensors in any missile not employing Infra-Red (unjamable) but rather using radar or sensorscan homing. If a failure to jam occurs, roll



the 1d20 for a missile lock-on and direct hit. The aircraft may attempt to evade the missile, which brings into play the air-to-air capability of the missile as opposed to the air-to-air capability of the aircraft and the expertise of the Combat Pilot. Add +1 to the 1d20 for each air-to-air factor of the missile. Subtract -1 from the 1d20 for each air-to-air factor of the aircraft and -1 for each level of expertise possessed by the Combat Pilot. If the corrected 1d20 roll is 8+, the missile will hit the target. If the result is 5-7, the missile detonates within the CZ casualty zone range of the aircraft 50% of the time. If the result is 4 or less, it is a miss.

If more than one missile is fired at the same target, each successive missile gains a +1 DM hit probability, reflecting the ever-decreasing effects of evasion to avoid all of the incoming SAMS or AAMs - SAMS have five times the range of normal PML rounds.

Non-AA Missiles: Any missile is capable of knocking down an aircraft, but it is not very effective. For each missile fired, roll 1d10, with 6+ required to hit a non-evading aircraft. An evading aircraft subtracts ½ of its air-to-air combat rating as a -DM from the 1d10 roll. Round the air-to-air -DM up. If the adjusted 1d10 roll is 5, only a 5% chance exists of a Direct Hit (DH). A 1d10 result of 4 means a 2% chance to hit and a 3 means a 1% chance to hit. Note: such missiles are of the homing variety; ordinary rockets (unguided) will have no chance of hitting an aircraft unless it is flying at speeds under 300 kmh.

Direct Hits by Missiles: A DH Direct Hit will occur when the missile result is +1 over the result required to hit. If the result is on the precise number required to hit, the 'direct hit' is read in the KZ Kill Zone damage column instead of the DH Direct Hit damage column in the Warhead Tables (see following). If the result is -1 below the required result to hit, there is a 50% chance that an AA missile has detonated close enough to place the aircraft in the CZ Casualty Zone of the warhead.

4.0 AIRCRAFT RULES

'Aircraft' (which includes a number of craft capable of attaining orbit as well as Deep Space StarFighters, described later in the rules) are capable of one or several functions: Transportation, Reconnaissance, Ground Attack, and Air Superiority.

Aircraft Altitude Levels: Aircraft may fly at various altitudes. To simplify the gaming mechanics, these have been divided into a number of distinct altitude levels rather than into measurement according to meters or feet above the ground. Altitude matters in precise measurement only when determining whether an aircraft can clear a mountain range or can fly higher than another aircraft.

1. Nap of Earth altitude is flying very low ('on the deck'), usually under 100m from the ground.

2. Low Altitude is flying 200m to 500m from the ground. Add 200m to AA weapon ranges.

3. Low Medium Altitude is flying around 2000m from the ground. Add 2000m to AA weapon ranges.

4. High Medium Altitude is flying around 5000m from the ground. Add 500m to AA weapon ranges.

5. High Altitude is flying around 10,000m from the ground. Add ten thousand meters to AA weapon ranges.

6. Very High Altitude is flying around 20,000m from the ground. Add 20,000m to AA weapon ranges.

7. Low Sub-Orbital Altitude is flying around 25,000m from the ground. Add 25,000m to AA weapon ranges.

8. High Sub-Orbital Altitude is flying around 30,000m from the ground. Add 30,000m to AA weapon ranges.

9. Low Orbit is close free-fall range from the planet, about 100 km (100,000m) from the surface. The low orbit altitude is the point at which a craft either functions like a spacecraft, attaining the capacity to maintain a permanent (theoretically) 'parking' altitude around a planet, with passage around a Terran planet in about 1.25 to 1.5 hours (speed approx. 30,000 kmh.)

Type of Aircraft

Altitude Levels Per Six Seconds

StarFighter	2.00
Advanced Fighter	2.00
Advanced Fighter Bomber	1.50
Advanced Bomber	1.00
Utility Flitter	1.00
SST	1.00
SuperSonic Jet Fighter	1.00
SuperSonic Fighter Bomber	1.00
Early Bomber	0.50
Primitive Fighter	0.50
Light Plane	0.25
Prop Transport	0.25
Helicopter	0.25
AirCav Mount	0.50
SkyCycle	0.50
Shuttle	1.00
Assault Shuttle	1.00
Spaceship	1.00

Landing on TurboGrav or Helicopter/VTOL mode requires 12-18 seconds. Take-offs require 6 seconds. Aircraft requiring a runway require 30 seconds for STOL and 60 seconds otherwise for take-offs and landings.

Aircraft Movement: Most aircraft movement will probably be conducted with the use of graph paper and a pencil to locate aircraft maneuvering at high speeds, especially in battle situations, as they move too fast to remain 'on board.' When making 'routine flights,' it is enough to merely locate the aircraft on a map.

In a more or less standard Terran atmosphere, Mach 1 or the speed of sound is about 1950 kmh (3250m/6 seconds). It might be noted that the atmospheric speeds of most craft are rated at little more than Mach 3 at best. This is the low-level maximum. Speeds are increased by 1000 kmh per altitude level above Low Altitude for all supersonic craft. A Terran TurboGrav powered Fighter II, for example, can attain 7500 kmh 'on the deck', but at High Sub-Orbital levels it reaches 13,500 kmh or about Mach 6.9. Early supersonic aircraft add only 250 kmh per altitude level.

In vacuum or near-vacuum conditions, spacecraft and flitters with TurboGrav engines can attain High Orbital speeds, even at very low altitudes, and ranges are increased x5 above those listed for flitters.

Acceleration and deceleration can be accomplished at a rate of 30% of maximum speed for all TurboGrav equipped craft, and at a rate of 20% of maximum speed for all other aircraft. The maximum speed at low level is used as the basis for computing the acceleration.

Note: 100 kmh = 165m/6 seconds. Mach 1 = 1185 kmh or 1950m/6 seconds.

Crashes: Any aircraft (or CG Harness) flying NOE (Nap of Earth), or flying within 150m of an obstacle as tall as its altitude, runs the risk of crashing if it flies too fast. If an aircraft is flying faster than 300m/6 seconds (180 kmh), there is a risk of a crash. Roll 2d6, with a 3 or less result indicating that the aircraft has flown into the ground or hit an obstacle. For each 180 kmh above that speed, increase the crash number by +1.

For example, an aircraft is flying at 1500m/6 seconds (900 kmh or 560 mph) at NOE. Its chance of crashing is 2-6 rolled on 2d6, as 1500 meters/6 seconds is +4 over the base 300m/6 seconds speed.

Pilot expertise can be used to avert a crash, as described in **Space Opera** 4.9 General Skills for Atmospheric Pilots. However, there is also a penalty DM of -1 for every 180 kmh of speed being flown NOE. For instance, a Pilot has Dexterity 17 and expertise/9. He has a CR of 17 + 3 (expertise x 1/3) or 20 on 1d20. He is flying at 1500m/6 seconds at NOE, so his CR is reduced by -5 (1500/300 = 5) to 15. He must roll equal to or lower than 15 to avoid the crash.

Whistlers are exceptional pilots, being Avians, so they add +1 to Pilot CRs when a crash seems imminent. Mertuns, Klackons, and Bugs subtract -1 from both their CRs and also the 2d6 roll for a possible crash, as they are not the best in the business.

The crash site, if the plane does hit, is somewhere along its line of flight Roll 1d100 and apply the resulting percentage to the speed of the aircraft to see where it hit during the turn. If the aircraft in our example had flown into the ground, and the 1d100 roll came out 52, it crashed 52% of 1500m from the point where it started the turn, or 780m from the start point.

Anyone who crashes is stunned for 30 seconds to 3 minutes (1d6 x 30 seconds) and is unable to do much of anything except stagger away from the crash. However, if the aircraft is travelling faster than 300m-900m per turn, there is a 20% chance per additional 300m per turn of speed that it suffers damage as if hit by a 'D' explosive round in the CZ zone. A casualty roll is made for each occupant of the aircraft, applying the 'D' Casualty DM for a vehicle hit in the CZ zone. If the chance of an explosion equals or exceeds 100%, the 'D' explosion is considered in the KZ zone.

Aircraft Crashes due to Breakdown, Damage or Pilot Error: A crash is inevitable under the following conditions:

1. Common (civilian) aircraft with half or fewer engines operating, either from malfunction or damage.
2. Military aircraft with less than half engines operating from special damage taken (military aircraft only fly when properly maintained.)
3. Navigational error and running out of fuel.
4. Damage capacity reduced to zero or below.
5. Explosion causing structural damage affecting flight characteristics such as wing, tail, control surfaces blown off.

The chance for a crash exists if pressurization is lost in cabin or pilot's flight suit when flying above 5000m altitude. This basic chance is 50% modified by altitude and the pilot expertise modifiers given below. Any Roll is compared to the tables below and the modifiers are applied to the basic 50% chance. A roll below the modified chance to crash on 1d100 indicates a crash.

Altitude	DM	Pilot Expertise	DM
5000m	+25	0	+15
7500m	+15	1-2	-5
10,000m	+5	3-4	-15
12,500m	-5	5-6	-20
15,000m	-10	7-8	-25
17,500m	-15	9-10	-30
20,000m*	-15		

*Above 20,000m there is a reversal of the altitude DM table due to disorientation following decompressive blackout, ie. 22,500m has a -10 DM, 25,000m has a -5 DM, etc. to a maximum of +25 DM.

When a crash (forced) landing occurs, the severity is determined by a Dexterity CR for the best Pilot in the cockpit only, as modified by Pilot Expertise (**Space Opera**, Vol. I, p. 51 or 58) and terrain. Personnel on board may become injured as the result of a crash. Injury determination procedure will appear following the Crash Severity Table.

Terrain	DMs
Sea, Ocean, Large Lake*	0
Lake, Marsh, Swamp	-1
Plains (Grassland)	0
Gentle Hills	-2
Rocky or Steep Hills, Canyons	-5
Mountains	-7
Plowed Field	-1
Light Woods	-2
Heavy Woods, Jungle	-3
City or Town	-5

*Large Lake is two or more times length of normal landing run.

Dexterity + DMs - Die Roll = N (indication of Crash Severity)

N	Severity	Additional Vehicle Damage**	Injury CR DM
5+	Soft	10%	-5*
2-4	Bumpy	30%	-1*
-1-1	Rough	60%	+1*
-5-2	Serious	90%	+3*
-6 or less	Extreme	100%	+5*

* Additional +3 DM if not seated and restrained. If restrained an additional -1 DM for each Tech Level over 7 for improved restraint, crash webbing, etc.

**Expressed as a percentage of total damage capacity. Round to nearest whole number.

Injury CR: The Injury CR is made by rolling 1d20. The CR is based on the average of Agility, Constitution, and (Intelligence or Intuition), ignoring all fractions. Roll this five times with modifiers as given in the table above. Each failure increases the wound category to the next higher level, starting with unhurt. The first failure on the CR indicates a very light, the second failure indicates a light, etc.

After determining the wound category, if any, determine the injury location as per target hit location (**Space Opera**, Vol. II, p. 42) and points of damage (**Space Opera**, Vol. II, p. 47.)

4.1 AIR & STARFIGHTER COMBAT

Actual combat in the air will tend to be a far-ranging matter, with the aircraft attaining high Mach numbers when they maneuver for attack. Usually, it is impossible to depict air combat on a playing surface like a gaming table top. Accordingly, it is recommended that players resort to a sheet of graph paper to map the action as it rages overhead.

Instead of converting aircraft speeds to meters, use kilometers per hour as the measure of speed, with an aircraft covering 165m per 100 kmh in a 6 second period.

Air Combat Initiative: The initiative in an air combat scenario is determined by each combatant aircraft rolling 1d10, and adding to the die roll score the following modifiers:

Combat Pilot expertise, per level	+1
Air-to-Air Combat Factor of aircraft, per point	+1
Per 500 kmh of speed	+1
Altitude advantage over other aircraft	+2
EW/ECM Rating of aircraft, per EW factor	+1
Combat Pilot Veteran Elite (Expertise 9-10)	+4
Combat Pilot Elite (Expertise 7-8)	+3
Combat Pilot Veteran Regular (Expertise 5-6)	+2
Combat Pilot Regular (Expertise 4-5)	+0
Combat Pilot Green (Expertise 2-3)	-1
Combat Pilot Reservist (Militia not on active service, Exp./1-5)	-2
Combat Pilot StarForce StarFighter trained	+2*
*Terran Union StarForces and IPA only.	

Aircraft with a bracketed () air-to-air factor can only evade defensively; they cannot engage an aircraft unless it is flying below the speed of sound, at which point the combat factor is fully applicable. It will be seen that some of these slow craft are so nimble that they can dog-fight a high-technology fighter very effectively at subsonic speeds.

Bombers will likely lose the initiative determination, but they will be given anti-aircraft fire capability if they mount turrets. If they carry AAM and the attacker is not approaching from the rear, they may also fire missiles at the attacker.

The aircraft with the advantage can have one of several results:

1. If the initiative roll (adjusted) is +1 to +3 above the opponent's, an attack cannot be delivered, but a +2 DM to the next initiative roll is obtained for advantageous position.
2. If the initiative roll is +4 to +5 above the opponent's, an attack with guns may be made, using the procedure outlined for anti-aircraft fire. However, if the defender has a weapon turret, he may counterfire if the gunner succeeds in making a capability CR by rolling 18+ on 1d20, adding his expertise as a DM to the die roll. If he succeeds, he fires at the incoming aircraft before it fires. If he fails, he fires at the attacker after it completes its firing pass and is drawing away (assuming that the target is still in the air).
3. If the initiative roll is +6 or more above the opponent's, the attacker has the choice of firing AAM air-to-air missiles or guns. Up to two AAM may be fired by the aircraft carrying 2, 4 or 6 missiles, and up to 4 may be fired simultaneously by aircraft carrying 8+ AAMs.

If missiles are fired, the defender may attempt to evade and to use his ECM to jam the incoming missiles. These procedures have been outlined earlier for SAM/AAM missiles in the Anti-Aircraft section and in the EW/ECM section of these rules.

Damage caused by combat in atmosphere is determined by using the anti-aircraft fire rules. Note that StarFighter NovaGuns have reduced effects (see 4.3) in air, and that the BattleScreen DF is not applied. In space, StarFighters score damage as described for StarShip combat in **Space Opera**.

In most instances, air combat will be a one-on-one affair, but it sometimes happens that two craft are flying together (Leader and Wingman). In this instance, a single aircraft will have to beat both opponents to have the chance of a shot. If one of the two loses the initiative, but the other has a roll higher than the single aircraft, it will have a shot at the single aircraft.

It may also happen that two aircraft are fighting several opponents. If one of the two gets a higher initiative score than all of the opponents, the enemy cannot fire. It is assumed that any attempt by the enemy was frightened off because the wingman was maneuvering to attack the incoming aircraft.

4.2 BOMBING & STRAFING

Aircraft may attack targets on the ground or aircraft moving under 900m/6 seconds (540 kmh) using the direct-fire rules in **Space Opera**, adjusting for altitude as outlined previously. But, in order to strafe, the aircraft cannot evade groundfire.

The strafe, the aircraft must fire automatic weapons. The target(s) must be placed along the aircraft's line of flight. Up to three targets can be strafed in one turn, but they must be 500m apart and along the line of flight. The altitude must be low or NOE. Each strafing burst covers an area 50m x 50m, with all personnel and vehicles in that zone subject to attack. The range is always MR Medium Range for the appropriate automatic weapon (tripod equivalent).

If firing at a low-flying aircraft, reduce the hit probability for more than just a 'fast moving vehicle;' subtract the air-to-air rating and expertise of its pilot as well.

Most bombs are simply aimed at a piece of real estate. They have a chance of scattering.

Altitude of Bomber	Hit Probability (1d100)	Scatter Distance
Low/NOE	35%	25m-150m long or short only.
Medium	30%	50m-300m long or short/ 25m-100m to either side.
High	25%	25m-500m in random direction.

When bombing, the target must be along the flight path of the bomber for free fall bombs and rockets. Bombed targets will pass beneath the aircraft. Rocket targets must be up to 750m directly in front of the aircraft. A direct hit is not scored even if the accuracy roll is successful. If the bombs/missiles are on target, roll 1d6 to find out if a direct hit was scored:

Target Is	1d6 Required
Small Emplacement	6
Vehicle	5+
Small Hut	4+
Small Building	2+
Larger Structure	Automatic

Some bombs are 'smart,' meaning they glide to a target on a homing basis, as described for missiles. If of the homing variety, their hit probability is 95% if the bomber is not evading, and 85% if it is evading. Such bombs scatter if they miss in the same manner as a missile or free-fall bomb. However, ECM can be used to jam homing 'smart' bombs. If the bomb is accurate, roll on the direct hit table, with a +1 DM as for rockets. If the bomb scatters, treat as a free-fall bomb.

Smart bombs can also have inertial guidance systems set for the location of a landmark. These are unjammable by ECM. Hit probabilities are as for homing rounds, only the target is a patch of ground.

A-G-M Air-to-Ground Missiles are fired exactly as described for PMLs, with 95% accuracy if the aircraft is not evading, and 85% if it is evading. Attacks must be made at low or NOE altitude.

4.3 PLANETARY BOMBARDMENT

Planetary atmospheres and magneto-gravitic fields have a serious dissipating effect on NovaFire so it is necessary to enter orbit in order to fire on the ground. Ships in orbit may bombard only major installations and cities; tactical targets (infantry, vehicles, etc.) are too small to be hit with effect by NovaFire.

In orbit, the defensive values of BattleScreens are reduced to a maximum of +15. A Blast*200 will therefore penetrate the heaviest BattleScreen on a roll of 9+ on 1d10. Do not add BattleScreen strengths to armor ratings.

In atmosphere, the defensive values of BattleScreens are reduced to a maximum of +12. A Blast*200 will therefore penetrate the heaviest BattleScreen on a roll of 6+ on 1d10. Do not add BattleScreen strength to armor ratings.

Armor is 50% effective in orbit, with a maximum +16 rating.

Armor is 50% effective in atmosphere, with a maximum +13 rating.

Ships are highly vulnerable to groundfire and will rarely be risked in close orbit. The effectiveness of NovaGuns is also reduced in atmosphere. Penetrations are rated accordingly to equivalent Blast Cannon calibres when firing through atmosphere (either when the ship is in atmosphere or in low orbit firing down into the atmosphere at a target

on the ground). Damage inflicted is also per shot, as 6-second battle turns are contemplated in such instances:

NovaGun Calibre	Penetration Armor	Screens	Damage
N*25	0	1	7
N*50	-1	0	12
N*75	-2	-1	14
N*100	-3	-2	15
N*125	-4	-3	16
N*150	-5	-4	18
N*175	-6	-5	20
N*200	-7	-6	22
N*225	-7	-6	24
N*250	-7	-6	26
N*275	-7	-6	28
N*300	-7	-6	30
N*325	-7	-6	32
N*350	-7	-6	35
N*375	-7	-6	37
N*400	-7	-6	40
N*450	-7	-6	45
N*500	-7	-6	50
N*600	-7	-6	60
N*750	-7	-6	75
N*1000	-7	-6	100

Casualty factors and vehicle casualty DMs, as well as vehicle special damage DMs are as for the equivalent Blast Cannon calibre. All NovaGuns of N*200+ calibre are treated as Blast*200 heavy energy cannon for this purpose.

When firing on ground targets from low orbit or in the atmosphere/ on the ground, the direct fire rules are applied as given for firing on the ground or as anti-aircraft, etc., as applicable. HUD bonuses of StarShips in such instances are equivalent to +1% x EW rating plus +1% x Mk. of BattleComputer.

Massive ground artillery can be acquired in NovaGun calibres at a cost of 150% of a NovaGun turret. These weapons may be armored up to +12/+10.

Note that spacecraft actions inside the atmosphere are conducted using groundfire rules for all spacecraft lacking DA Dogfighting/Air-to-Air capability, and as aircraft when the ships have this capability. Grounded vessels count as 'vehicles' for firing purposes.

Spacecraft are very vulnerable to groundfire and atmospheric fire, whatever their size. When in low orbit or in atmosphere/grounded, every penetrating hit requires a critical hit roll, as described in **Space Opera**. However, only penetrating hit will do damage to the vessel and be assessed against the DC Damage Capacity of the StarShip.

When engaging in orbit, StarShips fight other StarShips and Orbital Forts using the space battle rules. The rules detailed here are only for planetary actions.

