HOME SWEET HOME

Creating planets for the STAR FRONTIERS™ game

by David Cook

Rex Dexter, planet explorer extraordinaire, cracked the hatch of his scoutship open. Snakelike threads of vapor reached into the airlock, then the hatch swung open with a distinct pop. Having studied the aerial maps, he knew the place was bad, but as he looked out, his historic first words were stifled in his throat.

Before him stretched a red plain, strewn with yellow-speckled boulders. To his eye, the ground had the same gentle swelling consistency as his mother's oatmeal. Plants, resembling giant fuzzy blue mold, swayed gently in the roasting breeze; they threw complex shadows from the light of the eight bright moons overhead. The air was dense enough to feel like paste; it clogged his lungs, nearly choking him. His feet dragged, held in the grip of 6 Gs. "Oh s_____" he said, "not again!"

Illustration by Jeff Easley

Does this happen to you? Are your science-fiction characters constantly landing on planets that resemble Gumbyland? Do you keep expecting Duck Dodgers (of the 24th and a half century) to appear around the next rock? Do you have the feeling that the planets you are landing on are not quite realistic?

This article presents a method for creating realistic star systems and planets for use in the STAR FRONTIERS game. The method given below attempts to be accurate, allowing the referee to create planets that are reasonable and scientifically possible. Wherever possible, the best scientific theories and information have been used in making this system. However, at the same time, very little is positively known about how planets are formed or even whether habitable planets are common.

The tables below should be used in the order listed. However, creating planets should not be always done just by dice rolls. If the referee has some plan or idea of what he wants, he should design the planet by choice, not letting random rolls dictate the outcome.

Likewise, the referee should not expect these rules to do everything for him. The planets created will have descriptions of the physical factors — the gravity, size, average temperature, amount of water, etc. It is still necessary for the referee to give the planet "life" — creatures, places of interest, colorful descriptions, and a history. No amount of tables can do this, nor any number of rules. This work must be done by the referee.

If the referee is designing a completely new area, the first step is to create the Sector Map. This may be done using graph paper, hexagon paper, or even a blank sheet of paper. The referee should start by rolling for ten to twenty stars on the Stellar Configuration Table (found below). The General Column of the two die ranges should be used. As the referee learns what each star system is, he should place it on the map (wherever he chooses). The map symbols on the following page may be used to indicate each type of star or object. After the referee has done this, he should place an additional 2-20 stars on the map, this time using the Habitable System Column of the table. This will ensure that there are at least several habitable systems in the sector. The referee should not attempt to place all the stars that would be found in a sector; since, in reality, a sector map could have hundreds of stars in its area. Only enough stars to provide many exciting adventures need be placed.

Realistically, it is very unlikely that so many habitable systems would be found in one area of space. However, the more realistic possibility of 1 habitable planet every 1,000,000 cubic light years (or thereabouts) is not very exciting or useful for most science-fiction games.

For those referees wanting greater realism for their sector map, the third dimension may be added. Stars do not all exist on the same plane (as a sheet of paper would seem to indicate), they fill an area. This may be done by assigning a plus or minus number to each star. This number is the number of squares above or below the level of the paper the star actually exists on. True distances between stars may then be found by doing some simple math, using the formula for finding the hypotenuse of a

triangle. However, this is not a math class. Furthermore, this math can be tedious if there are many stars involved. Therefore, adding in the third dimension is optional. The diagram below shows a perspective view of this mapping system.

Once a system map has been created, the referee may begin designing the actual systems that are found around each star. The following tables are used for creating star systems. They will determine the arrangement of the stars, the type of star, and the number of planets in the system. If the referee does not need to know this information, these tables may be skipped.

Creating systems

Stellar Configuration: When placing the stars on the sector map, the referee should determine the stellar configuration (or type and arrangement) of the star(s) at each location. This is done by rolling or choosing from the table below. The General Die Roll applies to most stellar systems. If the referee does not want to bother with these stars he may roll on the Habitable Die Roll column of the table.

