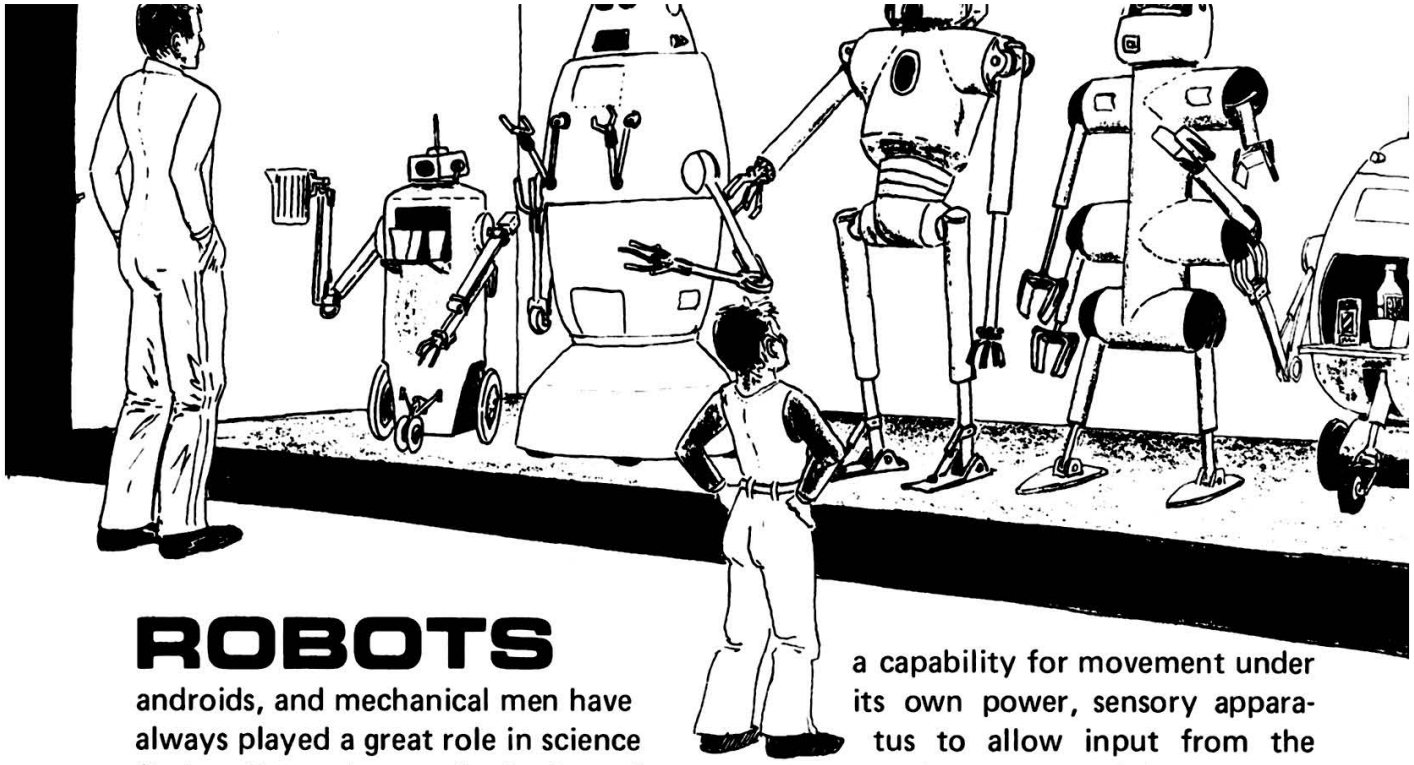


ROBOTS

androids, and mechanical men have always played a great role in science fiction. From the very beginnings of history, people have viewed mechanical, non-human intelligence with a mixture of fear and fascination. From Capek's *R.U.R.* through Asimov's robots and Saberhagen's berserkers (as well as countless others) to the droids of *Star Wars* and Ash of *Alien,* robots have been an integral part of SF literature.