ST*157 StarTorps can be employed as guided missiles with 'AA' warheads. These are typically used for both planetary bombardment, and also as SSM (Surface-to-Space) defensive missiles to shoot at ships above the atmosphere. In space, they are treated as standard StarTorps, using the space combat rules. In atmosphere as planetary bombardment missiles, they are employed using the ground combat missile rules. Note that such missiles can evade ground fire like fighters when in atmosphere, and are rated as having 15,000 kmh speeds. They will strike only ground targets and cannot be used as anti-aircraft missiles in atmosphere.

While it is perhaps unrealistic, treat airless planets as having an atmosphere for purposes of using bombardment rules. To account for the absence of atmosphere produces massive play imbalances because the NovaGuns would, in fact, have tremendous penetration power and make all except the most massive ground installations totally vulnerable 'sitting ducks.' While this may seem reasonable, the intent of **Space Opera** is to provide for exciting ground action, not target practice.

5.0 MILITARY AIRCRAFT

Atmospheric combat aircraft will not become obsolete, despite the advent of the ultra-high performance StarFighters, simply because they are relatively inexpensive to build and will prove quite effective in 'low level' planetary combat. The following terms and conditions will apply to the various aircraft described below.

Nationality: Except for the 'early' Tech/5 and Tech/6 aircraft, all military aircraft are grouped according to the national/stellar cultures which form the basis of **Space Opera** and **Space Marines** universes. These nationalities do not have to be adhered to by players, who are quite free to develop their own unique starcultures, and should therefore stand as a guide as to how various equipment might be allocated.

Crew: The actual personnel manning the aircraft as pilots, navigator/ bombardiers, air gunners, etc. In a pinch, most aircraft can usually carry up to double the crew number as passengers or observers.

Mass: The standard take-off 'weight' of the aircraft, excluding ordnance such as bombs, missiles, and ammunition. By multiplying the mass times ten the volume of the aircraft can be found in cubic meters and this figure may be used to compute the space required to store a plane aboard a StarShip. If the craft is carried in launching bays, twice the volume is required to permit servicing. All advanced Tech/7+ craft are assumed to have folding wings and other features associated with contemporary carrier aircraft.

Cargo: The amount of stores, equipment, munitions, or even vehicles the aircraft may carry. Passengers may be carried instead of cargo. If both are carried, each passenger denies the use of space for cargo equal to the total tonnage x 1/number of passengers possible. All craft without cargo capacity are assumed to have provision for 50kg to 100kg of personal equipment for each crew member, in addition to his flight gear.

Powerplant: Three basic types of propulsion systems are distinguished. The IC prop is a standard internal combustion engine powered propeller system. The Jet is either a turbojet or fanjet, with Tech/6 aircraft likely having afterburners as well. Both propeller and jet or fanjet, may have runway, STOL (short take-off and landing) or VTOL (vertical take-off and landing) capability, depending on the specific aircraft. This can be designated by the StarMaster. Runway landings/ take-offs require a run in meters equal to the basic speed of the aircraft plus 250m per size class over fighter. STOL landings/take-offs require 1/5 the distance for runway landings, while VTOL operations require little more than the space the aircraft actually occupies. 'Turbo' powerplants refer to the helicopter rotor/jet engine system or to a jet engine in the AirCav Mount or SkyCycle. Such craft are VTOL types. The TurboGrav is a combination jet/anti-gravity propulsion system which raises the speed, ceiling, and maneuverability of aircraft to such a degree that they not only outclass all previous aircraft types, but also can achieve orbit or atmospheric re-entry. This permits the 'aircraft' to operate from spacecraft in low orbit. All TurboGrav craft are capable of VTOL take-offs and landings.

Speed: The maximum speed of the aircraft 'on the deck' at low altitude. Speeds will be increased by +1000 kmh per altitude level above low altitude. Also, +1000 kmh is added to the speed for each Tech level above Tech/7.

Ceiling: The ceiling of an aircraft refers to the maximum altitude at which it can still employ lift of the aerodynamic properties of its wings or equivalent lifting surfaces to remain aloft. TurboGrav craft will be able only to achieve orbit once they reach operational ceiling and cannot initiate attacks between ceiling altitude and orbit because of control problems.

Range: The distance that an aircraft can fly with a maximum fuel load. The fuel carried masses 20% of the aircraft mass and costs CR.10 per kg. Note: This fuel load is used only in atmosphere; TurboGrav craft ride the magnetic lines of force of a planet above the atmosphere or when there is a very thin atmosphere or vacuum conditions at the surface, with endurance of 24 to 48 hours on the powercells. Also, to reflect the efficiency of higher technology engines, increase the range by +20% per Tech level above Tech/7, regardless of the type of aircraft. Thus a Tech/10 culture will produce a Tech/5 fighter with 200% of the range of a Tech/5 produced craft.

Damage Capacity: The total amount of damage that the aircraft can sustain from heavy weapon or missile fire before it is unable to fly.

Rad Shield: The factor by which an external radiation level is reduced by the aircraft hull or any special shielding equipment. See Nuclear Weapons, section 7.1.

Armor: The degree of armored protection provided by the hull of the craft as well as by actual armor installed to protect the crew and vital equipment.

EW/ECM: The Electronic Warfare and Electronic Counter Measures capability of an aircraft will play an increasingly important role as combat becomes more advanced and dependent upon the use of sophisticated sensor/tracking equipment to detect, range, and fire weapons or to foil such systems. See EW/ECM, section 2.0. This factor increases +1 per Tech level above Tech/7.

Dogfighting: All aircraft are rated for their air-to-air combat ability, as are missiles designed to shoot down aircraft. See Air Combat, section 4.1. The dogfighting factor is increased by +1 per Tech level above Tech/7.

Weapons: The basic type of weapon mounted either in a fixed forward position or, in the case of some bomber types, in a forward turret, and also in hull turrets to protect the top, sides, bottom, and/or rear of the aircraft are listed. However, it should be noted that late Tech/6 and early Tech/7 aircraft could mount 20mm Infinite Repeaters or heavy laser 'machine guns' or very light laser cannon instead. Also, some craft may mount blast HMGs instead of the very typical Blast*20 light automatic energy cannon.

Ordinance: Most aircraft will carry either a bomb load or else air-to-air missiles (AAM), depending upon their combat role.

Factors not stated in the general descriptions are'

BattleScreens: Tech&6 aircraft typically possess standard strength BattleScreens. Tech/8+ aircraft have +1 BattleScreens and Tech/9+ Terran, Mercantile League, Azuriach, and MedPurr aircraft may have +2 BattleScreens in some cases, especially in elite units.

STOL Fuel Consumption: Each STOL take-off or landing will consume 100km worth of fuel if a distance less than 1/3 standard runway take-off or landing is required.

VTOL Fuel Consumption: Each VTOL take-off or landing will consume 250 km worth of fuel. A VTOL aircraft may hover by consuming 100 km in fuel per minute. However, helicopters, AirCav Mounts and SkyCycles consume only 10 km in fuel per VTOL take-off or landing or per minute of hovering. TurboGravs do not require fuel for airless maneuvering, as full gravity drive is used instead.

Pressurization & Sealing: All Tech/6+ aircraft are assumed to be fully pressurized and sealed. They typically have a 24–48 hour life-support system for the maximum crew and passengers for which they are rated, beginning with Tech/7 craft. Additional life-support systems can be installed for a greater duration, as outlined in **Space Opera** for vehicles.

Breakdown: All aircraft have a chance of becoming non-operational just before a mission or flight, with a 1/4 Breakdown Number. Otherwise, malfunctions will occur only when improper maintenance is performed or when battle damage is sustained. Maintenance has to be done every 50 hours of flight time, with +1 added to the Breakdown Number per 1d6 hours of operation above that limit. Maintenance requires 1d6 + 4 hours plus 1 hour per point added to the breakdown numbers for overdue maintenance. See **Space Opera** for complete breakdown rules.

Cost: Aircraft costs are stated in MegaCredits (CR 1,000,000). Obsolete and used aircraft can be acquired at –15% cost per Tech level below the current level of the culture in which the unit is purchased. Merchant expertise further reduces the cost of used aircraft by –1% x expertise. Such aircraft will have a greater likelihood of breaking down, so add +1 to the serious breakdown number per Tech level the aircraft is below current standards. For example, a Tech/7 aircraft is purchased in used condition in a Tech/8 stargate, so the Breakdown no. = 1/5, not 1/4. However, a new aircraft of a lower Tech level can be purchased at –10% from the base cost, with no penalties attached to the Breakdown. For instance, a Tech/9 culture could produce a new Tech/6 Jet Fighter at –30% cost or CR 240,500. Merchant expertise could reduce this cost by up to an additional –10% to CR 210,000. Finally, veterans of military organizations can obtain special discounts, as outlined in **Space Opera** for retirement benefits, to further reduce costs. However, at no time will costs be below 20% base listed price.

Nationality Type	Primitive Fighter	Primitive Fighter Bomber	Primitive Light Bomber	Primitive Bomber	Primitive Fighter	Primitive Ftr. Bomber
Tech Level	5	5	5	5	5-6	5-6
Crew	1	2	4	8	1	2
Mass	3t	5t	15t	30t	10t	15t
Powerplant	x1 IC Prop	x1 IC Prop	x2 IC Prop	x4 IC Prop	x1-2 Jet	x2 Jet
Speed	700 kmh	550 kmh	500 kmh	450 kmh	1800 kmh	1600 kmh
Ceiling	High Alt.	High Alt.	High Alt.	High Alt.	High Alt.	High Alt.
Range	1000 km	1000 km	1500 km	2500 km	1500 km	2500 km
Damage Cap.	5	6	8	10	6	6
Rad. Shield	—	—	—	—	-1	-1
Armor	D	D	D	D	D	D
EW/ECM	0	0	0	0	2	2
Dogfighting	(10)	(8)	(4)	(0)	6	4
Weapons Fwd.	x8 .50 HMG	x6 .50 HMG	x2 .50 HMG	x2 .50 HMG	x4 20mm	x4 20mm
or	x4 20mm	—	—	—	—	—
Weapon Turrets	—	x2 .50 HMG	2 x 2 .50 HMG	3 x 2 .50 HMG	—	—
Ordinance	—	2t bombs	4t bombs	10t bombs	—	2t bombs
Cost (CR)	35,000	35,000	85,000	125,000	150,000	175,000

Nationality	Primitive	Primitive	Early	Early	Early	Early
Type	Light Bomber	Bomber	Fighter	Fighter Bomber	Light Bomber	Bomber
Tech Level	5-6	5-6	6-7	6-7	6-7	6-7
Crew	3	6	1	2	4	6
Mass	25t	85t	12t	20t	40t	75t
Powerplant	x2 Jet	x8 Jet	x2 Jet	x2 Jet	x2 Jet	x4 Jet
Speed	1200 kmh	1000 kmh	3500 kmh	2500 kmh	2500 kmh	2000 kmh
Ceiling	High Alt.	High Alt.	V. High Alt.	V. High Alt.	V. High Alt.	V. High Alt.
Range	4000 km	12,000 km	2500 km	2500 km	5000 km	15,000 km
Damage Cap.	8	10	7	8	9	10
Rad. Shield	-1	-1	-3	-3	-3	-3
Armor	D	D	D	D	D	D
EW/ECM	2	2	4	4	5	5
Dogfighting	2	0	8	7	4	2
Weapons Fwd.	x2 20mm	x2 20mm	x4 20mm M61	x2 20mm M61	x2 20mm M61	x2 20mm M61
Weapon Turret	x2 20mm	x2 20mm	—	—	x2 20mm M61	x2 20mm M61
Ordinance	5t bombs	15t bombs	x4 AAM	10t bombs	15t bombs	25t bombs
Cost (CR)	250,000	500,000	350,000	400,000	650,000	800,000

Nationality	Terra	Terra	Terra	Terra	Terra	Terra
Type	ASP Fighter	Fighter Bomber	Bomber	Utility	Helicopter	AirCav Mount
Crew	1	2	2	3	2	1
Mass	10t	12t	20t	15t	5t	500 kg
Cargo	—	—	—	10t or 25 troops	5t or 25 troops	200 kg and 1 passenger
Powerplant	x2 TurboGrav	x2 TurboGrav	x4 TurboGrav	x4 TurboGrav	x1 Turbo	x1 Turbo
Speed	7500 kmh	6000 kmh	5000 kmh	4000 kmh	1000 kmh	1000 kmh
Ceiling	High Sub-Orbit	Low Sub-Orbit	Low Sub-Orbit	V. High Alt.	High Mdm. Alt.	High Mdm. Alt.
Range	10,000 km	10,000 km	25,000 km	15,000 km	2500 km	1000 km
Damage Cap.	10	12	15	12	10	4
Rad. Shield	-8	-8	-8	-6	-6	-2
Armor	AFV	+1	AFV	AFV	AFV	A
EW/ECM	10	10	10	9	9	9
Dogfighting	15	12	7	6	(8)	(10)
Weapons Fwd.	.8 Blast*20	x6 Blast*20	x4 Blast*20	x2 Blast*20	x2 Blast*20	x2 Blast HMG
Weapon Turrets	—	—	x2 Blast*20	—	—	—
Ordinance	x8 AAM	x2 AAM	10t bombs	6t bombs	x1 Hv.PML	x1 Lt.PML
Cost (MCR)	1.85	x1 Hv.PML 1.6	x1 Hv.PML 2.75	— 1.5	— 0.4	— 0.075

Nationality	Mercantile	Mercantile	Mercantile	Mercantile	Azuriach	Azuriach
Type	ASP Fighter	Fighter Bomber	Bomber	Utility	ASP Fighter	Fighter Bomber
Crew	1	2	2	2	1	1
Mass	10t	12t	20t	15t	10t	12t
Cargo	—	—	—	10t or 20 troops	—	—
Powerplant	x2 TurboGrav	x2 TurboGrav	x4 TurboGrav	x4 TurboGrav	x2 TurboGrav	x2 TurboGrav
Speed	7000 kmh	6000 kmh	5000 kmh	3500 kmh	7500 kmh	6500 kmh
Ceiling	High Sub-Orbit	Low Sub-Orbit	Low Sub-Orbit	V. High Alt.	High Sub-Orbit	High Sub-Orbit
Range	10,000 km	12,000 km	20,000 km	20,000 km	7500 km	10,000 km
Damage Cap.	8	8	10	9	10	10
Rad. Shield	-7	-7	-7	-5	-8	-8
Armor	AFV	AFV	AFV	AFV	AFV	AFV
EW/ECM	8	8	8	8	10	10
Dogfighting	13	9	7	5	14	10
Weapons Fwd.	x6 Blast*20	x4 Blast*20	x2 Blast*20	x2 Blast*20	x6 Blast*20	x4 Blast*20
Weapon Turrets	—	—	x2 Blast*20	—	—	—
Ordinance	x6 AAM	x2 AAM	10t bombs	6t bombs	x8 AAM	x2 AAM
Cost (MCR)	1.65	2t bombs 1.65	— 2.1	— 1.25	— 1.75	2t bombs 1.75

Nationality	Azuriach	Azuriach	GPR	GPR	GPR	GPR
Type	Bomber	Utility	ASP Fighter	Fighter Bomber	Bomber	Utility
Crew	1	3	1	1	2	2
Mass	15t	15t	10t	10t	20t	20t
Cargo	—	6t or 18 troops	—	—	—	6t or 16 troops
Powerplant	x2 TurboGrav	x2 TurboGrav	x1 TurboGrav	x1 TurboGrav	x2 TurboGrav	x2 TurboGrav
Speed	4500 kmh	3000 kmh	6500 kmh	5000 kmh	4000 kmh	2500 kmh
Ceiling	V. High Alt.	High Alt.	Low Sub-Orbit	v. High Alt.	High Alt.	High Alt.
Range	15,000 km	15,000 km	5000 km	5000 km	10,000 km	10,000 km
Rad Shield	-8	-8	-4	-4	-5	-3
Damage Cap.	12	10	6	8	9	8
Armor	AFV	A	A	A	A	B
EW/ECM	10	9	7	7	7	6
Dogfighting	7	5	11	8	6	5
Weapons Fwd.	x4 Blast*20	x2 Blast*20	x4 Blast*20	x4 Blast*20	x2 Blast*20	x2 Blast*20
Weapon Turrets	—	—	—	—	x2 Blast*20	—
Ordinance	6t bombs	6t bombs	x4 AAM	x2 AAM	6t bombs	6t bombs
Cost (MCR)	2.75	— 1.1	— 1.15	2t bombs 1.0	— 1.5	— 0.85

Nationality	Ranan	Ranan	Ranan	Mertun	Mertun	Mertun
Type	ASP Fighter	Bomber	Sky Cycle	ASP Fighter	Bomber	Utility
Crew	1	2	1	1	1	2
Mass	10t	25t	250 kg	10t	20t	20t
Cargo	—	—	100 kg	—	—	15t or 25 troops
Powerplant	x1 TurboGrav	x2 TurboGrav	x1 Turbo	x3 TurboGrav	x3 TurboGrav	x3 TurboGrav
Speed	6000 kmh	4500 kmh	500 kmh	7000 kmh	5000 kmh	3500 kmh
Ceiling	V. High Alt.	V. High Alt.	Low Mdm. Alt.	Low Sub-Orbit	Low Sub-Orbit	V. High Alt.
Range	4000 km	7500 km	500 km	7500 km	15,000 km	15,000 km
Damage Cap.	6	8	3	8	10	8
Rad. Shield	-4	-4	-3	-2	-2	-2
Armor	B	A	B	AFV	AFV	AFV
EW/ECM	6	6	4	9	9	8
Dogfighting	10	4	(8)	12	8	6
Weapons Fwd.	x4 Blast*HMG	x2 Blast*HMG	x1 Blast*MMG	x3 Blast*20	x3 Blast*20	x3 Blast*HMG
Weapons Turrets	—	—	—	—	—	—
Ordnance	4 AAM	10t bombs	1 G.L. 'E'	6 AAM	1 Hv.PML	6t bombs
	—	—	—	—	10t bombs	—
Cost (MCR)	0.9	1.2	0.035	1.4	1.9	1.1
Nationality	Mekpurrr	MekPurr	MekPurr	MekPurr	Blarad	Blarad
Type	ASP Fighter	Fighter Bomber	Bomber	Utility	ASP Fighter	Fighter Bomber
Crew	1	1	1	1 or 2	1	2
Mass	10t	10t	20t	20t	10t	12t
Cargo	—	—	—	10t or 25 troops	—	—
Powerplant	x2 TurboGrav	x2 TurboGrav	x4 TurboGrav	x4 TurboGrav	x2 TurboGrav	x2 TurboGrav
Speed	7000 kmh	6000 kmh	5000 kmh	4500 kmh	6500 kmh	5000 kmh
Ceiling	High Sub-Orbit	Low Sub-Orbit	Low Sub-Orbit	V. High Alt.	Low Sub-Orbit	Low Sub-Orbit
Range	10,000 km	10,000 km	15,000 km	20,000 km	6500 km	7500 km
Damage Cap.	10	12	15	10	12	12
Rad. Shield	-7	-7	-7	-7	-8	-8
Armor	AFV	+1	+1	A	+1	+1
EW/ECM	10	10	10	9	9	9
Dogfighting	14	11	7	6	12	8
Weapons Fwd.	x8 Blast*20	x6 Blast*20	x4 Blast*20	x2 Blast*20	x6 Blast*20	x6 Blast*20
Weapon Turrets	—	—	—	x2 Blast*HMG	—	x2 Blast*HMG
Ordnance	8 AAM	2 AAM	6t bombs	6t bombs	6 AAM	2 AAM
	—	2t bombs	Hv.PML	—	—	2t bombs
Cost (MCR)	1.8	1.7	2.1	1.65	1.45	1.25
Nationality	Blarad	Blarad	Rauwoof	Rauwoof	Rauwoof	Rauwoof
Type	Bomber	Utility	ASP Fighter	Fighter Bomber	Bomber	Utility
Crew	3	3	1	1	2	2
Mass	25t	25t	10t	12t	20t	20t
Cargo	—	12t or 25 troops	—	—	—	—
Powerplant	x2 TurboGrav	x2 TurboGrav	x1 TurboGrav	x2 TurboGrav	x2 TurboGrav	x2 TurboGrav
Speed	4000 kmh	3000 kmh	7000 kmh	6000 kmh	5000 kmh	3000 kmh
Ceiling	V. High Alt.	V. High Alt.	Low Sub-Orbit	Low Sub-Orbit	V. High Alt.	V. High Alt.
Range	25,000 km	15,000 km	7000 km	6000 km	17,500 km	15,000 km
Damage Cap.	15	12	8	9	10	10
Rad. Shield	-8	-8	-7	-7	-7	-7
Armor	+1	A	A	A	A	B
EW/ECM	9	8	8	8	8	7
Dogfighting	6	4	13	11	7	4
Weapons Fwd.	x2 Blast*20	x2 Blast*20	x6 Blast*20	x4 Blast*20	X2 Blast*20	x2 Blast*20
Weapon Turrets	x4 Blast*HMG	X2 Blast*HMG	—	—	x2 Blast*HMG	—
Ordnance	10t bombs	6t bombs	x6 AAM	x2 AAM	6t bombs	6t bombs
	—	—	—	Hv.PML	—	—
Cost(MCR)	2.4	1.6	1.55	1.35	2.6	1.3