Special Feature Table

Die Roll	Feature
01-03	Alien artifact
04	Alien lifeform
05-06	Artificial world
07	Black hole
08-20	Dead star
21-22	Derelict spaceship
23-50	Dust cloud
51	Neutron star
52-71	Protostar
72-80	Rogue planet
81-99	Supernova remnant
00	White hole

Alien artifact: An alien device just floating in space. It could be space mines left from some ancient battle or an unmanned deep space probe. Whatever it is, it is likely to be a source of adventures for the player characters.

Alien lifeform: Some unknown creature, able to live in deep space without any life-support is found here. The referee will have to create the creature.

Artificial world: Instead of a star system with planets, there is a world created or drastically altered by unknown beings. Such worlds could include artificial suns and planets, ringworlds, or Dyson spheres.

Black hole: A collapsed star with a gravitation field so intense that even light cannot escape its pull. The exact effect of the black hole will depend on the game being played.

Dead star: A burnt out cinder of a star. The surface will still be very hot, but may be able to support some type of alien life.

Derelict spaceship: A spacecraft in deep space. It may be a recent ship, abandoned after a pirate attack, a lost slower-than-light colony ship, a damaged fighting ship unable to return to base, or whatever else the referee desires.

Dust cloud: If a dust cloud is rolled, the referee should roll 1-10. This is the number of cubic light-years filled by the dust cloud. Dust clouds may be a hazard to navigation.

Neutron star: A collapsed star of extreme density and high gravity. Although not as intense as a black hole, a neutron star emits high amounts of energy that could pose a hazard to communication and navigation.

Protostar: This area is considered a dust cloud for the purposes of navigation. It is really a star in the beginning steps of forming.

Rogue planet: A planet pulled out of orbit from its star and now traveling by itself between stars. The planet may have been inhabited, and the inhabitants may still be alive under the surface of the planet.

Supernova remnant: A rapidly expanding aura of hot gases and particles. Long distance communication may be difficult in the area.

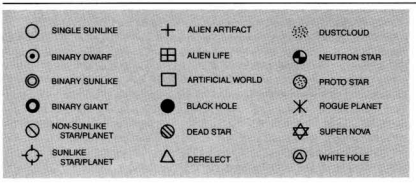
White hole: Currently a theorized counterpart to a black hole. Where a black hole absorbs everything, a white hole would release enormous amounts of energy and matter. They could therefore be exit points for the matter drawn in by a black hole. The amount of energy given off by a white hole is so great that any ship of known design would be totally destroyed if it came too

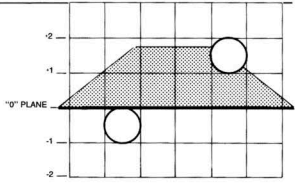
Stellar Configuration Table

Gen. Die Roll	Hab. Die Roll	Configuration
1-10	01-40	Sunlike star, habitable planets
11-18	41-72	Binary*: sunlike and dwarf, habitable planets
19-24	73-97	Binary*: two sunlike stars, habitable planets
25	98-99	Binary*: sunlike and giant star, habitable planet
26-93	—	Non-sunlike star, non-habitable planets
94-99	—	Any type star, no planets
00	00	Special feature**

* A binary star system is one that has two stars that orbit each other. In this system, the binaries will either be close or far. In a close binary, two stars circle each other so that they almost appear to be touching. In a far binary, one of the stars is at least as far away as Jupiter is from the Sun. It is suggested that most stars in a binary system be far apart from each other.

** Special features represent things in space which either are extremely rare or do not fit into other categories. These serve as sources of possible adventures for the PCs. To determine what the special feature is, the referee should either make one up, select one from the table below, or roll percentile dice and consult the table below. The special features are explained after the table.





close. Therefore, white holes are considered hazards to navigation.

Stellar class: In astronomy, all stars are given a stellar class to indicate the brightness and size of the star. However, not all stars can support habitable planets. Some are too hot and others are too small and cold. Some stars give off too much dangerous radiation. A small range of stars (from F2 to K1) are thought to be right for habitable planets. These are called sunlike stars in these rules. The stellar class of the sunlike star will have an effect on the number of planets around it. The referee should roll on the table featured right to find the stellar class of the sunlike star in the system.