Nationality	Hissss'ist	Hissss'ist	Hissss'ist	Klackon	Klackon	Klackon
Type	ASP Fighter	Utility	Sky Cycle	ASP Fighter	Lt. Triphibian	Mdm. Triphibian
Crew	1	2	1	1	2	2
Mass	10t	20t	500 kg	10t	12t	20t
Cargo	—	6t or 16 troops	100 kg 1 passenger	—	1t	2t
Powerplant	x1 TurboGrav	x2 TurboGrav	x1 Turbo	x1 TurboGrav	x1 TurboFan	x2 TurboFan
Speed	6000 kmh	3500 kmh	500 kmh	5000 kmh	1800 kmh	1800 kmh
Ceiling	Low Sub-Orbit	V. High Alt.	Low Mdm. Alt.	Low Sub-Orbit	High Alt.	High Alt.
Range	5000 km	7500 km	500 km	5000 km	5000 km	7500 km
Damage Cap.	6	8	3	8	15	15
Rad. Shield	-7	-7	-3	-6	-8	-8
Armor	A	B	B	A	+1	+2
EW/ECM	6	5	4	8	7	7
Dogfighting	10	5	(8)	10	(7)	(5)
Weapons Fwd.	x4 Blast*20	x2 Blast*20	x1 Blast*HMG	x4 Blast*20	x4 Blast*20	x2 Blast*20
Weapon Turrets	—	—	—	—	x2 20mm InfR	x2 40mm InfR
Ordinance	2 AAM 2t bombs	6t bombs	Lt. Scrambler	4 AAM	6t bombs	12t bombs
Cost (MCR)	1.25	1.3	0.035	1.4	0.35	0.45
Nationality	Klackon	Klackon	Whistler	Whistler	Whistler	Whistler
Type	Hv. Triphibian	Transport	ASP Fighter	Fighter Bomber	Bomber	Utility
Crew	2	2	1	1	2	2
Mass	35t	20t	10t	10t	15t	15t
Cargo	5t	10t and 16 troops	—	—	—	6t or 16 troops
Powerplant	x2 TurboFan	x2 TurboFan	x2 TurboGrav	x2 TurboGrav	x2 TurboGrav	x2 TurboGrav
Speed	1500 kmh	1500 kmh	8000 kmh	6500 kmh	5500 kmh	4500 kmh
Ceiling	High Alt.	High Alt.	High Sub-Orbit	Low Sub-Orbit	Low Sub-Orbit	V. High Alt.
Range	10,000 km	10,000 km	7500 km	10,000 km	20,000 km	20,000 km
Damage Cap.	25	15	6	8	9	9
Rad. Shield	-8	-8	-5	-5	-5	-3
Armor	+3	+1	A	A	A	B
EW/ECM	7	6	8	8	8	7
Dogfighting	(3)	(3)	14	10	8	6
Weapons Fwd.	x2 Blast*20	—	x4 Blast*20	x4 Blast*20	x2 Blast*20	x2 Blast*20
Weapon Turrets	x1 Blast*50 x2 Blast*HMG	x2 Blast*20	—	—	x2 Blast*20	x2 Blast*20
Ordinance	20t bombs	—	x4 AAM	x2 AAM and 2t bombs	6t bombs	6t bombs
Cost (MCR)	0.6	0.275	1.7	1.5	2.75	1.65
Nationality	Bug	Bug	Bug			
Type	Missile	Assault Ship	Command Ship			
Crew	1	2	2			
Mass	1.5t	100t	50t			
Cargo	—	80t or 200 Bugs	40t or 100 Bugs			
Powerplant	x1 TurboGrav	x2 TurboGrav	x2 TurboGrav			
Speed	20,000 kmh	4000 kmh	5000 kmh			
Ceiling	High Sub-Orbit	Low Sub-Orbit	Low Sub-Orbit			
Range	100 km	20,000 km	20,000 km			
Damage Cap.	4	25	25			
Rad. Shield	—	—	—			
Armor	D	A	AFV			
EW/ECM	6	6	6			
Dogfighting	10	3	7			
Weapons Fwd.	—	—	—			
Weapon Turrets	—	x2 Blast*20	x4 Blast*20			
Ordinance	'A' Warhead or .25kt Nuke	x2 Missiles	x4 Missiles			
Cost (MCR)	0.1 (?)	1.1(?)	1.5(?)			

5.1 AIR-TO-AIR MISSILES

Air-to-Air missiles are carried by aircraft for the sole purpose of destroying other aircraft. All have a cost as indicated in the Warhead section for missiles. Performance varies from nationality to nationality.

Nationality	Warhead	EW Rating	Air-to-Air Rating	Nuke
Terra	'E'	10	21	0.1kt.
Mercantile	'E'	9	20	0.1kt.
Azuriach	'E'	10	20	0.1kt.
GPR	'E'	7	19	0.1kt.
Ranan	'F'	4	19	—
Mertun	'E'	9	20	—
MekPurr	'E'	9	20	—
IRSOL	'D'	10	21	—
Blarad	'E'	8	19	—
Rauwoof	'E'	8	19	—
Hiss's'st	'E'	5	19	—
Klackon	'E'	7	20	—
Whistler	'E'	8	22	—
Bug	'E'	7	19	—

5.2 ASM AIR-TO-SURFACE MISSILES

Aircraft equipped with ASM can accept a number of Hv. PML automatic weapon pods equal to the EW/ECM rating. The mass of each pod is 250kg., at a cost of CR 15,000 each. Each PML pod holds 3 PML missile rounds equivalent to those fired by the ground PMLs of the appropriate nationality, except for AAM air-to-air missiles. The PML is typically patched into the aircraft BattleComputer for 'sanp-down' missile launch against ground targets with command-guidance and homing missile rounds. The missiles may be fired at medium altitude on command guidance and at low altitude for homing missiles.

5.3 BOMBS

Aircraft equipped to carry 'ordnance' may drop bomb loads. Bombs come in relatively heavy calibres, and some are 'smart' bombs with inertial guidance and glide ability, permitting them to strike a pinpoint target. 'Smart' bombs cost as much as missiles.

Bomb Warhead	Mass	Nuclear Warhead	Power	Mass
'E'	25kg.	Type NW/1	1.0kt.	100kg
'D'	50kg.	Type NW/2	5.0kt.	250kg
'C'	100kg.	Type NW/3	10kt.	500kg
'B'	250kg.	Type NW/4	50kt.	1000kg
'A'	500kg.	Type NW/5	1.0Mega	2000kg
'AA'	1000kg.	Type NW/6	20Mega	5000kg

6.0 STARFIGHTERS

The StarFighter is a high-performance combat and patrol spacecraft designed for operations in a solar system or planetary atmosphere. Sacrificing FTL capability in order to mount powerful TISA maneuver drive engines and surprisingly heavy armaments, the StarFighter is the fastest warship that will be encountered in normal space. As an atmospheric fighter, it generally outclasses standard planetary defense aircraft.

The temptation to regard the StarFighter as an 'aircraft' and larger spaceships as equivalent to surface vessels of a water borne navy should be avoided. All spacecraft 'swim' in the same environment, and the performance of other ships is not significantly poorer than that of the StarFighter. It has a role not unlike that of the fast PT boat. The StarFighter depends upon speed, maneuverability, and small size to evade the fire of a larger enemy until it can close to the effective range of its StarTorps and light NovaGuns. It has just enough of a speed advantage that it will be able to pursue and intercept even very fast ships with a high probability of success. Because it is small, the StarFighter also can be carried aboard large ships to extend the offensive and defensive capabilities of the large vessel. When it is employed in substantial numbers, the StarFighter can pose a threat to the mightiest StarShips, able to overwhelm it simply because there are enough attackers to saturate the defenses. Naturally, it also serves as one of the best defensive armaments against enemy StarFighter and torpedo attacks, as interception of enemy ships can be made a distant ranges from the mother ship.

Type/Role: As described for aircraft.

Crew: As described for aircraft.

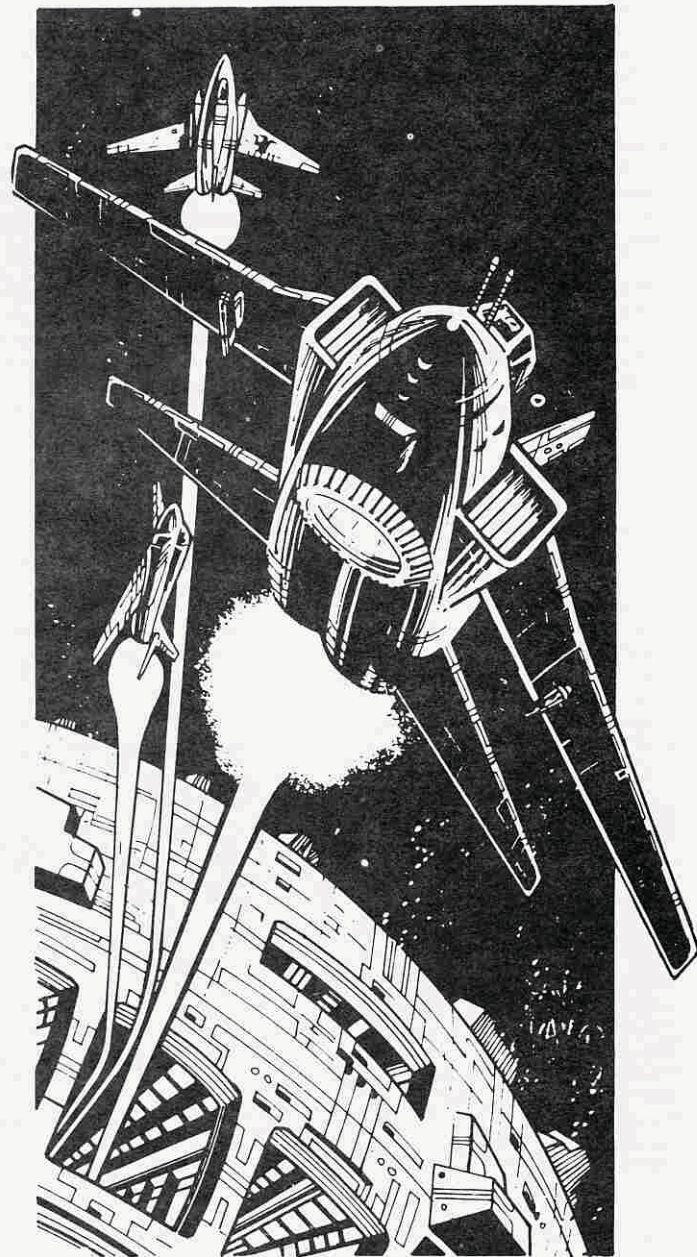
Mass: The 'weight' of the StarFighter, excluding ordnance. The volume required in the launch bays is stated below.

Cargo Space: The capacity of the StarFighter to carry various items of personal equipment and armaments for the crew. Note: Crewmen wearing spacesuits or battlearmor do not count such equipment into the cargo capacity.

Endurance: The capacity of the life-support systems to keep the crew alive. This time may be extended +1 day at an additional cost of CR 15,000 per man to a maximum period double that of the basic rating.

Dimensions: The approximate length, breadth, and height of the StarFighter. Actual dimensions will vary somewhat as these indicate only the area occupied when wings/lifting surfaces are fully deployed.

Bay Required: The volume needed in cubic meters to store and service a StarFighter carried aboard a StarShip. StarFighter bays cost 250,000 Credits per 1000 cubic meters and include basic workshop equipment to effect repairs on the craft.



No. Engines: StarFighters suffer damage like aircraft and may lose propulsive power if an engine is hit. The number of engines carried is therefore very important to the performance characteristics of the StarFighter.

Maneuver Speed: The maximum sub-light speed the StarFighter can attain under maximum field anomaly drive (T(SA)). Speeds are given in the standard LS/5 minute measurements used in **Space Opera**.

Acceleration: The maximum standard acceleration the StarFighter is capable of achieving, whether speeding up or slowing down, in a 5-minute period.

Overboost Acceleration: At an expenditure of 250LS worth of fuel, a StarFighter can 'overboost' by cutting in its TurboGrav engines while under Anomaly drive, which effectively triples its acceleration/deceleration for a 5-minute period.

Range: The maximum distance in light-seconds a StarFighter can travel with a full load of fuel.

Fuel: The number of standard 10kg. units of trans-atomic fuel that the StarFighter carries. The fuel is the same as that used by StarShips.

Air Speed: Atmospheric speed, as described for aircraft.

Damage Capacity: The amount of damage that a StarFighter can absorb, as described in **Space Opera** for StarShips. When fighting conventional aircraft or taking ground fire, double damage effects of all projectile, missile, and energy weapons to reflect the decrease in the effectiveness of forcefield augmented battlearmor in atmosphere.

Armor: The standard StarShip battlearmor rating of the StarFighter (see **Space Opera**). When in atmosphere, the armor's effectiveness is reduced to 50% effectiveness, and standard screen penetration and then armor penetration procedures are used to determine whether the StarFighter is damaged by enemy fire.

BattleScreens: The strength of the forcefield battlescreens of the StarFighter. In space, this value is added to the armor factor to determine the resistance to NovaFire and other weapon penetrations, as described in the **Space Opera** StarShip combat rules. However, in atmosphere, the BattleScreens are only 50% effective and are treated separately from the armor, as if the StarFighter were an aircraft or vehicle under fire.

EW Rating: As described for EW/ECM for aircraft.

Dogfight Factor: When in atmosphere, as described for aircraft. In space, StarFighters will dogfight each other like aircraft, but when attacked by larger ships, the dogfight factor is a -DM applied against the 'to hit' with bracketing fire procedures.

Weapons: StarFighters mount light NovaGuns, which have effects like those described in **Space Opera** for StarShip combat. However, in atmosphere, their effects are greatly attenuated, and NovaGun N*25s are equivalent to Blast*20 weapons, while NovaGun N*50s are equivalent to Blast*50 weapons.

StarTorpedoes: The StarTorps are as described in **Space Opera** for StarShip Combat. In atmosphere, they give a sure kill of any aircraft they hit and otherwise explode like an 'AA' warhead in a Xenon damper field and as a 1 Megatonne Nuke if not Xenon field exists. StarFighters in atmosphere are treated as spacecraft when hit by a StarTorp. In space, the StarFighter can move so fast that there is a good chance a StarTorp will not hit it. If fired at a StarFighter target, there is a flat 90% chance that it will not catch the target if fired from outside an arc 45° to either side of the target's nose, unless it is travelling under 250 LS. This assumes, of course, that evasion includes turning away from a StarTorp and running from it until it completes its run and explodes. Thus, most anti-StarFighter actions will depend upon NovaFire.

Ordinance: StarBombers are equipped to carry bomb loads, like atmospheric bombers, with the ordinance entry indicating the weight of bombs in tons.

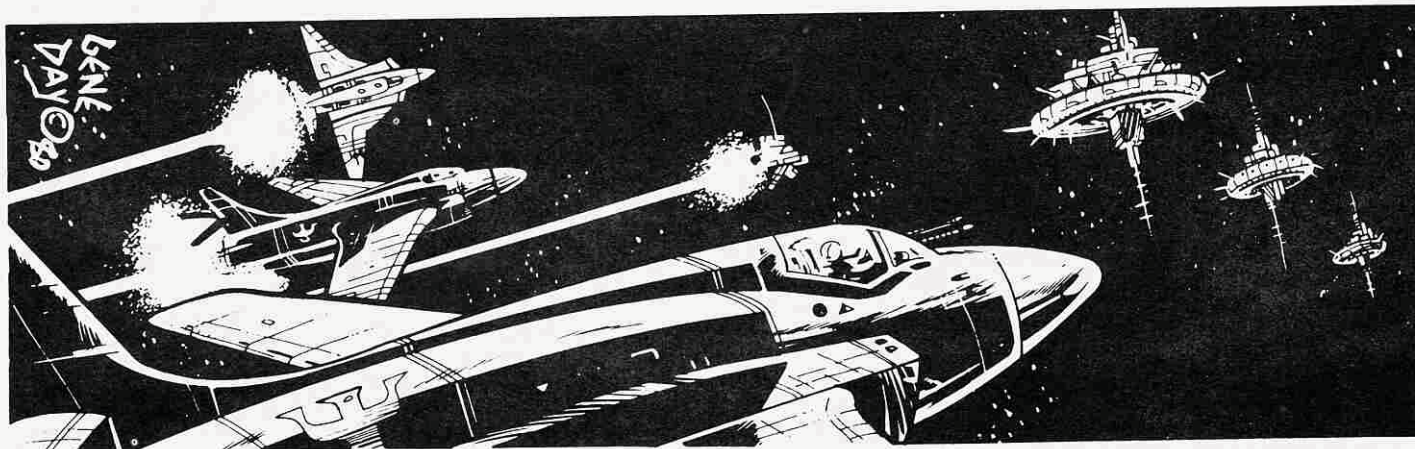
It should be noted that atmospheric speed is increased by +1000 kmh per Tech level over Tech/7, just as for aircraft. Also, EW increases +1, and Dogfighting increases +1 per Tech level over Tech/7. StarFighter Sensors are purchased separately, as are communicators. Computer Mk. is Mk. IV for Tech/7, Mk. V for Tech/8, and Mk. VI for Tech/9-10 craft. All craft include 1-man life capsules which are automatically jettisoned when the StarFighter is about to explode (the capsules literally enclose the crewman's seat and thus give a 90% chance of survival for PCs and a 50% chance for NPCs.)

The following StarFighter types will be encountered in the StarForces and interstellar police forces of the known starcultures. Not all starcultures employ the craft, and only the Terrans and IRSOL employ them in significant numbers.

Nationality	Terran	Terran	Terran	IRSOL	IRSOL	Mercantile
Code Name	Phantom	Spectre	Banshee	StarFury	Sunfire	Intruder
Type/Role	StarFighter	StarFighter	StarBomber	StarFighter	StarBomber	StarFighter
Crew	1	2	3	1	2	1
Mass	30t	50t	75t	30t	75t	30t
Cargo Space	500 kg.	1t	2t	500 kg.	1t	500 kg.
Crew Space	Cockpit	Cockpit	Cockpit	Cockpit	Cockpit	Cockpit
Endurance	7 days	7 days	7 days	10 days	10 days	5 days
Dimensions (m)	10 x 10 x 4	15 x 10 x 4	20 x 10 x 4	10 x 10 x 4	20 x 10 x 4	10 x 10 x 4
Bay Required	1000m ³	1500m ³	2000m ³	1000m ³	2000m ³	1000m ³
No. Engines	4	4	4	2	2	2
Maneuver Speed	300 LS	280 LS	250 LS	290 LS	250 LS	270 LS
Acceleration	50 LS	40 LS	30 LS	50 LS	30 LS	40 LS
Overboost Acc.	150 LS	120 LS	90 LS	150 LS	90 LS	120 LS
Range	10,000 LS	15,000 LS	15,000 LS	10,000 LS	20,000 LS	7500 LS
Fuel	2 units	4 units	6 units	2 units	5 units	2 units
Air Speed	12,000 kmh	11,000 kmh	6000 kmh	12,000 kmh	6000 kmh	11,000 kmh
Damage Capacity	75	100	150	75	150	75
Armor	+1	+2	+3	+1	+3	+1
BattleScreens	+12	+12	+12	+12	+12	+10
EW Rating	12	12	12	12	12	11
DogFight Factor	18	16	11	17	11	16
Weapons Forward	x6 N*25	x6 N*25	x4 N*25	x6 N*25	x2 N*25	x4 N*25
Weapon Turret	—	—	x2 N*50	—	x2 N*50	—
StarTorpedoes	x4 ST*157	x6 ST*157	X8 ST*257	x4 ST*157	x8 ST*257	x4 ST*157
or	x2 ST*775	x2 ST*775	x4 ST*775	x2 ST*375	x4 ST*775	x2 ST*375
Ordinance	—	—	15t	—	15t	—
Cost (MCR)	50	50	75	50	75	45

Nationality	Azuriach	Azuriach	GPR	Ranan	MekPurr	MekPurr
Code Name	StarLord	Devastator	FoxFire	Venom	Lightning	ThunderBolt
Type/Role	StarFighter	StarBomber	StarFighter	StarFighter	StarFighter	StarBomber
Crew	1	3	1	1	1 + 1 Mek	1 + 3 Meks
Mass	30t	75t	40t	40t	50t	100t
Cargo Space	500 kg.	2t	500 kg.	500 kg.	1t	3t
Crew Space	Cockpit	Cockpit	Cockpit	Cockpit	Cockpit	25m ³ cabin
Endurance	5 days	5 days	4 days	3 days	10 days	10 days
Dimensions (m)	10 x 10 x 4	20 x 10 x 4	10 x 10 x 4	10 x 10 x 4	10 x 10 x 4	20 x 10 x 4
Bay Required	1000m ³	2000m ³	1000m ³	1000m ³	1000m ³	2000m ³
No. Engines	3	3	2	2	4	4
Maneuver Speed	280 LS	240 LS	260 LS	250 LS	290 LS	250 LS
Acceleration	50 LS	30 LS	40 LS	40 LS	50 LS	30 LS
Overboost Acc.	150 LS	90 LS	120 LS	120 LS	150 LS	90 LS
Range	10,000 LS	10,000 LS	5000 LS	5000 LS	15,000 LS	20,000 LS
Fuel	2 units	4 units	1 unit	1 unit	3 units	8 units
Air Speed	11,000 kmh	5000 kmh	9500 kmh	9000 kmh	12,000 kmh	6500 kmh
Damage Capacity	75	150	75	65	75	200
Armor	+1	+3	+1	+1	+2	+3
BattleScreens	+12	+12	+9	+9	+12	+12
EW Rating	12	12	9	8	12	12
DogFight Factor	16	10	13	12	15	10
Weapons Forward	x6 N*25	x2 N*25	x4 N*25	x4 N*25	x6 N*25	x4 N*25
Weapon Turret	—	x2 N*50	—	—	—	x2 N*50
StarTorpedoes	x4 ST*157	x6 ST*257	x4 ST*157	x4 ST*157	x6 ST*157	x10 ST*257
or	x2 ST*375	x2 ST*775	x2 ST*257	x2 ST*257	x4 ST*375	x5 ST*775
Ordinance	—	15t	—	—	—	25t
Cost (MCR)	47.5	70	30	25	50	87.5

Nationality	Blarad	Blarad	Rauwoof	Hiss'sist	Avian	Avian
Code Name	Sabre	Sword	Hunter	DeathWind	StarHawk	WarEagle
Type/Role	StarFighter	StarBomber	StarFighter	StarFighter	StarFighter	StarBomber
Crew	1	2	1	1	1	3
Mass	50t	100t	30t	40t	25t	75t
Cargo Space	500 kg.	2t	500 kg.	500 kg.	500 kg.	2t
Crew Space	Cockpit	25m ³ cabin	Cockpit	Cockpit	Cockpit	Cockpit
Endurance	5 days	5 days	5 days	3 days	7 days	7 days
Dimensions (m)	15 x 10 x 4	20 x 10 x 4	10 x 10 x 4	10 x 10 x 4	10 x 10 x 4	20 x 10 x 4
Bay Required	1500m ³	2000m ³	1000m ³	1000m ³	1000m ³	2000m ³
No. Engines	3	3	2	2	3	3
Maneuver Speed	270 LS	240 LS	280 LS	260 LS	290 LS	240 LS
Acceleration	40 LS	30 LS	40 LS	40 LS	40 LS	30 LS
Overboost Acc.	120 LS	90 LS	120 LS	120 LS	120 LS	90 LS
Range	8000 LS	8000 LS	10,000 LS	6000 LS	7500 LS	10,000 LS
Fuel	2 units	4 units	2 units	4 units	2 units	5 units
Air Speed	10,500 kmh	5000 kmh	11,000 kmh	10,000 kmh	12,000 kmh	6000 kmh
Damage Capacity	90	200	75	75	65	150
Armor	+2	+3	+1	+3	+1	+2
BattleScreens	+10	+10	+9	+8	+8	+10
EW Rating	10	10	10	9	9	9
DogFight Factor	15	10	16	13	16	10
Weapons Forward	x6 N*25	x2 N*25	x6 N*25	x6 N*25	x6 N*25	x3 N*25
Weapon Turret	—	x2 N*75	—	—	—	x3 N*25
StarTorpedoes	x6 ST*257	x10 ST*257	x4 ST*257	x4 ST*157	x6 ST*157	x8 ST*257
or	—	x5 ST*375	x2 ST*375	x2 ST*257	x3 ST*375	x4 ST*775
Ordinance	—	20t	—	—	—	10t
Cost (MCR)	42.5	60	45	32.5	55	80



7.0 WARHEADS

Chemical and energy explosives and explosive shells are rated on a spectrum of destructive power ranging from Type 'J' to Type 'AA'. The Warhead Penetration Table gives penetration numbers which must be equalled or exceeded on a 1d10 roll for an explosive round to penetrate the target's armor. This roll is made after it has been determined where the round landed, whether a given target is in the area, and whether it was affected by the burst.

Projectiles and chemical explosives are somewhat less effective than energy bolts, so add +1 to the penetration number required to penetrate armor. If the target is of equal or higher Tech level than the firing weapon, add an additional +1 to the penetration number.

PML and energy rounds penetrate upon rolling equal to or higher than the penetration number on 1d10. If the target is of equal or higher Tech level than the firing weapon, add an additional +1 to the penetration number. Energy explosives, such as Scrambler rounds and GZ Ground Zero nuclear bursts are affected by this rule as well.

Most warheads will be assigned several zones of effect; these are:

DH Direct Hit: The round lands squarely on the target and does maximum damage.

KZ Kill Zone: The round lands close to the target, producing considerable destructive effects which may grievously injure or kill the personnel or knock out vehicles.

CZ Casualty Zone: The round has landed some distance away, but personnel and vehicles, especially lightly armored or unarmored personnel and vehicles, will be fairly vulnerable to shrapnel damage, etc.

GZ Ground Zero: Applied only to nuclear (Nuke) warheads, ground zero represents the region filled by the nuclear fireball or that zone immediately adjacent. Ground zero is filled with intense radiation and heat which will ignite all flammable materials or even slag down metal, pulverize rock and concrete, etc. Survival in this zone is distinctly minimal, but very heavy armored vehicles and spacecraft can survive.

Warheads also have several distinct types; these are:

HE High Explosive: The standard artillery or missile round, and all grenades with an anti-personnel function, are rated as HE rounds and affect the missile/armor defense of the target. HE artillery rounds and missile rounds can be set to 'airburst' above the target zone. This eliminates DH Direct Hit and KZ Kill Zone penetrations. Troops in foxholes looking out and/or who have no overhead cover will have a chance of being hit like prone infantry. (Troops in foxholes would normally be invulnerable to artillery bursts other than direct hits.)

AP Armor Piercing: The standard anti-tank round. It affects the missile/armor defense of the target. The AP round has a +1 bonus to penetrate armor, but it has only a CZ equal to the KZ of HE rounds when determining possible casualties to targets in the vicinity of the burst. All AP rounds are 'shaped charge' shells which simply do not have the general damage capability of HE, as the explosive force is focused on the target actually hit.

APNC Armor Piercing, Nuclear Core: The AP round is given a uranium core, which greatly improves penetration capability, adding +2 to the penetration chance. It is otherwise like standard AP.

APG Armor Piercing, Gauss: The APG is a uranium-core round specially designed for the Gauss Cannon and adds +3 to the penetration capability.

FAE Fuel Air Explosive: A thermo-incendiary round comparable to napalm. Advanced versions also have concussion/pressure effects which will rupture the lungs of unprotected personnel (not in pressure-suits, using self-contained breathing apparatus, etc.)

Smoke: A round which produces an obscuring gas or aerosol. The area of coverage of smoke shells will vary according to the calibre of the round. It is assumed that advanced 'smoke' is 'electrostatically charged' (a crude and somewhat inaccurate translation of an advanced concept) so that it will hold together for a brief time. It is effective even on airless and thin atmosphere planets. All advanced smoke is an effective anti-laser aerosol and reduces laser penetration by -2 per 25m of

smoke penetrated by a laser bolt. If more than 150m of smoke is to be penetrated, the smoke proves impervious to laser fire. Note: several rounds can be set off in the same area to give a high density of smoke so that it is equivalent to 150m (6 rounds in the same zone provides this protection). Troops on the edge of smoke are ruled to have ½ the protection provided.

Weather conditions should be determined. On a low/no pressure planet, or on a world with winds like Terra's, smoke will endure for 30d6 seconds or from half a minute to three minutes. On a planet with high winds the time could be halved. Wind drift will be ignored for smoke.

CBR Chemical/Bacteriological/Radiological: A round containing CBR agents. Numerous CBR agents can be employed, either persistent or non-persistent. A non-persistent CBR agent will last for 1d6 minutes, or 2d6 minutes if in an enclosed space. Persistent CBR agents will last for 1d6 or 2d6 hours.

Chemical Agents: A wide range of chemical agents are available for CBR warfare and also for private use. These include Nerve gas, sleep gas,retch gas, vertigo gas, euphoria gas, tear gas, and just about any other kind of gas imaginable. All have an effect in seconds after being breathed by unprotected personnel. Antidotes are available, but lethal nerve gases require the antidote be administered quickly to save the victim. Liquid sprays of the same agents affect victims through their skin in 30-60 seconds. To simulate the effects of such gases in role play, the poisons in *Space Opera*, 6.20, *Drugs & Poisons*, can be assigned to nerve gas types, while the drugs can be assigned to non-lethal gases.

Regular troops are equipped with anti-gas equipment which makes gas of limited value. Normal body armor and combat coveralls are impregnated against liquid agents. Most troops have masks or breathing gear built into their combat helmets so that use of chemical agents is generally restricted to lower technology opponents or riot situations. However, many civilians and militia units will have little or no protection, making CBR a reasonably good weapon.

One notable exception is the gas DZT (P14), an insecticide which affects Insectoids (the Bugs), Scorpionids, and Arachnids. Since Bugs do not typically issue protective equipment to Soldiers, unless operating in unfavorable environments, DZT (a non-persistent gas) proves quite effective.

Bacteriological Agents: A deliberate use of plague-causing agents is generally regarded as a most 'uncivilized' act and rarely occurs on a battlefield. However, such agents do exist and may be issued from time to time. Bacteriological agents are highly complex, and StarMasters desiring their use should evolve rules to cover their effects.

Radiological Agents: On occasion, short-term radioactive 'dusts' will be used on the battlefield. These dusts will produce rad levels of class 1 to 6 (roll 1d6). Exposure will sometimes produce radiation sickness. See 7.1, Nuclear Weapons for details.

Thermal: The thermal round is a high temperature 'explosive' like thermite which burns through armor or which acts as an incendiary device.

Stun: A large number of armaments contain either explosives or energy warheads which will stun affected personnel. The warheads are treated as Stunners for purposes of penetration. If a penetration occurs, the victim is knocked unconscious for 1d20 minutes. He can be aroused with a stimulant.

Starshell/Flare: A general illumination round used at night to light up a region. The flares last for about 60 seconds and hang above the area to be illuminated on parachutes or some other supportive device.

ECM Smoke: Available from Tech/8 onward, ECM Smoke rounds are capable of producing a cloud that is impervious to all radar and sensor-beam probes, reducing personnel and fighting vehicles to visual contact with intended targets. Such rounds cost three times as much as normal smoke rounds. The rounds are rated at the EW of the standard battlefield vehicle which the producing culture employs. See the EW rules in the combat section for details.

Round	Type	Shell Cost (CR)	Rocket Cost (CR)	Missile Cost (CR)	Bomb Cost (CR)	Round	Type	Mass (kg)	Mine Cost (CR)	Grenade Cost (CR)	Charge Cost (CR)
AA+	HE	—	—	—	5000	Demol.	HE 'D'	5	—	—	200
AA+	FAE	—	—	—	5000	Demol.	Thermal	5	—	—	250
AA+	CBR	—	—	—	12500	F	HE/AT	1	—	250	—
AA+	Stun*	—	—	—	7500	F	Thermal	1	—	225	—
AA	HE	—	—	—	3000	F	Smoke	1	—	200	—
AA	FAE	—	—	—	3000	F	Flare	1	—	200	—
AA	CBR	—	—	—	7500	G	HE	0.35	—	175	—
AA	Stun*	—	—	—	4500	G	FAE	0.50	—	200	—
A	HE	2000	3000	10,000	1500	G	Smoke	0.35	—	150	—
A	FAE	2000	3000	10,000	—	G	CBR	0.35	—	350	—
A	Smoke	1500	2500	10,000	1000	G	Flare	0.35	—	175	—
A	CBR	5000	6000	13,000	5000	H	HE	0.10	—	135	—
A	Stun	2500	3500	10,000	2000	H	Smoke	0.10	—	100	—
A	Starshell	2000	3000	10,000	1500	H	CBR	0.10	—	225	—
B	HE	1250	2000	6500	1000	H	Flare	0.10	—	135	—
B	FAE	1250	2000	6500	1000	J	HE	0.01	—	50	—
B	Smoke	950	1750	6500	750	D	HE Mine	5	450	—	—
B	CBR	2750	3500	8000	2500	D	AP Mine	5	750	—	—
B	Stun	1500	2500	7000	1500	E	HE Mine	2	325	—	—
B	Starshell	1250	2000	6500	1000	E	AP Mine	2	500	—	—
C	HE	900	1250	4000	750	F	HE Mine	1	200	—	—
C	FAE	900	1250	4000	750						
C	Smoke	750	1000	4000	600						
C	Stun	1000	1400	4250	800						
C	Starshell	900	1250	4000	750						
C	AP**	1350	1850	4750	—						
C	APNC**	2250	3100	5800	—						
C	APG***	2500	—	—	—						
D	HE	750	1000	3000	—						
D	FAE	750	1000	3000	—						
D	Smoke	500	750	3000	—						
D	Stun	800	1100	3100	—						
D	Starshell	750	1000	3000	—						
D	AP**	1100	1500	3500	—						
D	APNC**	1750	2750	4250	—						
D	APG***	2000	—	—	—						
E	HE	500	650	2000	—						
E	FAE	500	650	2000	—						
E	Smoke	300	450	2000	—						
E	Stun	550	700	2000	—						
E	Starshell	500	650	2000	—						
E	AP**	700	900	2500	—						
E	APNC**	1250	1600	3000	—						
E	APG***	1250	—	—	—						
F	HE	250	300	1000	—						
F	FAE	250	300	1000	—						
F	Smoke	175	225	1000	—						
F	Stun	250	300	1000	—						
F	Starshell	250	300	1000	—						
F	AP**	325	400	1250	—						
F	APNC**	600	750	2000	—						
F	APG***	600	—	—	—						

* Cluster bombs: AA+=40 stun bombs; AA=20 stun bombs.

** AP and APNC can be fired only by anti-tank guns and tank cannon, bazooka type direct-fire rocket launchers, and guided missiles.

*** APG can be fired only by Gauss Cannon.

Costs are wholesale rates per 10 rounds of shells, rockets, and bombs, and per 5 missiles. Military veterans can apply discounts to this rate. Retail costs will be 150% on major planets, and in 'backwater' areas the costs will be 150% + 10.d10%.

Costs are wholesale prices per 10 rounds. Military veterans can apply discounts to this rate. Retail costs will be 150% on major planets, and in 'backwater' areas the costs will be 150% + 10.d10%.

7.1 NUCLEAR WEAPONS

The thermonuclear device is a warhead employing a fission reaction (A-Bomb), fission-fusion (H-Bomb), or matter-conversion (AM Anti-Matter Bomb).

Conventional nuclear weapons have three ways of affecting anything within range; these are blast, heat, and radiation. To avoid complexity, blast and heat are combined to represent immediate destructive effects of nuclear detonations on structures, vehicles, and living tissue. Radiation covers delayed effects of overexposure to x-rays, gamma rays, etc., emitted by the detonation or lingering in the form of fallout.

BLAST: The effects of a nuclear detonation are covered by the penetration capability of the weapons. Depending upon range, the effects vary.

DH Direct Hit: The target is at the center of the nuclear detonation. The penetration capability of the Nuke is compared to the energy armor protection. If the target is penetrated, it will be exploded or vaporized.

GZ Ground Zero: The target is in or on the edge of the nuclear fireball. Blast penetration is again assessed against energy armor protection. Survival chances are slim to non-existent for exposed personnel and thin-skinned vehicles.

KZ Kill Zone: The effects of the blast are severe in the Kill Zone, but they are assessed against the missile/projectile armor protection of the target of infantry personnel. Exposed personnel have a very slim chance of survival, but well armored vehicles will have a good chance of coming out unscathed.

CZ Casualty Zone: The blast effects are still considerable, but well armored personnel and AFVs will 'take it on the armor' successfully. As with KZ effects, CZ blast effects are assessed against the missile/projectile armor protection of the personnel or vehicle target.

RADIATION: The effects of radiation are longer term. Even if the blast effects are survived, it is possible that hard radiation has penetrated whatever armor protection (energy) the exposed individual or vehicle possesses.

Rad. Shielding: Most types of personal armor and vehicles are assigned a radiation shielding factor. This appears in the form of a negative value (-1, -5, etc.) in the Rad. Shield entry in the vehicle, aircraft, and personal armor data sections. This negative factor shall be called the RSU or Rad Shielding Unit. The effect of each RSU is to effectively increase the 'range' of the protected person or vehicle from the source of radiation.

tion by reducing the level of radiation by the value stated in the RSU. For instance, a radiation level of Rad*6 will be reduced -5 levels by RSU -5 to Rad*1. In addition to the RSUs already given for the various types of equipment, the following materials will provide RSU -1 protection against hard radiation:

Material	Thickness
Lead	12mm (½")
Steel	40mm (1½")
Concrete	150mm (6")
Earth	300mm (12")
Water	600mm (24")
Wood	900mm (36")

Note: Radiation Shielding is additive. A man in RSU -6 personal armor and sitting in a vehicle with RSU -5 protection has RSU -11 in protection.

Lasting Radiation Effects: Subsequent to a nuclear blast, fallout occurs. To simplify gaming, only the zone of total destruction (corresponding to the KZ Kill Zone diameter) will have fallout conditions equal to 1d6 Rad. levels. This rad level will drop by -1 level every 1d6 hours for the first level, 1d6 days for the second level, and 1d6 weeks for subsequent levels until Rad*1 is reached. In the case of multiple warhead bursts in the area, the rad level is increased by a further 1d6 Rad units, to a maximum of Rad*12.

Every ten minutes (two standard game turns) a character is exposed to a radiation area, he must roll a special CR to avoid suffering the effects of REL (radiation effects levels) if he has not sufficient RSU protection to block out the radiation. The CR level is a Constitution CR minus 6, and minus the difference between his RSU protection and the REL count. For example, a character with a Constitution 16 is wearing RSU -3 protection and is exposed to REL at Rad*5. His RSU -3 cannot block out the radiation, and Rad*2 gets through. His REL CR level is 16 - 6 - 2 = 8. He must roll 8 or less on 1d20 or run a risk of radiation sickness or worse. In such instances he might have to resort to a shot of ARD (Anti-Rad Drug, see *Space Opera*, 5.5 Medical Supplies).

Over-Exposure & Radiation Sickness: The following table gives the effects that over-exposure to high-intensity radiation has on a victim. The table can be used for not only thermonuclear blast radiation, but also for fallout, CBR radioactive dusting weapons, and even cosmic storms and high background radiation on some planetary surfaces.

Rad*	Effect of Exposure
Level 12 & 11	Death will occur within 10d6 minutes. The victim is immediately and completely incapacitated and cannot function; unconsciousness and coma result within several minutes at best. A Regeneration Center has a 50% chance + Constitution score of a character of being able to revive him, but his Constitution, Strength, and Intelligence scores will each be dropped by ½d6 points because of the extensive radiation damage that was inflicted.
10	Immediate incapacitation: 95% chance of death within a week. The victim is racked by vomiting and nausea, and will be too weak to move about or do much of anything for himself. Within 4-24 hours (4d6), he will be in coma. Check for death in 1-6 days (1d6). Survivors have Radiation Sickness III.
9	As above but with 90% chance of death in 2-6 days (1 + 1d6). Survivors have Radiation Sickness III.
8 & 7	Incapacitation will occur within 5-30 hours (5d6), with vomiting and nausea occurring after about half that time. 75% chance of death in 4-14 days (2 + 2d6). Survivors have Radiation Sickness III.
6 & 5	Vomiting and nausea appear in 4-24 hours (4d6), with incapacitation in 2-7 days (1 + 1d6). 50% chance of death in 2-7 days (1 + 1d6). 50% chance of death in 8-28 days (4 + 4d6). Survivors have Radiation Sickness II.
4 & 3	Vomiting and nausea appear in 4-24 hours (4d6), with 50% incapacitation in 5-10 days (4 + 1d6). 20% chance of death in 8-28 days (4 + 4d6). Survivors have Radiation Sickness I.
2	No deaths expected, but there is a 60% chance minus Constitution score of acquiring Radiation Sickness I.
1	No deaths expected, but there is a 30% chance minus Constitution score of acquiring Radiation Sickness I.