Class: The letter and number combinations listed give the Stellar Class for information purposes.

Planet Mod.: This is the Planet Modifier. It is used when determining the number of planets in the system, as explained below.

Length of Year: The approximate length of a year in Earth days (24 hours) for an Earthlike, habitable planet.

Range: There are three different orbit ranges that a character-habitable planet can be in — close, middle, and far. These will have an effect on the temperature of the planet. You may choose an orbit range or roll randomly to determine it.

Color: The colors for stars listed blend into each other. A G9 star would be orange with a slight amount of red to it.

Sunlike Stellar Class Table

Die Roll	Class	Planet Mod.	Length of Year Range Close	Range Med.	Far	Color
01-05	F2	+2	605	810	1030	Yellow-White
06-10	F3	+2	550	750	970	
11-15	F4	+2	500	675	845	
16-20	F5	+2	450	620	785	
21-25	F6	+1	420	530	690	Yellow
26-30	F7	+1	390	500	635	
31-35	F8	+1	360	470	605	
36-40	F9	+1	335	440	555	
41-45	G0	0	325	380	455	
46-50	G1	0	285	370	480	
51-55	G2	0	260	350	440	
56-60	G2	0	245	315	405	
61-65	G4	-2	215	280	370	
66-70	G5	-2	205	265	335	Orange-Yellow
71-75	G6	-4	200	250	300	
76-80	G7	-4	195	235	270	
81-85	G8	-4	193	220	255	
86-90	G9	-5	191	210	225	
91-95	K0	-5	190	200	210	
96-00	K1	-5	189	195	200	Red-Orange

Planets in the System: Not all star systems with planets will have the same number of planets. Furthermore, not all planets are the same. These rules divide planets into four categories — Planetoids, Minor Planets, Terrestrial Planets, and Jovian Planets. Because of the way planets are formed, the different types will be at different positions from the star. The table below determines the number and type of planets that will be found in a star system. To use the table roll 1-10 and find the proper column. Then roll another 1-10 and add or subtract the Planet Modifier obtained from the Stellar Class Table. Treat modified die rolls of less than 1 as 1 and greater than 10 as 10. Find where the proper row and column meet. The information there will give the numbers and general types of planets in the system. This information is arranged from planets closest to the star to planets farthest from the star.

After this information is found, the referee should place each planet on a system display or some type of solar map. At the center of the display is the star. Each ring out from the sun is a possible planet orbit. Each planet should be placed on an orbit ring. If there are more rings than planets in the system, the referee may skip any rings he or she desires. The shaded area of the display is the star's Habitable Zone. All character-habitable planets should be placed in this zone.

Planet Type Table

Second Die Roll	First Die Roll 1-2	3-4	5-6	7-8	9-10
1-2	1H	1M/2H	1M/2H/1J1J	1M/1H/1J/1T	2M/2H/1J
3-4	2M/1H/A	1M/1H/2J	1H/A/1J	1M/A/2H/1J/1T	3M/1H/2T
5-6	1M/A/1H/1P	2M/2H/2J	1M/2H/1J/1T	2M/2H/2J/1P	1M/ 1P/1H
7-8	2M/2H/A/3J	3M/2H/3J/1P	3H/A/2J/2T	3H/A/2J/2T1T	2M/3H/4J
9-10	2M/3H/2J/2T	1M/3H/5T	3M/3H/4J/2T	3H/4J/4T	3M/A/1H

Explanation of results

#: The number of planets of that given type.

M: Minor Planet — a small chunk of rock much like Mercury in size.

H: Terrestrial Planet located in the Habitable Zone — Venus, Earth, and Mars are considered Terrestrial planets.

A: Asteroid Belt

J: Jovian Planet — a gas giant planet, more a cloud of gases. Jupiter and Saturn are Jovian Planets.

T: Terrestrial Planet not in the Habitable Zone.