Radiation Sickness III: Patient is reduced to 10% capacity (fatigue and wind levels, lifting capacity, etc.) for a number of weeks equal to the Rad* level of over-exposure to radiation. At the end of that time, he advances to Radiation Sickness II status.

Radiation Sickness II: Patient is reduced to 25% capacity for a number of weeks equal to the Rad* level of over-exposure to radiation. At the end of that time he advances to Radiation Sickness I status.

Radiation Sickness I: Patient is reduced to 50% capacity for a number of weeks equal to the Rad* level of over-exposure to radiation. At the end of that time he is capable of resuming duty. Note: A minimum of 3 weeks recovery time is required.

It is assumed that the patient receives proper medical treatment by a trained Physician or MediTech, with at least level/5 expertise. Otherwise recovery time is twice as long and death rate chances are increased by 1d20%. Treatment includes administration of ARD anti-radiation drugs three times a week. If Quicktime is used, recovery can be speeded by 25%. If wound have been suffered, add an additional +10% to the recovery time for each level of radiation sickness contracted.

The Rad* level of exposure is found by subtracting the person's rad shield factor (RSU) from the radiation level to which he was exposed. If his armor was breached by a hit, he will have received a greater dosage because his shielding was only 50% effective under such circumstances.

Example: Corporal Jamieson of the Mobile Infantry is exposed to Rad* 9 radiation levels external to his suit. His Marauder armor is rated at -7 Rad. Shield, so he would normally be exposed to only Rad*2. However, he was hit by a blaster bolt and his suit was holed when the radiation exposure occurred, so he received 9-4 (½ rad shield)=Rad*5 exposure. Corporal Jamieson's Constitution is 15, so he has an immediate chance of 15-6-5=4 or less on 1d20 of not contracting radiation sickness in the next 10 minutes. If he is not picked up and taken to a shielded area, this check must be made every 10 minutes thereafter. Because his Rad Shield integrity is not perfect, he will lose -1 per additional 10 minutes, he is exposed, so his chance after 10 minutes is 3 or less on 1d20, then 2 or less after 20 minutes, etc. Corporal Jamieson is unlucky and rolls 8. With Rad*5 exposure, he will begin to experience vomiting and nausea within 4-24 hours, and will be completely incapacitated in 2-7 days, with a 50% chance of death in 8-28 days. That chance of death can be reduced if he is given an injection of ARD by -5d6% or 5% to 30%. As it turns out, Corporal Jamieson's comrades pick him up and he merely contracts Radiation Sickness II. He is reduced to 25% capacity (all physical functions, including weapons skills) for 5 weeks, the Rad* level of exposure, after which time he advances to Radiation Sickness I status and has 50% capacity for another 5 weeks, after which time his recovery is completed. During that time period, he will have received 3 ARD shots per week (total of 30) and was under the care of his StarShip Physician in the Sick Bay. Had either the ARD drugs or the Physician been absent from the picture, he would have required 10 weeks to recover from each stage of the illness.

CBR Radioactive Dust: A portion of the battlefield can be dusted with radioactive dust using CBR rounds. The dust will infect an area equal to that given in the Warhead section for a CBR burst (see 7.0). The Rad* level will be 1-6 (1d6) for a period of 1-6 (1d6) hours. Should additional rounds be fired into the area, the Rad* level will be raised +1 per round, until a maximum Rad*8 radiation count is achieved. Since the isotopes used have a very short half-life, the overall effects are eliminated at the end of the period of time indicated.

THERMONUCLEAR TACTICAL WEAPONS: Most thermonuclear weapons used in *Space Opera* will be rated as 'TTC/TND' or Tactical Tamped-Charge Thermonuclear Devices. These will be low-yield weapons with 100 tons to 10 kiloton TNT-equivalent blasts. As will be seen these weapons are quite sufficient for any battlefield. All such weapons may be delivered by one or another of the PML Portable Missile Launchers or by any Tank Guns rated at 'C' or higher. Aircraft Bombs of 'C' or higher may also deliver TTC/TND weapons.

Blast/ Rad* Zone	0.1 Kiloton TTC/TND			Rad*	0.25 Kiloton TTC/TND			Rad*
	Diameter				Diameter			
	Meters	Inchest	Level		Meters	Inchest	Level	
DH	25	1	12		50	2	12	
GZ	75	3	12		125	5	12	
KZ/1	100	4	10		150	6	11	
KZ/2	125	5	8		200	8	10	
KZ/3	150	6	7		250	10	9	
KZ/4	200	8	6		300	12	8	
CZ/5	250	10	5		350	14	7	
CZ/6	300	12	4		400	16	6	
CZ/7	350	14	3		450	18	5	
CZ/8	400	16	2		500	20	4	
CZ/9	450	18	1		550	22	3	
CZ/10	500	20	0		650	26	2	
CZ/11	—	—	—		750	30	1	

Cost: CR 10,000 + round.
Tech/6+ weapon system.

Cost: CR 20,000 + round.
Tech/6+ weapon system.

Blast/ Rad* Zone	0.50 Kiloton TTC/TND			Rad*	1.0 Kiloton TTC/TND			Rad*
	Diameter				Diameter			
	Meters	Inchest	Level		Meters	Inchest	Level	
DH	50	2	12		100	4	12	
GZ	200	8	12		250	10	12	
KZ/1	250	10	11		350	14	11	
KZ/2	300	12	10		450	18	10	
KZ/3	375	15	9		550	22	9	
KZ/4	450	18	8		650	26	8	
CZ/5	550	22	7		800	32	7	
CZ/6	650	26	6		950	38	6	
CZ/7	750	30	5		1100	44	5	
CZ/8	850	34	4		1250	50	4	
CZ/9	950	38	3		1400	56	3	
CZ/10	1050	42	2		1550	62	2	
CZ/11	1200	48	1		1700	68	1	

Cost: CR 30,000 + round.
Tech/6+ weapon system.

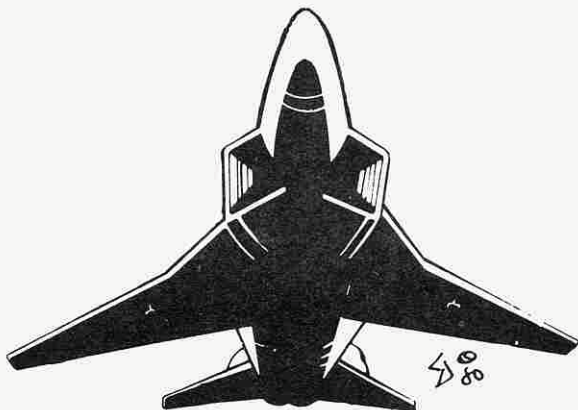
Cost: CR 40,000 + round.
Tech/6+ weapon system.

Blast/ Rad* Zone	5.0 Kiloton TTC/TND			Rad*	10 Kiloton TTC/TND			Rad*
	Diameter				Diameter			
	Meters	Inchest	Level		Meters	Inchest	Level	
DH	100	4	12		150	6	12	
GZ	300	12	12		350	14	12	
KZ/1	400	16	11		500	20	11	
KZ/2	500	20	10		650	26	10	
KZ/3	600	24	9		800	32	9	
KZ/4	750	30	8		950	38	8	
CZ/5	900	36	7		1150	46	7	
CZ/6	1050	42	6		1350	54	6	
CZ/7	1200	48	5		1550	62	5	
CZ/8	1350	54	4		1750	70	4	
CZ/9	1500	60	3		1950	78	3	
CZ/10	1650	66	2		2150	86	2	
CZ/11	1800	72	1		2350	94	1	

Cost: CR 50,000 + round.
Tech/6+ weapon system.

Cost: CR 60,000 + round.
Tech/6+ weapon system.

HEAVY THERMONUCLEAR WEAPONS: While it is not anticipated that heavy weapons will be used in most *Space Opera* scenarios, the following three weapons are offered for comparison with the tactical battlefield Nukes presented above:



Blast/ Rad* Zone	50 Kiloton HTN			Rad*	1.0 Megaton HTN			Rad*
	Diameter				Diameter			
	Meters	Inchest	Level		Meters	Inchest	Level	
DH	250	10	12		500	20	12	
GZ	1000	40	12		2000	80	12	
KZ/1	2000	80	11		3000	120	11	
KZ/2	2500	100	10		4000	160	10	
KZ/3	3000	120	9		5000	200	9	
KZ/4	3500	140	8		6000	240	8	
CZ/5	4000	160	7		8000	320	7	
CZ/6	4500	180	6		10,000	400	6	
CZ/7	5000	200	5		12,000	480	5	
CZ/8	5500	220	4		14,000	560	4	
CZ/9	6000	240	3		16,000	640	3	
CZ/10	6500	260	2		18,000	720	2	
CZ/11	7000	280	1		20,000	800	1	

Cost: CR 150,000 + round.
Tech/6+ weapon system.

Minor destructive effects will be felt up to 10,000m from ground zero—light structures damaged, fires started, windows blown out, flash blindness (temporary and permanent), etc. Warhead masses 1t and is delivered by heavy tactical missiles, aircraft.

Cost: CR 250,000 + round.
Tech/6+ weapon system.

Minor destructive effects will be felt up to 20,000m from ground zero. Weapon is delivered by strike bomber or heavy bomber aircraft. Warhead masses 1 ton. The 1 Megaton warhead is used in clusters to destroy cities.

Blast/ Rad* Zone	20 Megaton HTN			Rad*
	Diameter			
	Meters	Inchest	Level	
DH	1000	40	12	
GZ	4000	160	12	
KZ/1	5000	200	11	
KZ/2	6000	240	10	
KZ/3	8000	320	9	
KZ/4	10,000	400	8	
CZ/5	12,000	480	7	
CZ/6	15,000	600	6	
CZ/7	18,000	720	5	
CZ/8	21,000	840	4	
CZ/9	24,000	960	3	
CZ/10	27,000	1080	2	
CZ/11	30,000	1200	1	

Cost: CR 375,000

Tech/6+ weapon system.

Minor destructive effects will be felt up to 35,000m from ground zero.

Weapon is delivered by heavy bomber aircraft. Warhead masses 3 tons. The 20 Megaton H-Bomb is a standard strategic thermonuclear round used to crack 'hard' military targets.

HELLBURNER: The warhead of the 'Hellburner' is a 100 Megaton Fusion Bomb built around a specially modified contragravity unit and very heavy-duty forcefield defensive screen. Upon detonation, the screen generator lasts for a few milliseconds, just enough time for the modified contragrav unit to generate an intense field of gravity in the center of the reaction. Heat and pressure/gravity conditions existing at the core of a star are created, and the result is a self-sustaining fission-fusion-fission 'Phoenix' thermonuclear reaction. Enough heavy hydrogen is contained in the warhead to sustain the reaction for 10.d6 minutes (6 to 60 minutes). The Phoenix 'Hellburner' totally destroys and melts down to bedrock any unshielded target (personnel, vehicles, buildings, hills, valleys, streams, lakes, —everything) within a radius of twenty kilometers from ground zero within the first six minutes of the reaction, with the radius of total destruction expanding by 5 kilometers per 6 minute period the weapon 'burns' thereafter, giving a maximum total destruction radius of 65 kilometers (40 miles).

Amazingly enough, the +12 BattleScreens of many StarShips are capable of withstanding such firepower with little difficulty, and similar battlescreens will typically be installed to defend major military installations and cities. However, when one considers that a Hellburner can destroy up to 13,000 square kilometers of landscape so that it cannot be used for much of anything until the next century, even that defense leaves the survivors inside the battlescreens with no prospect of making good use of the devastated countryside beyond.

The entire region is filled with Rad*12 radiation at the conclusion of the reaction, graduating downward by -1 Rad* level per 5km beyond the edge of the zone of total destruction. In short, a maximum burst can affect a radius of 120 km (75 miles), an area of 45,000 square kilometers (17,660 sq. miles). That whole region may be converted into a firestorm until all flammable materials have been burned.

'Hellburner' Phoenix Reaction Devices cost MCR50 to produce, and will typically be delivered by a 250 ton missile with defensive ECM and automatic weapons. The missile is equivalent to a StarBomber. The Phoenix Missile is described in the space combat section. Hellburners can be produced by any Tech/7-8 culture, but the weapons are strictly limited to the military. Indeed, no one will seriously consider using the weapon in a conventional war for fear of arousing neutral powers who will mass together to eliminate the 'Madmen' who unleash such horror on populated worlds or upon 'valorous' troops.

PLANETBUSTER: The PlanetBuster Missile is a 250 ton weapon which utilizes a series of nuclear 'shaped' charges that enable it to 'burrow' its way into the planetary crust before the 10,000 Megaton main warhead is detonated, usually at a depth of 100 kilometers. The explosion will produce violent earthquakes; roll 1d100:

1d100 Roll	Effect of PlanetBuster Detonation
01-60	Total destruction of all non-earthquake proofed structures will occur within a radius of 15-150 km (15.d10) of ground zero. Destruction of all civilian structures occurs within a radius of 1.5-15 (1%.d10) kilometers. Only fully battle-screened military installations will survive the earth tremors.
61-85	Total destruction of all non-earthquake proofed structures will occur within a radius of 100-1000 km (100.d10) from ground zero. Destruction of all civilian structures occurs in a radius of 10-100 (10.d10) kilometers. Fully battlescreened military installations will lose 5%-100% of capacity and defensive/offensive strength (5.d20).
86-99	Subsidence will occur such that an entire region will sink 100-2000 (100.d20) meters. If the region drops below sea level, it will be flooded. If the area's altitude has not been determined, roll 150.d20 for a range of 150m to 3000m of altitude above sea level. The area affected is equal to that in the previous section (61-85), and effects apart from a subsidence below sea level (total destruction of everything) will be the same as detailed for 61-85.
00	The region, as described in 61-85, is pulverized by the blast and resulting volcanic eruptions as the planetary crust is breached, releasing the internal pressure of magma with sudden violence. The region is literally flung into low orbit, and the cataclysm produces planet-wide devastation, with 25% + 7.5% to 75% of the population destroyed (25 + 7%.d10%). The planet's weather patterns are totally disrupted and vast amounts of volcanic ash and poisonous gases are released which have a 10% to 100% (10.d10) chance of rendering the planet uninhabitable for 1 to 10 years (1d10) until the wounds can be healed. Note: Planets of more than 5000 km diameter are too massive to be blown apart. However, if the planet is under 5000 km in diameter, this effect has a 10% to 60% (10.d6) chance of blowing it to rubble, starting a new asteroid belt.

The Planet Buster is the ultimate development in thermonuclear destructiveness and can be found in the arsenals of most advanced star-cultures. However, a counterweapon, the XM& 'Badger' has been developed to 'burrow' after a PlanetBuster and destroy it if the planetary Xenon defense screens have been destroyed.

A 'Badger' has a 95% chance of catching and destroying a PlanetBuster if it is launched in pursuit before 5 minutes have elapsed after the PlanetBuster hits ground and starts its plunge to the 100 km level. Each minute thereafter reduces the chance by -5%. The reaction time to launch the 'Badger' is 4-24 minutes (4d6). It is believed that the Azur-ia-Imperium has developed a similar counter-weapon, and it is possible that others have it too.

The cost of a PlanetBuster is about MCR250 to MCR400. Few of the weapons have been produced because of the high cost and also because they will tend not to be effective if the target planet is defended by a planetary Xenon XR nuclear damping field. For obvious reasons, such weapons will not find their way into the hands of private citizens. 'Badgers' cost MCR75.

A PlanetBuster was used only once by Terran forces in the assault on the fortress planet of Sakaar VI, after the Fourth and Seventh Marine Divisions were annihilated by the ferocious defense waged by the powerful Bug garrison. When the Thirty-Sixth Heavy Cruiser Squadron committed to a low orbit bombardment of the planetary installations to cover the withdrawal of the surviving mobile infantry scored a lucky torpedo hit destroying the main planetary damper field generator. Before the Bugs could activate the stand-by unit, a TMR50 PlanetBuster missile was fired and detonated 87km beneath the planetary surface. The 4000 km diameter planet was blasted apart by the detonation.

OMEGA MISSILE: The Greek letter Omega is the last in their alphabet, and the Omega Missile means the last of life on a planet. The Omega Missile is the ultimate in 'dirty' weapons. It contains ten independently targeted 250 Megaton warheads, each encased in 10,000 kg. of cobalt. The fallout from each warhead will effectively dust the surface of a Terran-sized planet with Rad*1 radiation. If all ten warheads get through, the Rad* level can reach Rad*10. The radiation levels take 1-10 months to build up to full intensity, so there will be a chance to evacuate the population. However, all unprotected persons will most certainly die. The radiation count will be halved every 100 years; for example, a Rad*5 will become Rad*2.5 after 100 years. When the Rad* level falls below Rad*0.25, the planet will be considered inhabitable again by a general population. The cost of an Omega Missile is about MCR100. It is not effective if a planet is defended by a planetary Xenon XR damper field generator.

PLANETARY DESTRUCTION: Very few planets in the galaxy are considered to be inhabitable. Consequently, interstellar races will not resort to massive destruction of inhabitable planets. Even the starkly 'inhuman' Bugs show great restraint in such instances. Thus, only purely military targets on otherwise uninhabitable worlds will be liable to attack by PlanetBusters, Phoenix missiles, and Omega missiles.

7.2 PORTABLE ROCKET & MISSILE LAUNCHERS

Portable rocket and missile launchers are designed to be carried by infantry, giving them needed firepower when faced with armored attack or an enemy air strike. Heavy launchers may also be mounted on vehicles.

PRL PORTABLE ROCKET LAUNCHERS: The PRL is a bazooka type weapon firing a HEAT armor-piercing round or a recoilless rifle which is either tripod or vehicle mounted and fires armor-piercing or general purpose rounds. Both types are direct-fire weapons which depend upon a good aim to hit the target. Rockets are straight-flight, unguided 'missiles' whose course cannot be altered once fired.

PML PORTABLE MISSILE LAUNCHERS: Unlike the PRL, the PML is designed to fire guided missiles as well as standard rocket warheads. The Light PML is a compact launcher easily carried by a man. The medium PML is a heavier weapon capable of accepting a larger missile/rocket, possessing greater range. The Heavy PML is a substantial weapon which is difficult for a man to fire without Powered Armor to augment his strength. Tripods can be used by unpowered infantry to steady the weapon. Heavy PMLs are regularly mounted on fighting vehicles to give them instant artillery support, in addition to any other weapons they may mount.

MISSILE GUIDANCE: DIRECT CONTROL: The Tech/6 wire-guided and T.V. guided missiles developed late in the 20th century on Terra give an idea of the operation of DCM or Direct Control Missiles. PMLs fitted with DCM give the operator command guidance. By keeping the crosshairs of the PML sights on the target while the missile is in flight, the automatic guidance system signals the missile so that it remains on course. When using DCM, any modifications to direct fire hit probability due to smoke or terrain obscuring the target will apply.

DCM DIRECT CONTROL MISSILES: Direct Control Missiles fly at relatively 'slow' speeds in order to permit the operator to retain control. Remotely piloted missiles (actually flown by the PML operator) have a ground speed of 800 kmh (1300m in 6 seconds). Targeted missiles kept on course by retaining the target in the crosshairs will fly at 1500 kmh (2500m in 6 seconds). The EW rating of the missile will be important, as the enemy will have a chance of jamming any incoming missile unless it is wire-guided, and those types of DCM tend to be Tech/6 versions only. It should be remembered that the operator must keep his eye on the target, either directly or electronically. If the target moves behind a copse of trees, is obscured by smoke, etc., the chance of hitting anything worthwhile diminishes considerably.

MISSILE GUIDANCE: HOMING GUIDANCE: Homing missiles have either a passive homing/semi-active homing capacity or an active homing capacity. Passive homing missiles of PHM will target on something radiated by the target, typically heat or some form of electromagnetic radiation. PHM/SAH semi-active homing missiles may also home in on a visual image of the target picked up by a T.V. scanner in the nose of the missile. Alternatively, it may home in on an infra-red or radar 'spot' projected on the target by the PML operator (an I-R projector or Battlefield Radar can accomplish this). Such systems are open to ECM countermeasures by the enemy, but infra-red homing is almost impossible to jam.

PHM MISSILES: Passive Homing Missiles move at high velocity — usually their full range in a **Space Opera** six second turn. PHMs are virtually proof against ECM unless the enemy has some means of blocking the radiated energy. The BattleScreen will dow this 25% of the time. However, if the missiles are pre-set to home in on a steady radio transmission (someone is careless), or an enemy radar set (the missile flies down the radar beam), the only way to counter them is to turn off the offending equipment — providing one knows what to turn off. Note: a PHM cannot home in effectively on less than a 2 ton vehicle target.

SAH MISSILES: Semi-Active Homing Missiles also move at high velocity — usually their full range in a 6-second combat turn when fired on PHM and can also maneuver at speeds on SAH like a targeted DCM Direct Control Missile. The SAH/PHM system allows the missile to fly toward a target painted by the radar or sensorscan of the DCM unit in the PML. Once the target has been designated, the missile's own sensors take over and lock on to the target so long as it remains in view. This is the 'Look-See and Go/Go' missile. The PML operator registers the target on his sighting crosshairs, pushes the 'Look-See' or Target Designation trigger to give the SAH/PHM round a 'look' at the target it is going to be fired upon, then the 'Go/Go' Fire button is pushed and the missile is on its way. Once launched, it no longer needs the attention of the PML operator.

MISSILE GUIDANCE: INERTIAL GUIDANCE: The IGM or Inertial Guidance Missile can be pre-set to impact a predetermined spot of ground. An IGM is immune to any counter-measures, while the other guidance systems can be countered in various ways by enemy ECM. Once fired, it will impact the designated position, give or take 25m. (There is a 5% chance per 2500m of range that it will land 25m off target.) Setting an IGM by hand — that is, without an Inertial Map — takes three 6-second combat turns or one 20-second **Space Marines** combat turn. With an Inertial Map, the setting can be immediate. Hand settings also require fire control procedure.

IGM MISSILES: All IGM Missiles are high velocity rounds which will reach the target in the turn they are fired. As noted, they are accurate within 25m. When setting the target position by hand, the Indirect Fire Control procedure is followed as if a Forward Observer were directing a gun. See the ground combat rules for details.

SAM SURFACE-TO-AIR MISSILES: All SAM rounds are missiles with velocities high enough to hit an aircraft target in the turn they are fired. Aircraft EW/ECM systems can foil a SAM round fired by a PML. Also, SAMS have an air combat factor to represent their dogfighting ability, as target aircraft can attempt to dodge the missile by out-turning it, etc. If the SAM is clearly 'locked on target' and enemy ECM has failed, the dogfighting rules apply and a 'hit' is scored on a 5+ result.

All PMLs and PRLs are divided into light, medium and heavy categories

Launcher Type	ROF	Ammo Mass
Lt. PRL	1**	1 kg.
Mdm. PRL	1**	5 kg.
Hv. PRL*	1**	10 kg.
Lt. PML	1**	1 kg.
Mdm. PML	1**	5 kg.
Hv. PML*	1**	10 kg.
DRL***	1	3 kg.

* Tripod mounted for unpowered infantry or vehicle mounted.

** In **Space Opera**, two 6-second combat turns are required to reload after the turn the PML or PRL is fired. An operator with expertise over level/5 can cut the reload time to 6 seconds. This gives an effective ROF of 1 per 3 turns or 1 per 2 turns.

*** Terran Disposable Rocket Launcher.

LIGHT PRL 'BAZOOKA': The Lt. PRL is a Tech/5 weapon massing 4 kg. with length 1200mm. It has no special sighting equipment other than a simple cross-hair target sight. Cost=CR 175. The weapon fires a direct-fire AP 'F' warhead and is an anti-tank weapon. Breakdown No.=2/2.

MEDIUM PRL 'ROCKET LAUNCHER': The Mdm. PRL is a Tech/6 weapon massing 4 kg. with length 1200mm. It is an improved 'bazooka' with better sighting and greater range. Cost=CR 175. The weapon fires a direct fire AP 'F' warhead and is an anti-tank weapon. Breakdown No.=2/2.

HEAVY PRL 'RECOILESS RIFLE': The Hv. PRL is a Tech/6 weapon massing 50 kg. with length 2000mm. It is a tripod or vehicle-mounted rocket launcher with good sighting equipment and long range. Cost=CR 1500. The weapon can direct fire AP 'E' warheads or any 'F' artillery round.

LIGHT TECH/6 PML/SAM: The Tech/6 PML is an anti-aircraft weapon designed to shoot down low-flying aircraft at ranges up to 3600m. A PHM infra-red passive homing round is used, with an EW/3 and air-to-air rating of 5. The launcher masses 6 kg. with length 1000mm. Cost=CR 500. Breakdown No.=2/2. Ammo Mass=5 kg.

HEAVY TECH/6 PML/DEM: 'HOT' WIRE-GUIDED ANTI-TANK: This Tech/6 Hv. PML fires a type 'F' AP warhead by using a wire-guided missile. The weapon masses 35 kg., complete with control box, and costs CR 3500. It is tripod or vehicle mounted. The operator must 'fly' the missile, requiring him to actually see the target. It may be helicopter borne. Ammo mass=20 kg. Range=100m (minimum) to 4000m (maximum).

LIGHT TECH/7 PML: The advanced PML masses 6 kg., with length 1000mm, breaking down into two 500mm sections which can be carried in a porta-case strapped to the back and assembled in three **Space Opera** combat turns (18 seconds). Ammo mass is as given in the range tables. The weapon can fire a complete range of unguided rockets or DCM. Specific warhead types for each race will be given later in this section. Cost=CR 4000.

MEDIUM TECH/7 PML: The Mdm. PML masses 10-15 kg., with a length of 1000mm. It is bipod-equipped to steady the weapon for prone firing, but it can be shoulder-fired by a husky human. Ammo mass is as given in the range tables. The weapon can fire a complete range of unguided rockets and all guided missiles. Specific warhead types for each race/nationality will be given later in this section. Cost=CR 9000.

HEAVY TECH/7 PML: The Hv. PML masses 20 kg., with length 1000mm. It is typically tripod or vehicle mounted because of its considerable mass, but Power Armor personnel can shoulder fire the launcher. The weapon fires a complete range of unguided rockets and all guided missiles. Cost=CR 17,500.

SAM SURFACE-TO-AIR PMLS: Some races have general purpose PMLs capable of firing SAMs, while others have to use special SAM-firing PMLs which cannot accept standard PML rounds (and vice versa). These will be detailed later.

TERRAN DRL: The Terran Union has developed a lightweight disposable rocket launcher or DRL for general issue to troops. The unit may be regarded as a round of ammunition massing 3 kg. in total. It is 750mm long and is fired like a 'bazooka' type Tech/5-6 rocket launcher. The weapon fires a complete range of 'F' warheads.

RACIAL PML CHARACTERISTICS: Depending upon the race or nationality involved, PMLs will evidence specific capabilities with regard to the type of warheads that can be fired and the EW ratings of those warheads. The following tables summarize those capabilities.

PML Type	Nationality	Standard Warhead	EW Rating	SAM	SAM EW	SAM Dogfight††	NUKE	NUKE EW Rating†
Lt. PML	Terran	'E'	10	'E'	10	15	.1kt. TTC/TND	10
Mdm. PML	Terran	'E'	10	'E'	10	18	.5kt. TTC/TND	10
Hv. PML	Terran	'D'	10	'D'	10	21	1kt. TTC/TND	10
DRL	Terran	'F'	—	—	—	—	—	—
Lt. PML	Mercantile	'F'	9	'E'	9	15	.1kt. TTC/TND	9
Mdm. PML	Mercantile	'E'	9	'E'	9	17	.5kt. TTC/TND	9
Hv. PML	Mercantile	'D'	9	'D'	9	20	1kt. TTC/TND	9
Lt. PML	Azuriach	'E'	10	'E'	10	15†††	.1kt. TTC/TND	10
Mdm. PML	Azuriach	'E'	10	'E'	10	18†††	.5kt. TTC/TND	10
Hv. PML	Azuriach	'D'	10	'D'	10	20†††	1kt. TTC/TND	10
Lt. PML	GPR	'F'††††	6	'E'	7	14†††	none	—
Mdm. PML	GPR	'E'††††	6	'E'	7	16†††	.1kt. TTC/TND	7
Hv. PML	GPR	'D'	6	'D'	7	19†††	.5kt. TTC/TND	7
Lt. PML	Ranan Horde	'F'††††	2†††††	none	—	—	none	—
Mdm. PML	Ranan Horde	'E'††††	2†††††	'E'	4	16†††	none	—
Hv. PML	Ranan Horde	'D'	2†††††	'D'	4	19†††	.25kt. TTC/TND	4†††††
Mdm. PML	Mertun	'E'	9	none	—	—	.25kt. TTC/TND	9
Hv. PML	Mertun	'D'	9	'D'	9	20	1kt. TTC/TND	9
Lt. PML	MekPurr	'F'††††	9	none	—	—	none	—
Mdm. PML	MekPurr	'E'	9	'E'	9	18	.25kt. TTC/TND	9
Hv. PML	MekPurr	'D'	9	'D'	9	20	1kt. TTC/TND	9
Lt. PML	IRSOL	'E'	10	'E'	10	15†††	.1kt. TTC/TND	10
Mdm. PML	IRSOL	'E'	10	'E'	10	18†††	.25kt. TTC/TND	10
Hv. PML	IRSOL	'D'	10	'D'	10	21†††	1kt. TTC/TND	10
Lt. PML	Blarad	'E'	7	'E'	8	14†††	none	—
Mdm. PML	Blarad	'E'	7	'E'	8	16†††	none	—
Hv. PML	Blarad	'D'	7	'D'	8	19†††	.25kt. TTC/TND	8
All PMLs	Rauwoof	as Blarad PMLs						
Lt. PML	Hissss'ist	'F'††††	4†††††	none	—	—	none	—
Mdm. PML	Hissss'ist	'E'††††	4†††††	'E'	5	16†††	none	—
Hv. PML	Hissss'ist	'D'	4†††††	'D'	5	19†††	.25kt. TTC/TND	5†††††
Lt. PML	Klackon	'F'††††	7	none	—	—	none	—
Mdm. PML	Klackon	'E'††††	7	none	—	—	none	—
Hv. PML	Klackon	'D'	7	'D'	7	20†††	.25kt. TTC/TND	7
Lt. PML	Whistler	'F'	7	'F'	8	17†††	none	—
Mdm. PML	Whistler	'E'	7	'E'	8	20†††	none	—
Hv. PML	Whistler	'D'	7	'D'	8	22†††	.25kt. TTC/TND	8
All PMLs	Bugs	as GPR in Tech/8; no PMLs used in Tech/7.						
Hv. PML	Terran CSU	'C'	10	'C'	10	21	10kt. TTC/TND	10
Hv. PML	Azuriach CSU	'C'	10	'C'	10	20	5kt. TTC/TND	10

† EW is rated at Tech/7 base. Add +1 EW factor per Tech level above Tech/7; subtract —3EW for Tech/6.

†† SAM Dogfight factor is rated at Tech/7 base. Add +1 Dogfight Factor per Tech level above Tech/7; subtract —3 factors for Tech/6.

††† Special SAM PML is required. Battlefield PMLs will not accept SAM rounds, and SAM PMLs will not accept battlefield rounds.

†††† No pre-set inertial guidance missiles (IGM) can be used with such designated PMLs.

††††† Tech/8+ values are equivalent to GPR missiles.

7.3 CALLIOPEs

The Calliope is a Tech/7 energy projector originally designed as an anti-aircraft weapon. However, when interfaced with a BattleComputer, the Calliope proved capable of intercepting shells in flight, and it therefore came into use as an anti-artillery and missile weapon. The typical weapon is a multi-barrelled gun, with each barrel generating a FTFC field effect. All barrels are focused on the same target area, but each barrel acts to increase the FTFC field strength, and thus increases hit probability as well. Any missile or artillery shell passing through the field has an excellent chance of being detonated by the FTFC field.

Three calibers are available: light, medium and heavy. All are too large to be man-portable, but they can be mounted on a field carriage (Grav-Sled) or in a vehicle. Depending upon the nationality producing the weapon, the number of barrels and the caliber will vary: Terrans, Mercantile Leaguers, Blarads, MekPurrs, Rauwoofs, and Whistlers all use x6 barrel Calliopes. IRSOL and Azuriachs use x8 barrel Calliopes. Mertuns use x9 barrels, Klackons x6 Barrels, Hissss'ist x5 Barrels, and Ranan Horde use x4 barrels. Costs and masses given below are per barrel:

Calliope	Ammo	ROF	Mass	Cost (CR)
Light	200c	10	5 kg.	1500
Medium	200c	10	50 kg.	2500
Heavy	200c	10	100 kg.	4000

Powercells are per barrel and are included in the mass total. A 200c powercell masses 1 kg. and costs CR200 to replace. Recharges cost CR50 and can be made in five minutes at any power main.

Light Calliopes cover a 50m x 50m area. Medium Calliopes cover an area 200m x 200m. Heavy calliopes cover 500m x 500m. Area autofire zones are given for heavy automatic weapons in **Space Opera**.

In addition to being able to function as an automatic AA weapon, the Calliope can be used most effectively to intercept incoming artillery rounds 99.9% of the time.

Special sensors are fitted to all Calliopes which can detect incoming missile (PML, PRL) rounds on a 6+, rolled on 1d10, on the first turn that the fire begins, and on 2+ thereafter. If the special sensors are knocked out, standard sensors can be used, with initial detection on 9+, and with 5+ on the second and 2+ on the third turns following. Once the field is established in a predetermined zone of defense, it is effective against all rounds passing through it.

To determine whether a missile has been hit and detonated by a Calliope, roll a number of 1d6 equal to the number of barrels on the Calliope. A '6' result indicates a hit on the round, and it is detonated in the air. The height of the round is assumed to be above its capacity to affect personnel or other ground targets. However, low-level guided missiles will airburst somewhere in the Calliope field zone, and might affect ground targets with CZ Casualty Zone effects.

Calliopes can also be used against lightly armored targets. Area fire allows twice the number of 1d6 to be rolled as there are number of barrels, with 1 hit per '6' result. If directed at a single target, 1d6 is rolled for each barrel, again with '6' indicating a hit.

Note: Calliopes are line-of-sight weapons and intervening terrain, buildings, etc., will block the FTFC field.

ARTILLERY

Advanced combat equipment has rendered 'indirect fire' weapons (field guns, mortars, etc.) virtually useless on the battlefield. Calliope weapons, for example, have been developed to such a degree that, by Tech/8, it is virtually impossible for even the heaviest barrage to reach a target. However, players desiring to use indirect fire artillery weapons are referred to **Space Marines** for the rules governing the use of these systems in Tech/6-7 situations and earlier.

7.4 GRENADE LAUNCHERS & GRENADES

Strictly speaking, grenades and grenade launchers are not 'heavy' weapons in the usual sense but are included here because they have explosive effects like those detailed in the section on Warheads.

There are three sizes of grenade: regular, 'thimble' and 'pill.' Regular grenades are similar to the common hand grenades used in the 20th century on Terra, and mass from 0.35 kg. to 1.0 kg. The 'thimble' grenade is an advanced explosive with a mass of 100 gm. 'Pill' grenades are tiny 10 gm. mini-charges about the size of buttons. The explosive and other charges contained in these grenades are outlined in the Warhead section.

Grenade launchers are grenade throwers which greatly enhance overall range. Some heavy Grenade Launchers are similar to the M79 Thumper used by the U.S. Army on late 20th century Terra, but carry a magazine of grenades. Grenade pistols fire 'thimble' or 'pill' grenades and load much like an automatic pistol. Single-round disposable grenade launchers are available to throw 'thimble' and 'pill' grenades as well, for the light mass of these weapons makes it difficult for a man to throw them a great distance by hand. Finally, APGV anti-personnel grenade launchers may be mounted on a heavy armored vehicle to discourage infantry attack. The APGV fires a grenade about 25 meters to each side and the rear of a tank in x3 APGV versions, and all around the vehicle in x4 APGV versions.

One type of grenade launcher which might be singled out is the I-rack or Y-rack PAPA Powered Armor launcher. The I-rack fires one grenade forward of the Power Armor trooper. The Y-rack fires one grenade to either side. The system has an automatic reloader and will fire on command until empty. The I-rack or Y-rack Grenade Launcher is carried on the back, between the propulsion pods of the PAPA Jet Pack CG Harness.

Thrown Grenades & Grenade Launchers	ROF	Ammo	Length (mm)	Mass (gm)
Regular Grenade 'G'	1	1	—	350 gm
Thimble Grenade 'H'	1	1	—	100 gm
Pill Grenade 'J'	1	1	—	10 gm
Grenade Launcher 'G'	1	5	750 mm	4000 gm
Grenade Launcher 'H'	1	10c	750 mm	3000 gm
Grenade Launcher 'J'	1	20c	750 mm	3000 gm
Grenade Pistol 'G'	1	1	200 mm	1250 gm
Grenade Pistol 'H'	1	5c	200 mm	1250 gm
Grenade Pistol 'J'	1	10c	200 mm	1250 gm
Disposable Grenade	1	1	100 mm	+150 gm†
Y-rack PAPA G.L. 'G'	2	20	750 mm	5000 gm
I-rack PAPA G.L. 'H'	1	20	500 mm	3000 gm
APGV 'H'	3/4	6 ea.	NA	3000 gm

The cost of grenade warheads is given in the Warhead section. Disposable grenade launchers cost CR 10. Grenade Launchers (carbine-type) all cost CR 500. Grenade Pistols all cost CR 375. I-Rack PAPA G.L. costs CR 1250 while Y-Rack PAPA units cost CR 1750. APGV 'H' costs CR 1000 per unit (see Vehicles for the types carrying these.)

Regular grenades and Grenade Launcher 'G' (single shot) are available in Tech/5-6. All others are available in Tech/7+ societies.

Note that grenade launchers are indirect fire weapons and are subject to the Scatter Rules.

7.5 SCRAMBLERS

Scramblers are Tech/7-8 weapons similar to grenade launchers which fire a small shell which gives off RRKM energy which 'scrambles' the molecules of anything in the burst zone of the weapon.

The effects of scrambler blasts are similar to those of an energy disruptor. They also cause various living things to explode due to the sudden release of cellular pressure, converting them into an oily 'gas' which can have the explosive effects of a grenade. For gaming purposes, this effect will be limited to trees. Any tree directly hit by a scrambler round will have a 1/3 chance of detonating like an HE grenade.

Scramblers are direct-fire weapons which fire a high-velocity round, unlike grenades, they either hit or miss. The scrambler round bursts on impact.

Scrambler Type	ROF	Ammo	Wound Effect	Grenade Equivalent
Hand Scrambler	1	12c	+3	'J'
Hand Scrambler	3	12c	+3	'J'
Hv. Scrambler†	1	24c	+4	'G'
Hv. Scrambler†	3	24c	+4	'H'

Scrambler Type	Weapon Length	Weapon Mass	Cost (CR)
Hand Scrambler	1000 mm	5000 gm	6500
Hv. Scrambler	1500 mm	35 kg.	12,500

† Tripod or vehicle mounted weapon.

Scrambler ammunition costs CR 240 for 12 rounds of Hand Scrambler ammo and CR 850 for 24 rounds of Hv. Scrambler ammo. Hand Scrambler ammo masses 4200 gm. per 12 rounds, while Heavy Scrambler ammo masses 15 kg. per 24 rounds.

Costs listed are wholesale prices per 12 or 24 rounds, as applicable. Military veterans can apply their discounts to this rate. Retail costs are 150% on most major planets, and in 'backwater' areas the costs will be 150% + 10.010%.

7.6 DIRECT-FIRE CANNON

The following group of weapons includes the MMG and HMG versions, as well as automatic light cannon, as most armored fighting vehicles and aircraft will be armed with such weapons as well as with heavier ordinance.

Anti-Tank Guns: These are the traditional high-velocity projectile firing artillery pieces designed specifically to deliver AP (armor-piercing) shot directly to an armored target. They also fire HE and other rounds of the same caliber. Penetration of AP is +1 above HE at PB, SR, and MR. At LR, penetration is standard. At ER, penetration is -1.

Gauss Cannon: The Tech/7+ Gauss Cannon is the heavy version of the Gauss Rifle and employs a powerful magnetic linear accelerator to bring an anti-tank round up to very high-velocity — often exceeding 5000 mps (meters per second) or 18,000 kmh. Effective range of the heaviest weapons is to the horizon, while lighter versions have ranges significantly greater than those of conventional anti-tank guns.

Energy Cannon: These direct-fire weapons are heavy Laser, Blaster, and Fusion ordinance. All fire an exactly straight line to target, and many will have a range out to the horizon (and, in the case of very heavy pieces, well beyond; such weapons are actually light spacecraft ordinance.)

All of the above weapon systems are typically vehicle-mounted, usually in turrets. However, they are also available as field guns. In Tech/5-6 cultures, field gun mounts are the usual artillery configuration from 20th century Terra — towed guns. In Tech/7+ cultures, field mounts are light powered turrets on an anti-grav 'floater' which can be towed by any vehicle.