P: Planetoid — a small chunk of rock, barely large enough to be spotted.

Creating Planets

The following tables (Planetary Diameter and Gravity and Satellites) are used to create any planet, whether habitable or not. If the planet is not habitable, these are the only tables used. If the planet is habitable, the remaining tables of the article are used to generate more information.

Planetary Diameter, Gravity, and Atmosphere: The following table determines the approximate size, gravity, and atmosphere of both habitable and non-habitable planets. Size and other factors have a great deal to do with the gravity of any given planet. The table below already has these factors figured into its results. The table is divided into four categories — Planetoids, Minor Planets, Terrestrial Planets, and Jovian Planets.

Planetary Diameter and Gravity Table

Second Die Roll	Dia.	First Die Roll 1	2	3	4	5	6	7	8	9	10
Planetoids											
1-4	Less than 1500	NE	NE	NE	NE	NE	NE	NE	NE	NE	.1N
5-6	1500	NE	NE	.1N	.1N	.1N	.1N	.1N	.1N	.1N	.1N
7-8	2000	.1N	.1N	.1N	.1N	.1N	.1N	.1N	.1N	.2N	.2N
9-10	2500	.1N	.1N	.1N	.1N	.2N	.2N	.2N	.2N	.2N	.2N
Minor Planets											
1-3	3000	.1N	.2N	.2N	.2N	.2N	.2N	.2N	.2N	.2N	.3N
4-6	4000	.2N	.2N	.2N	.2N	.2N	.3N	.3N	.3N	.3N	.3N
7-8	5000	.2N	.3N	.3N	.3N	.3N	.3N	.4N	.4N	.4N	.4N
9	6000	.3N	.3N	.3N	.4N	.4N	.4N	.4N	.5N	.5N	.5N
10	7000	.3N	.3N	.4H	.4H	.4H	.5H	.5H	.5H	.5B	.6B
Terrestrial Planets											
1	8000	.4H	.4H	.4H	.5H	.5B	.5B	.6B	.6B	.6B	.7*
2	9000	.5B	.5B	.6B	.6B	.6B	.7*	.7*	.8*	.8*	.8*
3	10000	.5B	.6B	.6B	.6B	.7*	.7*	.8*	.8*	.8*	.9*
4	12000	.7*	.7*	.8*	.8*	.9*	.9*	1.0*	1.0*	1.1*	1.1*
5	14000	.8*	.8*	.9*	1.0*	1.0*	1.1*	1.1*	1.2*	1.3*	1.3*
6	16000	.9*	.9*	1.0*	1.1*	1.1*	1.2*	1.3*	1.3*	1.4*	1.5*
7	18000	1.0*	1.1*	1.1*	1.2*	1.3*	1.4*	1.4*	1.5*	1.6H	1.7H
8	20000	1.1*	1.2*	1.3*	1.3*	1.2*	1.5*	1.6H	1.7H	1.8H	1.8H
9	22000	1.2*	1.3*	1.4*	1.4*	1.5*	1.6H	1.7H	1.8H	1.9H	2.0H
10	24000	1.3*	1.4*	1.5*	1.6H	1.7H	1.8H	1.9H	2.0H	2.1H	.2H
Jovian Planets											
1	30000	.3B	.4H	.5H	.6H	.6H	.7H	.8H	.9H	1.0H	1.1H
2	40000	.3H	.5H	.7H	.7H	.8H	.9H	1.0H	1.2H	1.3H	1.5H
3	50000	.5H	.6H	.8H	.9H	1.0H	1.1H	1.3H	1.5H	1.7H	1.9H
4	70000	.6H	.9H	1.2H	1.3H	1.5H	1.6H	1.7H	2.0H	2.3H	2.6H
5	90000	.8H	1.0H	1.5H	1.7H	1.9H	2.0H	2.3H	2.6H	3.0H	3.4H
6-7	110000	.9H	1.4H	1.8H	2.0H	2.3H	2.5H	2.8H	3.2H	3.7H	4.1H
8-9	130000	1.1H	1.6H	2.2H	2.4H	2.7H	2.9H	3.2H	3.8H	4.3H	4.9H
10	150000	1.3H	1.9H	2.5H	2.8H	3.1H	3.4H	3.8H	4.4H	5.0H	5.6H

First, find the proper category of planet type. Next, roll 1-10 and find the proper column across the top of the table. Then, roll 1-10 and find the correct row down the side. Find where the column and row meet. To give the gravity and atmosphere of the planet. The diameter is listed beside the second die roll.