Weapon Type	Caliber	ROF	Ammot†
AP Anti-Tank	'F'	2	40 'F'
AP Anti-Tank	'E'	2	40 'E'
AP Anti-Tank	'D'	2	40 'D'
AP Anti-Tank	'C'	2	40 'C'
APG Gauss	'F'	2	50 'F'
APG Gauss	'E'	2	50 'E'
APG Gauss	'D'	2	50 'D'
APG Gauss	'C'	2	50 'C'
Laser Cannon	All	1,2	50c
Blast Cannon	All	1,2	50c
Fusion Cannon	All	1,2	50c

† Standard ammunition stowage capacity of most AFVs. This ammunition is in ready magazines (shells in turret) or in energy weapon power cells. Additional ammunition will be stowed internally, if desired, using the vehicle's interior cargo capacity. Energy Cannon may have double or triple capacity power cells at additional cost.

Weapon Type	Caliber	Ammo Mass	Length††	Mass††	GunShield Armor††	Tech Level	Cost (CR)
AP Anti-Tank	'F'†	3 kg.	3.5m	50 kg.	AFV/AFV	5	10,000
AP Anti-Tank	'E'†	5 kg.	5m	1t	AFV/AFV	5	22,500
AP Anti-Tank	'D'†	10 kg.	6m	2t	+1/AFV	5-6	35,000
AP Anti-Tank	'C'†	15 kg.	7m	3t	+2/AFV	6	50,000
APG Gauss	'F'	2 kg.	3.5m	450 kg.	+2/+1	7	20,000
APG Gauss	'E'	4 kg.	5m	1t	+3/+2	7	35,000
APG Gauss	'D'	7 kg.	6m	2t	+4/+3	7	50,000
APG Gauss	'C'	10 kg.	7m	3t	+5/+4	7-8	90,000
LaserCannon	*50/std.	50 kg.	3m	1t	+2/+1	6-7	50,000
LaserCannon	*75/+1	100 kg.	4m	2t	+3/+2	6-7	75,000
LaserCannon	*100/+2	150 kg.	5m	3t	+4/+3	7	100,000
LaserCannon	*125/+3	200 kg.	6m	5t	+5/+4	7	150,000
LaserCannon	*150/+4	275 kg.	7m	10t	+5/+4	7	225,000
BlastCannon	*50/std.	100 kg.	3m	1t	+2/+1	7-8	75,000
BlastCannon	*75/+1	200 kg.	4m	2t	+3/+2	7-8	125,000
BlastCannon	*100/+2	275 kg.	5m	3t	+4/+3	7-8	175,000
BlastCannon	*125/+3	350 kg.	6m	5t	+5/+4	7-8	250,000
BlastCannon	*150/+4	425 kg.	7m	7t	+5/+4	8	335,000
BlastCannon	*175/+5	500 kg.	9m	10t	+6/+6	8	400,000
BlastCannon	*200/+6	1t	10m	20t	+7/+7	8	500,000
FusionCannon	*50/std.	100 kg.	3.5m	1t	+3/+2	8	100,000
FusionCannon	*75/+1	200 kg.	4m	2t	+4/+3	8	150,000
FusionCannon	*100/+2	300 kg.	5m	4t	+5/+4	8	225,000

† Projectile firing anti-tank guns can also fire standard artillery ammunition of 1 class lower in the Warhead Tables. That is, an AP 'F' can fire 'G' type (grenade) rounds. An AP 'E' can fire 'F' warheads, etc. Gauss Cannon can fire artillery warheads of the same caliber because of their magnetic accelerators and capacity to handle a more massive warhead.

†† Stats refer to field-mount guns. Field guns are not self-propelled and must be towed on wheels, tracks, or grav floaters. The GunShield armor is frontal only. Tech/7+ guns may be on power mounts with +1/AFV armor on the sides and top. Mass is increased by 100% as the gun becomes a veritable turret in its own right. Such guns will also have the equivalent of +2 BattleScreens for *50 to *75 calibers, +3 BattleScreens for *100 to *125 calibers. Heavy BlastCannon (*150, *175, and *200) will have +4 BattleScreens for Terran and Azuriach units. Cost of the power-turrets is 50% of the cost of the gun, and EW and HUD is equivalent to the AFV required to mount such a weapon.

Guns may not be vehicle mounted unless the vehicle is of the required type.

Larger caliber energy cannon have a plus modifier to penetration. For example, *75/+1, *100/+2, etc. The plus after the slash indicates this penetration modifier.

7.7 FLAMERS

Flamers are incendiary weapons which closely parallel the flamethrower of the 20th century. Flammable materials have a 50% chance of being set on fire when struck by a flame burst.

It should be noted that flamers are not generally for sale to the public. They are strictly military weapons, although they do have some industrial applications. All commercial use of such flamers is regulated as is the case with high explosives. Security precautions are taken in areas where flamers are stored in industrial facilities.

The FlameThrower is treated as a 'projectile' weapon for penetration purposes, as are the splatter effects of the advanced flamers. Advanced Flamers have higher wound effects for direct hits, which penetrate as energy bursts, while splatter effects are treated as projectile hits and have lower wound factors (+2). FlameThrowers are available in Tech/5 cultures, while the advanced Flamers are Tech/7-8 weapons.

Splatter effects will target any target in the affected zone when automatic fire is engaged.

Flare pistols fire a small magnesium charge which can be aimed to 25m as if at long range. The damage effects are the same as FlamePistol 'scatter' effects, but can only be directed at one target. Flare guns hold one round, are 200mm long and mass 750 gm. Ammunition masses 250 gm. for ten rounds at a cost of CR 12.5. These flare guns are common equipment in Tech/5 cultures.

Weapon Type	ROF	Ammo	Wound Factor	Splatter Radius	Length	Mass	Cost (CR)
FlameThrower	10	60c	+2	2m x 5m	750mm	15kg.	500
FlamePistol	2	20c	+4/+2	3m	175mm	900gm.	500
FlameRifle	2/10	30c	+4/+2	3m	1000mm	4000gm.	1500
Heavy Flamer	1/10	100c	+6/+2	5m x 10m	1500mm	50kg.	5000

Cost of 'ammunition' is:

FlameThrower. CR 30 for 10kg tank of fuel. Tank costs CR 250, with napalm charge.
 FlamePistol CR 15 for 10 rounds massing 150 gm.
 FlameRifle. CR 15 for 10 rounds massing 150 gm.
 Heavy Flamer CR 30 for 10 rounds massing 500 gm.

7.8 AREA JAMMERS

Although the Area Jammer could easily have been included in the ECM section, it should properly be thought of as a heavy weapon because of its disruptive effects on enemy communications in general, as well as its capacity to disrupt and detonate guided missiles. An area jammer will blanket all radio and sub-space frequencies in an area from 1000m x 1000m to 10,000m x 10,000m (roll 1000.d10), with the jammer located somewhere within the disrupted zone. The unit can also be focused in any direction to cover a 60° arc, within which the jamming beam has a chance of affecting guided missiles (see EW/ECM). A Com/Tech/5+ is required to operate the equipment. Anyone attempting to locate the jammer or to punch a transmission through the jamming field can use the procedure given either in the ECM description of a standard jamming device or the EW/ECM rules. Area Jammers mass about 200 kg. and are vehicle-mounted. They have 24 hr. emergency powercells, but otherwise run on vehicle power. Breakdown = 2/5. Cost = CR 125,000.

7.9 XENON NUCLEAR REACTION DAMPER FIELD

The Xenon KR nuclear damper field generator prevents extremely large releases of energy in a short time period. The earliest Xenon units were massive installations, often measured in the thousands of tons, developed to protect late Tech/6 and early Tech/7 cities from thermonuclear attack. Later Tech/7 models were capable of being mounted first in ships and spacecraft, and later in heavy ground vehicles of tank size. Major and even some colony planets are protected by Xenon Planetary Defense Screens, which blanket an entire planet, preventing thermonuclear reactions from occurring anywhere within the zone protected — usually from about 1000 km above the surface down through the crust of the planet (the field is carried internally through the planet by its electromagnetic lines of force extending from pole to pole).

Planetary Xenon units mass about 1000 tons and are anti-matter powered. Cost is MCR 5000 each, and two are required. They are installed at the magnetic poles of the planet and are usually protected by massive military installations.

Spacecraft Xenon units mass about 1000 kg per 1000t of a ship's mass and will damp a nuclear detonation within the vessel or at a range of 10 km + 1d20 km beyond the hull. Breakdown = 1/4. The cost is CR 150,000 per 1000t of ship's mass protected. Most vessels have such Xenon units already included in the basic hull costs.

Battlefield Xenon Units mass about 1000 kg. and will damp a nuclear detonation within 5 km + 1d20 km of the vehicle carrying the unit. Breakdown = 1/5. Cost = CR 100,000. Xenon units are generally mounted in command vehicles and in CSUs.

One of the peacetime purposes of a planetary Xenon Damper Field is to prevent extensive damage by large meteor strikes and by crashes of massive spacecraft travelling at high velocity. (Refer to *Lucifer's Hammer* by Niven and Pournelle for an accurate description of the effect of such major cataclysms.) The Xenon field unit has the capacity to translate vast energies through a hyperspace warp throughout the magnetic field of a planet or through the anomaly field of a spacecraft drive system. Even multi-megaton detonations can be largely damped and their energies spread throughout the volume enclosed by the Xenon field and the planet's vaster magnetic field. The result is that the detonation simply fizzles. At the same time, a Xenon field will have only limited effects on controlled nuclear reactions. Energy weapons are not significantly affected, although there is a 50% chance that any energy weapons discharged in a Xenon field will have the N+ number, rolled on 1d10, to penetrate raised by +1 to +2. If such an effect occurs, it will apply to all energy weapons in the field.

8.0 HIT LOCATION

The location of a hit is important when dealing with any vehicle or aircraft. The armor of many vehicles will vary from point to point, and the penetration effect of a shot will therefore be of greater or lesser degree depending upon the point actually struck.

Vehicle Direct Fire Hit Location

1d6 Result	Area Affected†
1	Track/HoverFan/GravPod/Engine
2	Assessed against Hull Side
2-4	Hull Side/Front/Rear
5-6	Turret Side/Front/Rear

† Whether Side, Front, or Rear is hit depends upon the location of the firing gun relative to the target. A frontal shot cannot hit the hull flank, for example, so a '1' result would automatically be treated as a '2' fired into the hull front. Also, if the vehicle was behind hard cover (hull behind a fold of ground), a hit against the hull would not be a hit at all because the hard cover took the blast instead. Vehicles will be advised to use hull-down positions where possible, keeping heavy turret frontal armor pointed in the direction of the enemy.

Also see the special damage rules covering penetrations of vital areas. These are outlined in section 8.1. Even if it is not destroyed (exploded) by a hit that penetrates, a vehicle may suffer from temporary damage which puts it out of service for a time or reduces its performance.

Plunging Fire Vehicle Hit Location

1d10 Result	Area Affected†
1	Track/HoverFan/GravPod/Engine
2	Assessed against Hull Side
2-4	Hull Side/Front/Rear
5-6	Hull Top
7-8	Turret Side/Front/Rear
9-10	Turret Top

† Only a direct hit or airburst will strike a hull or turret top armor; groundbursts are read for top hits. Also see the note for Direct Fire hits against vehicles, above.

8.1 VEHICLE/AIRCRAFT COMBAT DAMAGE

Vehicles and aircraft that suffer penetrating hits take two kinds of damage, regular damage and special damage. Hits that do not penetrate have no effect.

Regular Damage is subtracted from the vehicle's damage capacity as given in the vehicle and aircraft descriptions, and this is the only effect until combat damage reduces the Damage Capacity to zero. At Damage Capacity 0, the vehicle is totally out of action, but is repairable.

Explosions may occur any time a vehicle takes a penetrating hit. The chance of explosive destruction is equal to the damage inflicted, expressed as a percentage of the total Damage Capacity x ½. For example, a vehicle rated at Damage Capacity 20 takes 5 points of damage. The immediate chance of destruction by explosion of fuel, ammunition, etc. is ½ x 5/20 x 100=13%, rolled on 1d100. Such a vehicle would be totally wrecked and irreparable if it explodes.

Negative Regular Damage is treated as outlined above, except that the combat rating of the aircraft is also reduced proportionately to the combat damage. For example, if an aircraft has a Damage Capacity of 10 and suffers 2 points of damage (20%), its air combat rating is reduced by 20%. If the aircraft was rated at air combat 5, it would be reduced by 20% to air combat 4. Fractional losses are rounded to the

nearest whole number. When the aircraft Damage Capacity reaches 1, the craft is not airworthy and must return to base. When it goes below 1, the aircraft crashes or crash lands.

Special Damage also occurs when a vehicle suffers a penetrating hit at a specific location. Special Damage resulting in a temporary failure will automatically be countered in 1-6 battle turns by 'appropriate' measures taken by the crews/automatic systems, etc., in the vehicle. However, if Multi-System Breakdowns occur, 1d20 is rolled on the Multi-System Breakdown Table to determine the severity of the malfunction.

That damage will have to be repaired according to the standard repair system. The damage points do not have to be restored in order to get the affected systems operational.

The area affected by special damage will be determined in the combat phase by the Vehicle Hit Location Roll. This combat table is reproduced below for reference. Apply the vehicle damage DMs from the Warhead Penetration tables to this die roll.

2d6 Roll Special Damage Effect

- 1-9 No special damage; regular damage only.
- 10-12 Area affected is temporarily out of action.
- 13-15 Multi-System Breakdown in area affected; roll 1d20 for breakdown class.
- 16+ Explosive Destruction if damage is over 10% of Damage Capacity, otherwise breakdown.

The temporary or breakdown effects of such special damage penetrations are:

Track or Wheel Hit: A tracked or wheeled vehicle will be immobilized by a special damage hit and remains immobilized until the problem corrects itself (temporary damage) or is repaired.

HoverFan or GravPod Hit: A hovercraft or ground effects machine (GEM) will be hit in a hoverfan or blower, while a grav vehicle is hit in a gravpod or gravstrip. There is a flat 1/3 chance that the unit will be instantly immobilized (1 or 2 on 1d6) and otherwise suffers a 1/4 reduction in speed (cumulative) until the problem corrects itself or is repaired.

Engine (Aircraft) Hit: When an aircraft engine is hit, there is automatically a chance of an Explosion, as outlined for regular hits. If the explosive destruction of the aircraft does not occur, there is a 1/2 chance that the engine will lose all power (1-3 on 1d6) and otherwise suffers a 50% loss of power (cumulative) until the problem corrects itself or is repaired. That is, the number of engines becomes important. A four engined aircraft has 25% of its speed provided by each engine. Full loss of an engine slows it by 25%, half power loss slows it by 12.5%.

Hull Hit: Some discretion has to be exercised when a special damage hit to the hull occurs. The chance of a temporary or serious breakdown is equal to the percentage of damage, compared to the total Damage Capacity of the vehicle. Exactly what system(s) are affected depends on the location of the hit. The engines and vehicle power generation systems are in the rear of the vehicle, so a hit in the side has a 50% chance of penetrating the engine compartment, while a rear hit has a 100% chance. A frontal hit has no chance unless the vehicle is lightly armored or unarmored, in which case it is 50% to hit the engine. If the engines/power generators go down, all motive power and electrical power is lost. That also knocks out the BattleScreens, turret powered training mechanisms, communicators, scanners, etc., unless such systems are separately powered by emergency powercells. Hits in the forward hull compartment(s) will knock out weapons mounted against the wall struck by the penetrating hit. If the engines are hit the vehicle will be immobilized until the temporary or serious problem is corrected or repaired. If the driver's compartment is hit, the vehicle will be immobilized only if the driver is a casualty and has not been replaced.

Fuselage Hit: Aircraft taking a hit in the 'hull' suffer an airframe hit, which counts only as regular damage. However, pressurization, etc., will be lost until battle repairs are made.

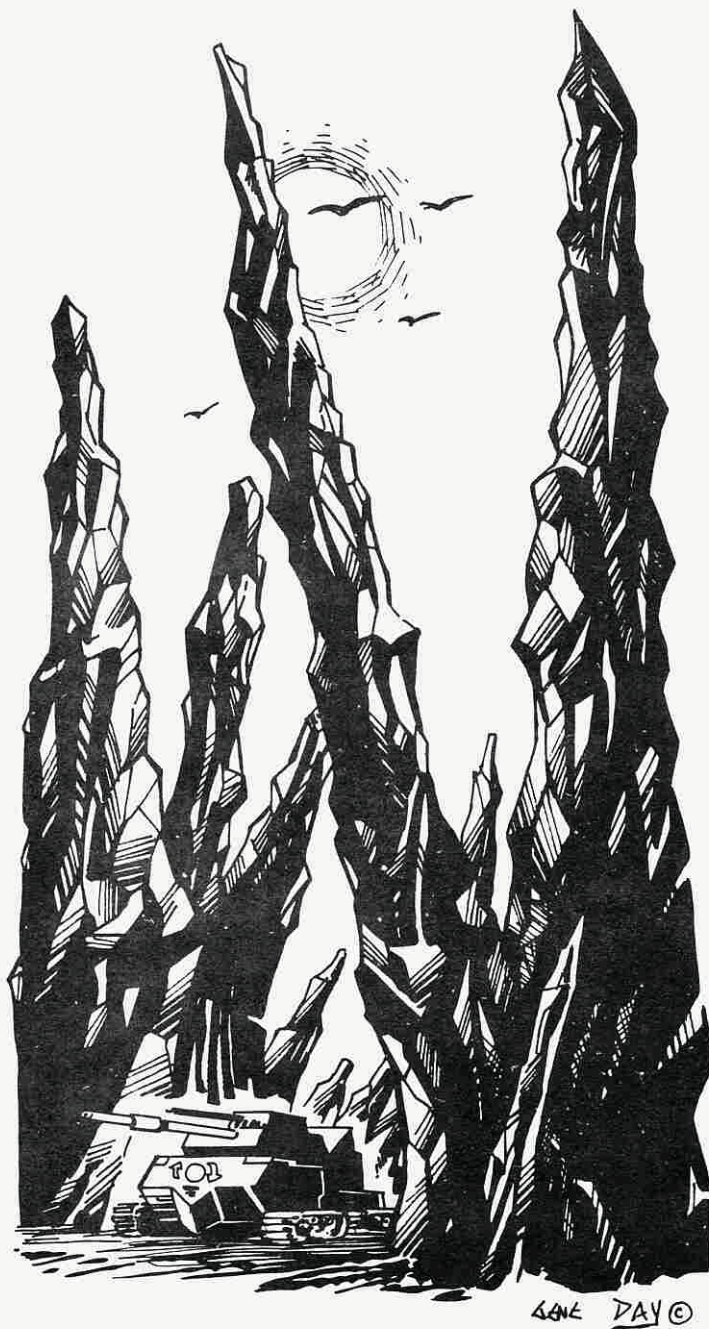
Turret Hits: Turret hits will knock out turret weapons and the training mechanisms until correction of the temporary or serious problem is made.

Top Hull, Top Turret Hits: Effects are identical to hull and turret hits, except that the armor tends to be thinner and renders most ground vehicles vulnerable to plunging fire.

8.2 CASUALTIES TO VEHICLE CREWS & PASSENGERS

For each penetrating hit, roll 1d6 per crewman or passenger in the compartment hit by the round. An adjusted roll, taking the Casualty DM from the warhead penetration table for the weapon into account, where 5+ means that the individual is a casualty. However, if in armor that could block the round (possible with lighter weapons), he can check to see if it penetrates his body armor as well as the vehicle.

If the vehicle explodes, the chance of becoming a casualty is 2+ on 1d6, and personal armor no longer makes a difference. No adjustment is made to this die roll. If wounded, check the Wounds section of **Space Opera**, this time applying the Casualty/Wound factor of the weapon to the wounds determination roll. In the case of a nuclear direct hit, a critical wound means the character of NPC is dead.