Explanation of results

Dia.: The number in this column is the diameter of the planet in kilometers.

@.1 through 5.6: The gravity of the planet in tenths of a G; 1.0 equals normal Earth gravity.

NE: Negligible gravity. The strength of the gravity on the planet is not enough to have any game effect. The rules for weightlessness should be used when characters are on the planet. Obviously, the planet will not have an atmosphere. Characters will have to wear spacesuits when on the surface.

N: The planet has no significant atmosphere. Characters will have to wear spacesuits when on the surface.

H: Hostile Atmosphere. The planet has an atmosphere, but it is not breathable by the player character races. The atmosphere may be poisonous methane and ammonia, hydrogen and helium, frozen solid or any of a number of other dangerous combinations. Characters will have to wear spacesuits while on the planet's surface.

B: The atmosphere of the planet is breathable by the character races, if the planet is in the habitable zone of the star. However, other conditions (gravity, average temperature, etc.) make the planet unsuitable for colonization. No character may remain on the planet for more than six months. If the planet is not in the Habitable Zone on the system display, the atmosphere is considered hostile.

*: The planet is character-habitable if in the Habitable Zone of a sunlike star. Conditions allow it to be colonized.

Satellites: Many planets will have satellites orbiting them. These will range in size from chunks of rock, barely visible from the ground, to large moons. In addition to satellites, some planets, especially larger ones, will have rings around them.

To determine the number of satellites around any planet, character-habitable or not, the following table and its modifiers should be used. The referee should find all modifiers that apply to the planet and add them to the roll of 1-100. The modified result should be found on the table below.

Modifiers
Gravity * 10
Diameter/1000

Satellites

Die Roll	Satellites
01-107	None
108-118	1-2 planetoids
119-129	Ring*
130-136	1-5 planetoids
137-149	1-10 planetoids
150-170	Ring**
171-250	2-20 planetoids
251-306	2-20 planetoids and 1 minor planet

* If a ring result is obtained, another modified die roll should be made. If the planet already has rings, treat the result as 1-5 planetoids.

** If a ring result is obtained, another modified die roll is made. If the planet already has rings, treat the result as 2-20 planetoids.

If the referee desires, he may determine the diameter, gravity, and atmosphere of the satellite by rolling on the proper section of the Planetary Diameter and Gravity Table. However, if the referee does not intend for the player characters to ever reach the satellite, this is not necessary.

Character-Habitable Tables: The following tables should only be used for character-habitable planets. If the planet is not character-habitable, no further information is required.

Length of Day: The following table is used to find the length of the day (in standard 60 minute Earth hours) on any character-habitable planet. It is possible for a day to be longer or shorter than the amounts listed. However, if this were so, the conditions on the planet would not be suitable for living creatures.

To determine the length of the day, roll percentile dice and read the proper row. This will give a range of hours, either 1-5, 1-10, or 1-20. The referee should then roll the proper die to determine the exact number of hours in the day.

By doing a little simple arithmetic, the

referee can find the length of the year in planet days. Multiply the number of Earth days in the planet's year by 24. Divide this total by the number of hours in the planet's day. The result is the number of planet days in the year. (Year in Earth days × 24 = hours in year. Hours in year/hours in planet day = number of planet days in year.)

Day Length Table (Earth hours)

Die Roll	# of Hours
01-07	6-10 hours
08-20	11-15 hours
21-50	16-20 hours
51-75	21-30 hours
76-85	31-40 hours
86-90	41-50 hours
91-95	51-70 hours
96-99	71-90 hours
00	91-95 hours

Equatorial Inclination: Most planets tilt on their axis. This tilt will have an effect on the seasons of the planet. The greater the tilt, the more severe the seasons will be. This will affect the average temperature of the planet according to the season. To find the equatorial inclination, roll percentile dice and read the result on the table below. This will list the degree of inclination, the general effect on the seasons, and the Average Temperature Modifier.

Equatorial Inclination Table

Die Roll	Degrees Inclination	Seasonal Effect	Av. Temp Change
01-15	0	No seasons	0°
16-35	10	Mild seasons	+5/-5° C
36-55	20	Earthlike seasons	+10/-10° C
56-70	30	Strong seasons	+15/-15° C
71-85	40	Extreme seasons	+20/-20° C
86-00	50	Drastic seasons	+25/-25° C

Average Temperature: With the orbit range and inclination of a character-habitable planet, the referee can determine its average yearly temperature. To do so, match the planet's orbit range on the table below with the orbit range for the planet on the Stellar Display. This will give a spread of degrees for the average temperature of the planet. The referee should roll 1-10 and add the base number (if any). The result is the average yearly temperature for the temperate zone of the planet. To find the average temperatures for the different seasons, the referee should add and subtract the Average Temperature Change given above for the planet's inclination. The lowest number is the winter temperature, the highest number is the summer temperature. Remember, these temperatures are only average. Some days will be hotter or colder. Furthermore, many other factors may affect the temperature of a planet (these may be created by the referee).

Orbit Range	Base Temp. In C
Close	20° C
Medium	10° C
Far	0° C

Percentage of Water: All character-habitable planets will have some amount surface area covered by water. Obviously, planets with a low percentage of water will be dry and barren for the most part. Planets with a high percentage of water will have many island chains, and will often be humid or sometimes tropical. It is impossible (by today's knowledge) to have a character-habitable planet that has less than 10% water or more than 90% water. The first would be a dry, barren ball and the second would be a misty globe.

Surface Water Table

Die Roll	Adjustment
01-25	+10
26-75	0
76-00	-10

To use the above table, roll percentile dice and check the number rolled against the adjustment line. Add or subtract this amount from the die roll. The result is the percentage of surface water on the planet.

Optional Tables

Age of Planet: The age of the planet will affect the results of the Lifeform, Resource, and Unusual Features Tables, and should be determined before these tables are used. The young planets will be less likely to have highly developed lifeforms, and will have different resources and unusual features as compared to older planets. Determining the age of the planet will give a modifier that is used on the three tables. It is not necessary for the referee to record this modifier, although he if desired.

To determine the modifier, find the proper stellar class for the star below. The amount listed is either added or subtracted from the die roll.

Stellar Class	Age Modifier
F stars	-2
G0 - G3	-1
G4 - G6	0
G7 - G9	+1
K Star	+2

If the result is positive, that number should be added to the die rolls on the proper tables. If the result is negative, that number should be subtracted.

Lifeforms: If the referee has not decided what types of creatures will inhabit the planet, he may use the following table for a general idea. It is important to note that the categories used are extremely general. Many different kinds of creatures fall under each category. Secondly, the creatures and evolutionary order are all from Earth. This certainly does not mean that these creatures will be found on other planets, only something similar to them. A flowering plant on another planet might be sticky pads of seeds that open, get caught on a passing creature, and eventually drop off the creature at a different place. A semi-intelligent creature might have five small brains controlling different parts of its body and a larger brain controlling the smaller brains. The referee should remember to create all alien creatures with imagination and common sense.

Lifeform Table

Die Roll	Typical Lifeform Equivalents
1 or less	Single celled bacteria, red algaes
2	Simple sponges, corals, jellyfish
3	Worms, lichen, snails, clams, green algaes
4	Fish, insects, ferns, mosses
5	Lungfish, frongs, Sago palm (not a true palm tree)
6	Lizards, pine trees, snakes, palm trees
7	Dinosaurs, birds, rats, flowering plants
8	Mammals, grasses, oak (and other trees)
9	Apes, chimpanzees, dolphins, whales, primitive man
10+	Intelligent beings (equal to character races)

To use the table, roll 1-10 and add or subtract the planet age modifier. The result will be the general level of development of lifeforms on the planet.