9.0 WARHEAD & HEAVY WEAPON PENETRATION TABLES

STANDARD WARHEADS

Warhead	Zone	Diameter (m)	Armor Protection Class/1d10 N+ Required to Penetrate													Casualty Factor	Vehicle		
			K	J	I	H	G	F	E	D	C	B	A	AFV	Screen		DM	Damage	DM
'A' HE	DH	8	A	A	A	A	A	A	A	A	A	A	A	-2	0	+8	+1	14+1d6	+7
	KZ	150	A	A	A	A	A	A	A	A	A	A	A	2	3	+4	+0	1+1d6	+0
	CZ	300	2	2	2	2	2	2	3	4	4	5	5	7	5	-1	+0	1-4	-1
'B' HE	DH	6	A	A	A	A	A	A	A	A	A	A	A	-1	1	+7	+1	12+1d6	+6
	KZ	125	A	A	A	A	A	A	2	2	2	3	3	3	4	+4	+0	1-6	+0
	CZ	250	A	A	A	A	A	A	2	3	4	5	6	7	8	-1	+0	1-4	-1
'C' HE	DH	5	A	A	A	A	A	A	A	A	A	A	A	0	2	+6	+1	10+1d6	+5
	KZ	100	A	A	A	A	A	A	2	2	3	3	4	5	5	+3	+0	1-6	+0
	CZ	200	A	A	A	2	2	3	4	5	6	7	8	9	9	-1	+0	1-4	-1
'D' HE	DH	4	A	A	A	A	A	A	A	A	A	A	A	1	3	+5	+0	8+1d6	+4
	KZ	75	A	A	A	A	A	A	2	3	3	4	4	6	7	+3	+0	1-6	+0
	CZ	150	2	2	2	3	4	5	6	6	7	7	8	9	10	-2	-1	1-3	-1
'E' HE	DH	3	A	A	A	A	A	A	A	A	A	A	A	2	4	+5	+0	6+1d6	+0
	KZ	50	A	A	A	2	2	3	4	4	4	5	5	7	9	+3	+0	1-6	+0
	CZ	100	2	2	2	3	4	6	7	7	8	8	9	10	—	-2	-1	1-3	-1
'F' HE	DH	2	A	A	A	A	A	A	A	A	A	A	A	3	6	+5	+0	4+1d6	+0
	KZ	25	A	A	A	2	2	3	4	4	5	5	6	8	10	+2	+0	1-5	+0
	CZ	75	2	2	3	4	5	7	8	8	9	9	10	—	—	-2	-1	1-3	-1
'G' HE Grenade	DH	2	A	A	A	A	A	A	A	2	2	3	4	9	10	+5	+0	2+1d6	+0
	KZ	10	A	A	A	3	3	4	5	6	7	8	10	—	—	+2	+0	1-4	+0
	CZ	50	2	2	3	4	5	6	8	9	10	10	—	—	—	-2	-1	1-2	-1
'H' HE Grenade	DH	2	A	A	A	A	A	A	A	2	2	3	5	10	10	+4	+0	1+1d6	+0
	KZ	10	A	A	A	3	3	4	6	7	9	10	10	10	—	+2	+0	1-4	+0
	CZ	25	2	2	3	4	6	9	9	9	9	10	10	—	—	-2	-1	1-2	-1
'J' HE Grenade	DH	1	A	A	A	A	A	A	2	3	4	5	6	8	10	+4	+0	1-6	+0
	CZ	5	2	2	3	3	4	5	6	7	9	10	—	—	—	+2	-1	1-3	-1
Thermal Grenade	DH	1	A	A	A	A	A	A	A	A	A	A	A	2	2	+5	+0	2.d10	+3
	KZ	5	A	A	A	A	A	A	2	2	3	4	5	6	6	+3	+0	1d10	+1
	CZ	25	A	A	A	A	A	2	3	4	5	6	7	9	10	-1	-1	1-6	+0
Stun	KZ	½WH*	2	2	2	2	2	2	3	5	7	9	10	—	—	Stun	—	—	—
	CZ	½WH*	3	3	3	3	3	3	5	7	10	—	—	—	—	Stun	—	—	—
FAE Hand Scrambler	KZ	½WH*	A	A	A	A	A	A	A	A	2	2	3	3	6	+6	+2	2.d10	+5
	DH	2	A	A	A	A	A	A	A	2	3	4	5	6	10	+4	+1	1-6	+1
	KZ	10	A	A	A	2	2	4	5	6	7	8	9	10	—	+2	+0	1-4	+0
Heavy Scrambler	CZ	25	A	A	A	3	5	8	9	9	10	10	—	—	—	+0	+0	1-2	-1
	DH	4	A	A	A	A	A	A	A	A	A	A	2	3	7	+5	+1	2+1d6	+1
	KZ	25	A	A	A	A	A	2	3	4	4	5	5	6	10	+2	+1	1-5	+0
	CZ	50	A	A	A	A	2	3	4	5	6	7	8	10	—	+0	+0	1-3	-1

SPECIAL ROUNDS

Warhead	KZ	CZ	DH Penetration	Starshell/Flare	Diameter (m)
AP	10	25	HE N+ -1	'A'	3000
APNC	15	25	HE N+ -2	'B'	2500
APG	15	25	HE N+ -3	'C'	2000
Smoke	—	HE	—	'D'	750
Smoke Grenade	—	HE	—	'E'	500
Lt. Smoke Gr.	—	½HE	—	'F'	250
'AA+' HE	250	450	HE N+ -1	'F' Grenade	250
'AA+' FAE	125	—	FAE	'G' Grenade	150
'AA+' Stun	375 x 125	—	Stun	'H' Grenade	100
'AA+' CBR	1000 x 300	—	—	—	—
'AA' HE	200	375	HE 'A'	—	—
'AA' FAE	125	—	FAE	—	—
'AA' Stun	375 x 125	—	Stun	—	—
'AA' CBR	750 x 200	—	—	—	—
'A' CBR	100	—	—	—	—
'B' CBR	75	—	—	—	—
'G' CBR	15	—	—	—	—
'H' CBR	5	—	—	—	—

* WH=The expected diameter for the appropriate sized WarHead (WH).

NUCLEAR WARHEADS

Blast Zone	Rad Level	K	J	I	H	G	F	E	D	C	B	A	AFV	Screen	Casualty Factor	DM	Vehicle Damage	DM
DH	12	A	A	A	A	A	A	A	A	A	A	A	-7	-5	KIA	KIA	Explodes	
GZ	12	A	A	A	A	A	A	A	A	A	A	A	0	-2	KIA	KIA	Explodes	
KZ/1	11	A	A	A	A	A	2	A	2	2	3	3	4	0	+7	+2	8+2d6	+5
KZ/2	10	A	A	A	A	A	A	A	2	2	3	4	6	1	+6	+2	4+2d6	+4
KZ/3	9	A	A	A	A	A	2	2	3	3	4	5	7	2	+5	+2	2d6	+3
KZ/4	8	A	A	A	A	2	2	2	3	4	5	6	8	3	+4	+1	2d6	+2
KZ/5	7	A	A	A	2	2	2	3	4	5	6	7	9	4	+3	+1	2d6	+1
KZ/6	6	A	A	2	2	2	3	5	6	7	8	9	10	6	+2	+0	1-6	+1
KZ/7	5	A	A	2	2	3	4	6	7	8	9	10	10	8	+1	+0	1-6	+1
KZ/8	4	3	3	3	3	3	5	7	8	9	10	—	—	10	+0	+0	1-5	+1
KZ/9	3	5	5	5	5	5	7	8	9	10	—	—	—	—	-1	-1	1-5	+0
KZ/10	2	6	6	6	6	6	8	9	10	—	—	—	—	—	-2	-1	1-4	+0
KZ/11	1	8	8	8	8	8	9	10	—	—	—	—	—	—	-3	-1	1-4	+0

Nuke Warhead	DH	GZ	KZ/1	KZ/2	KZ/3	KZ/4	KZ/5	KZ/6	KZ/7	KZ/8	KZ/9	KZ/10	KZ/11
0.1 kt	25	75	100	125	150	200	250	300	350	400	450	500	—
0.25 kt	50	125	150	200	250	300	350	400	450	500	550	650	750
0.5 kt	50	200	250	300	375	450	550	650	750	850	950	1050	1200
1.0 kt	100	250	350	450	550	650	800	950	1100	1250	1400	1550	1700
5.0 kt	100	300	400	500	600	750	900	1050	1200	1350	1500	1650	1800
10 kt	150	350	500	650	800	950	1150	1350	1550	1750	1950	2150	2350
50 kt	250	1000	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
1 Mt	500	2000	3000	4000	5000	6000	8000	10,000	12,000	14,000	16,000	18,000	20,000
20 Mt	1000	4000	5000	6000	8000	10,000	12,000	15,000	18,000	21,000	24,000	27,000	30,000

Target Range (Meters)										Armor Protection/1d10 N+ to Penetrate										Casualty	Vehicle	
Weapon Category		ROF	Ammo	PB	SR	MR	LR	ER	K-G	F	E	D	C	B	A	AFV	Screen	Factor	DM	Damage	DM	
20mm AutoCannon (1)	20mm M61 AutoCannon (1)	10	100c	50	500	1000	1500	2000	A	A	A	A	4	5	6	9	8	+5	+0	2-7	+0	
	20mm M61 AutoCannon (1)	10	100c	50	500	1000	1500	2000	A	A	A	A	3	4	5	8	8	+5	+0	2-7	+0	
	AP Cannon 'F' (1)	2	40	250	500	750	1000	1500	A	A	A	A	A	A	A	2	5	+5	+0	4+1d6	+1	
	AP Cannon 'E' (1)	2	40	300	600	1000	1500	2000	A	A	A	A	A	A	A	1	3	+5	+0	6+1d6	+2	
	AP Cannon 'D' (1)	2	40	500	1000	1500	2000	2500	A	A	A	A	A	A	A	0	2	+5	+0	8+1d6	+3	
	AP Cannon 'C' (1)	2	40	500	1000	2000	3000	4000	A	A	A	A	A	A	A	-1	1	+6	+1	10+1d6	+4	
	APG Gauss 'G' (1)	2	50	500	1000	1500	2000	2500	A	A	A	A	A	A	A	2	5	+5	+0	3+1d6	+1	
	APG Gauss 'F' (1)	2	50	500	1000	1500	2000	2500	A	A	A	A	A	A	A	1	4	+5	+0	5+1d6	+2	
	APG Gauss 'E' (1)	2	50	500	1000	2000	3000	5000	A	A	A	A	A	A	A	0	3	+5	+0	7+1d6	+3	
	APG Gauss 'D' (1)	2	50	750	1500	3000	4500	7500	A	A	A	A	A	A	A	-1	2	+6	+1	10+1d6	+4	
20mm Hv. Laser (2)	20mm Hv. Laser (2)	2	50	1000	2000	5000	7500	10,000	A	A	A	A	A	A	A	-2	1	+6	+1	12+1d6	+5	
	20mm Hv. Laser (2)	10	100c	50	1500	3000	H	—	A	A	A	A	A	A	A	2	2	+5	+1	2-7	+3	
	LaserCannon*50 (2)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	1	1	+6	+1	1+2d6	+4	
	LaserCannon*75 +1 (2)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	0	0	+6	+1	2+2d6	+5	
	LaserCannon*100 +2 (2)	1,2	50c	100	h	—	—	—	A	A	A	A	A	A	A	-1	-1	+6	+1	3+2d6	+6	
	LaserCannon*125 +3 (2)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	-2	-2	+6	+1	4+2d6	+7	
	20mm Hv. Blaster (3)	10	100c	50	1800	3600	H	—	A	A	A	A	A	A	A	0	1	+6	+1	4+2d6	+7	
	BlastCannon*50 (3)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	-1	0	+6	+1	2+2d6	+5	
	BlastCannon*75 +1 (3)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	-2	-1	+7	+1	3+2d6	+6	
	BlastCannon*100 +2 (3)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	-3	-2	+7	+1	4+2d6	+6	
20mm Fusion MG (4)	BlastCannon*125 +3 (3)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	-4	-3	+7	+1	10+1d6	+6	
	BlastCannon*150 +4 (3)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	-5	-4	+7	+1	12+1d6	+7	
	BlastCannon*175 +5 (3)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	-6	-5	+7	+1	14+1d6	+7	
	BlastCannon*200 +6 (3)	1,2	50c	100	H	—	—	—	A	A	A	A	A	A	A	-7	-6	+7	+1	16+1d6	+7	
	20mm Fusion MG (4)	10	100c	25	100	500	1500	—	A	A	A	A	A	A	A	0	4	+6	+1	3-8	+3	
	25mm Fusion Gun (4)	10	100c	50	500	2000	H	—	A	A	A	A	A	A	A	-1	3	+6	+1	2d6	+5	
	FusionCannon*50 (4)	1,2	50c	100	2500	H	—	—	A	A	A	A	A	A	A	-2	2	+6	+1	2+2d6	+6	
	FusionCannon*75 +1 (4)	1,2	50c	100	2500	H	—	—	A	A	A	A	A	A	A	-3	1	+6	+1	4+2d6	+6	
	FusionCannon*100 +2 (4)	1,2	50c	100	2500	H	—	—	A	A	A	A	A	A	A	-4	0	+6	+1	6+2d6	+7	
	20mm Inf. Repeater (5)	10	200c	25	200	500	1500	2500	A	A	A	A	2	3	5	7	8	+5	+0	2-7	+2	
40mm Inf. Repeater (5)	40mm Inf. Repeater (5)	10	200c	25	250	750	1500	3500	A	A	A	A	A	A	2	4	5	+5	+0	3+1d6	+3	
	Lt. Calliope (6)	10	200c	500	1000	1500	2000	—	2	9	9	10	10	—	—	—	—	+3	—	—	—	
	Mdm. Calliope (6)	10	200c	1500	3000	4500	6000	—	2	9	9	9	10	10	—	—	—	+3	—	—	—	
Hv. Calliope (6)	Hv. Calliope (6)	10	200c	5000	10,000	15,000	20,000	—	A	A	A	2	3	4	5	7	8	+4	+0	1-3	+0	
	Hv. Calliope (6)	10	200c	5000	10,000	15,000	20,000	—	A	A	A	2	3	4	5	7	8	+4	+0	1-6	+0	

(1) Penetration N+ -1 at LR and -2 at ER.

(2) No range reduction on N+, but smoke effects will reduce penetration.

(3) No range reduction on N+.

(2) and (3) +3 cannon and higher have orbital range capability (anti-spacecraft) in power mounts and CSUs.

(4) Splatter effects with 25m diameter = WB Flamer, in addition to DH on main target for fusion beam.

(5) No range effect on N+.

(6) Special anti-missile/artillery shell capability.

PRL' PML' & GRENADE LAUNCHERS

Weapon Category	ROF	Ammo	Range to Target in Meters					Warheads						
			PB	SR	MR	LR	ER	HE	FAE	Smk.	CBR	Stn.	AP	Nuke
'G' Grenade (Hand) (1)	1	1	10	—	50	—	—	yes	yes	yes	yes	no	no	no
'H' Grenade (Hand) (1)	1	1	10	—	75	—	—	yes	yes	no	yes	no	no	no
'J' Grenade (Hand) (1)	1	1	10	—	75	—	—	yes	no	no	no	no	no	no
'F' Grenade (Hand) (1)	1	1	—	—	40	—	—	yes	no	yes	no	no	yes	no
'F' Thermal (Hand) (1)	1	1	—	—	40	—	—	no	no	no	no	no	no	no
'D' HE Demo Charge (2)	1	1	—	—	—	—	—	yes	no	no	no	no	no	no
'D' Thermal Charge (2)	1	1	—	—	—	—	—	no	no	no	no	no	no	no
'C' HE Demo Charge (3)	1	1	—	—	—	—	—	yes	no	no	no	no	no	no
'G' Grenade Launcher (4)	1	5	10	100	200	400	600	yes	yes	yes	yes	yes	no	no
'H' Grenade Launcher (4)	1	10c	10	100	200	400	600	yes	yes	yes	yes	no	no	no
'J' Grenade Launcher (4)	1	20c	10	100	200	400	600	yes	no	no	no	no	no	no
'G' Grenade Pistol (4)	1	1	10	50	150	300	600	yes	yes	yes	yes	yes	no	no
'H' Grenade Pistol (4)	1	5c	10	50	150	300	600	yes	yes	yes	yes	no	no	no
'J' Grenade Pistol (4)	1	10c	10	50	150	300	600	yes	no	no	no	no	no	no
'G' Disposable Grenade (4)	1	1	—	—	—	—	450	yes	yes	yes	yes	no	no	no
'H' Disposable Grenade (4)	1	1	—	—	—	—	450	yes	yes	yes	no	no	no	no
'J' Disposable Grenade (4)	1	1	—	—	—	—	450	yes	no	no	no	no	no	no
'Y' Rack PAPA 'G' (4)	2	20	—	—	—	—	450	yes	yes	yes	yes	no	no	no
'I' Rack PAPA 'H' (4)	1	20	—	—	—	—	450	yes	yes	yes	yes	no	no	no
Hand Scrambler (5)	1,3	12c	—	—	150	450	900	Scrambler						
Heavy Scrambler (5)	1,3	24c	—	150	300	600	1200	Scrambler						
Lt. PRL 'G' (6)	1:2	1	—	100	150	200	300	yes	no	no	no	no	yes	no
Medium PRL 'F' (6)	1:2	1	—	150	300	400	600	yes	no	yes	no	no	yes	no
Heavy PRL 'E' (6)	1:2	1	—	500	1000	1500	2000	yes	yes	yes	yes	no	yes	no
Lt. PML 'F' or 'E' (7)	1:2	1	—	3600	—	—	—	yes	yes	yes	yes	yes	yes	var.
Medium PML 'E' (7)	1:2	1	—	5000	—	—	—	yes	yes	yes	yes	yes	yes	var.
Heavy PML 'D' (7)	1:2	1	—	10,000	—	—	—	yes	yes	yes	yes	yes	yes	yes
Disposable Rocket Launcher (6)	1	1	—	100	250	600	1000	yes	yes	no	no	no	yes	no

- (1) Hand-hurled grenade scatter effects apply.
 (2) Demolition charge must be placed by hand.
 (3) A triple 'D' charge; such charges are also carried by 'Kamikaze' Bugs.
 (4) Launched grenade scatter effects apply.
 (5) Launched grenade scatter effects apply.
 (6) Direct fire probabilities at SR and Launched Grenade scatter effects at MR to ER.

10.0 SCATTER EFFECTS: EXPLOSIVE ROUNDS

Use the following table for determining the hit point of hand-hurled and launched grenades, and for 'indirect fire' by PRLs, PMLs, and tank guns against infantry targets. PRLs, PMLs, and tank guns use the normal direct fire hit probabilities as given in **Space Opera** when firing on vehicle and building targets in line-of-sight. Roll 1d20 and consult the following table.

Fall of Shot	Hurled Grenade	Grenade Launcher	PML Round	Explosive Tank Round
Direct Hit	17+	15+	11+	13+
1d10m Short*	13–16	11–14	08–10	09–12
1d10m Long*	09–12	07–10	05–07	05–08
1d10m Left**	05–08	04–06	03–04	03–04
1d10m Right**	01–04	01–03	01–02	01–02
Modifiers:				
PB Range	+2	+2	+4	+3
SR	+1	+0	+1	+0
MR	+0	–1	+0	–1
LR	–1	–3	–2	–3
ER	–3	–5	–4	–5
Per Expertise Lvl.	+1	+1	+1	+1

* Add +1d10 meters at MR, 3d10 meters at LR, and 5d10 Meters at ER for grenade launchers, PMLs, PRLs, and tank guns.

** Add +1d10 meters at MR, 2d10 meters at LR, and 3d10 meters at ER for grenade launchers, PMLs, PRLs, and tank guns.

10.1 WARHEAD HITS

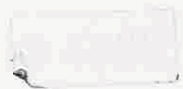
Any personnel or vehicle within the effect zone of a warhead, including grenades, is hit if N+ is rolled on 1d10:

	GroundBurst	AirBurst
In KZ: erect personnel/vehicle	2	2
In KZ: prone/in unarmored vehicle w/ open top	5	3
In KZ: in enclosed, armored vehicle	5	5
In KZ: in foxhole, head exposed	8	4
In KZ: in foxhole, head down but no overhead cover	—	8
In CZ: erect personnel/vehicle	5	5
In CZ: prone/in unarmored vehicle	9	6
In CZ: in enclosed, armored vehicle	9	9
In CZ: in foxhole, head exposed	10	7
In CZ: in foxhole, head down	—	10
FAE: erect personnel/vehicle	2	2
FAE: prone/in foxhole, head up/ in armored vehicle, in unarmored vehicle	3	3
FAE: in foxhole, head down/in enclosed armored vehicle	6	6

10.2 DAZING

Troops within the KZ or CZ of a nuclear weapon, the KZ of a high explosive weapon, or the area of effect of a FAE Fuel Air Explosive are dazed. PCs can roll a Constitution CR –6 to save from the effect. Bugs are always dazed if they are within the CZ of an HE weapon or nuclear weapon, in addition to the effects already described for all living personnel. Silicates and Cold Planets are never dazed.

Dazed troops either drop prone or go to cover (if there is such cover within 25m). They will do nothing else for 1–3 six second turns or for one 20-second turn except to melee defensively (–10% hit probability and 'surprised' for initiative) if attacked.



7102