Special Feature Table

Die Roll	Feature
0 or less	Extreme geothermal activity
1	High air pressure
2	Retrograde spin
3	Twin Planet
4	No feature
5	No feature
6	No feature
7	Violent weather
8	Alien artifact
9	Low air pressure
10	Greenhouse effect
11•	Tainted atmosphere

Explanation of results

Extreme geothermal activity: The planet is still quite hot and active. On its surface are volcanos, geyser basins, and fault lines. There is a 5% chance per week that an earthquake will occur in the region of the player characters. These quakes will knock characters off their feet and cause minor damage. The referee should place many active volcanos and geyser basins on the world map.

High air pressure: The air on the planet is denser than Earth normal but still liveable.

Retrograde Spin: The planet rotates in the opposite direction from most planets. The sun will rise in the west and set in the east.

Twin Planet: The planet actually circles another planet and both circle the star. The referee should note the twin planet on the stellar display. Five should be added to the length of the planet's day. The other planet of the twin planet group may or may not be habitable. Roll 1-10; a 1-3 indicates a Minor Planet, a 4-8 is a Terrestrial Planet, and a 9-10 is a Jovian Planet. Determine the size and gravity as a normal planet of the proper type. The length of day will be identical to the first planet.

Violent Weather: Storms and high winds are common on the planet. There is a 50% chance each day, that high winds will prevent any flying movement and will halve ground movement.

Alien Artifact: Something (a city, wrecked spacecraft, etc., of unknown alien construction is found on the planet.

Low Air Pressure: The air is less dense than that of Earth. Characters will require oxygen while on the planet. Characters without oxygen will suffer a small amount of damage every 12 hours (or part thereof).

Greenhouse Effect: The ground is always shrouded by a thick cloud cover, casting it into continual twilight. The temperature of the planet is increased by 15 degrees.

Tainted Atmosphere: Some agent in the air (a pollen, chemical, micro-inscet, etc.,) makes the use of a filter mask required. For every 30 minutes in the atmosphere without a filter mask the character will suffer serious damage.

Technological Stage: If the referee decides or determines that a planet has intelligent creatures, this does not necessarily mean they are equal in technology to the player character races. Instead, the beings are at *some* technological stage. To find their technological stage, roll one die and consult the table below. Each line is divided into four different parts for different areas of technology. These areas are transport, power sources, types of weapons, and information storage. An Earth equivalent for each category is given. The referee, if he chooses to do so, may raise or lower the stage of technology in any of the categories. For example, a 4 is rolled. The referee (because he wants it that way) decides the planet is poor in metals. Therefore, he lowers the Weapon category by two, giving the following combination — sails; water/wind; spear/bow; books/scrolls.

Technological Stage Table

Die Roll	Technological Categories: Transport	Power	Weapons	Data
1	Foot	Muscle	Muscle	Memory
2	Animal	Animal	Spear/bow	Painting/carving
3	wheels/oars	animal	metal weapons	alphabet
4	sails	water/wind	crossbow	books/scrolls
5	steam/airship	steam	gunpowder	printing
6	internal combustion	electric/ gasoline	rapid fire weapons	radio/ television
7	electric	man-made fuel	gases	early computer
8	jet/rocket	fission	nuclear	micro-chip computer
9	interplanetary	fusion	large beam weapon	magnetic bubble
10	Equal to character races			

Settlement Size Table

Adjusted Die Roll	Settlement Size
2-4	10-50 individuals
5-7	10-100 individuals
8-11	100-1000 individuals
12-15	1000-10,000 individuals
16•	More than 10,000 individuals

Settlement Size: To assist the referee in preparing maps of inhabited areas, he may use the above table to find the size of an average settlement on the planet. The result from the table will list the population of an average town on the planet. To use the table, roll 1-10 and add the number of the Technological Stage of the inhabitants.