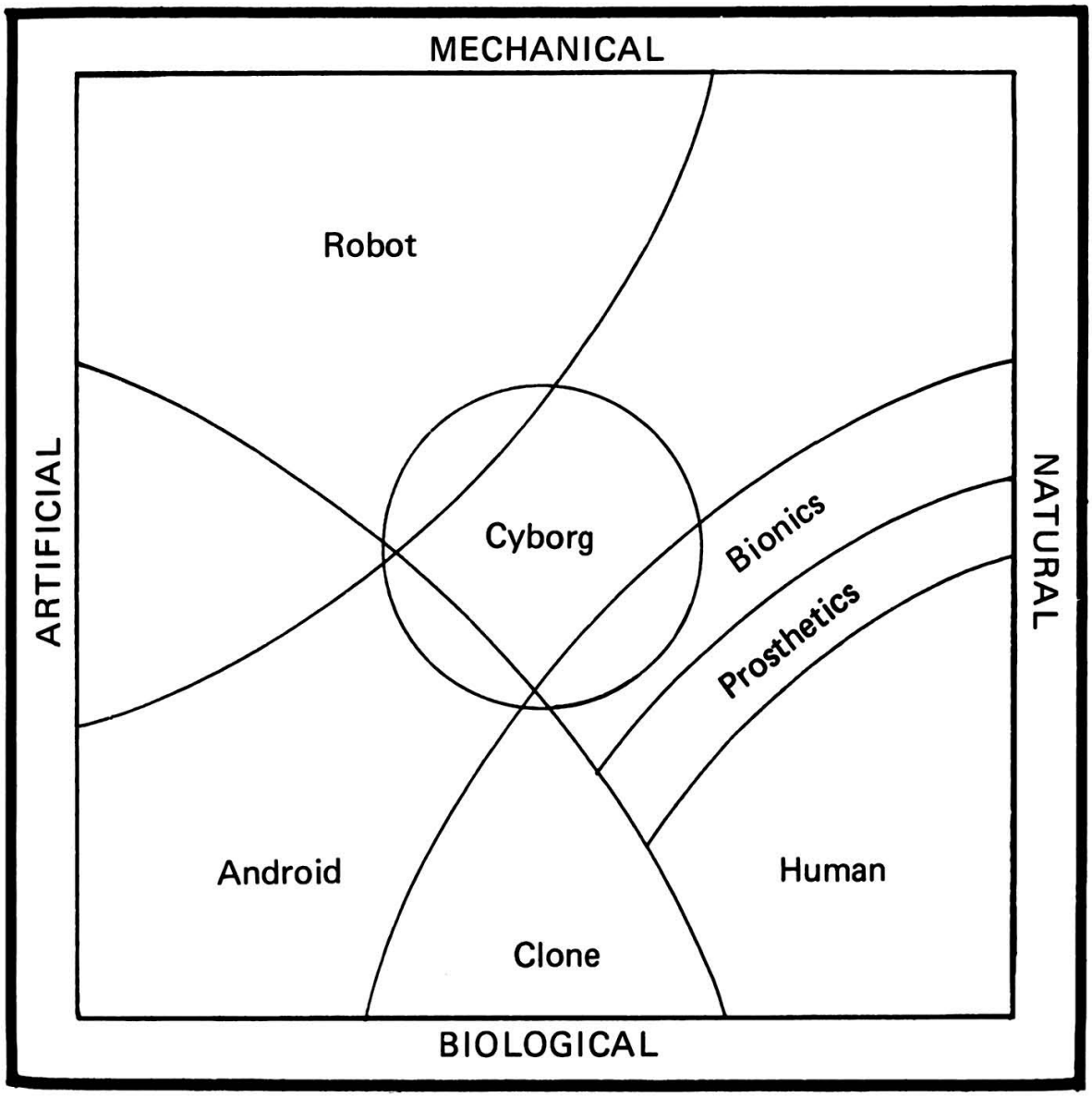
Before addressing the general idea of robots, it is necessary to define exactly what we are talking about. Is a robot a highly-polished, anthropomorphic English butler type like C3-P0, or is it a squat, utilitarian R2 unit? Does a computer-controlled tank qualify as a robot, and what about a smart bomb? What about an assembly-line welding machine? How do you classify an artificial person (perhaps the Frankenstein monster is the best example)? For the purposes of these ref's notes, we consider the requirements for a being, artificial or natural, to be a self-contained machine (in the broadest sense) endowed with artificial intelligence. Subordinate assumptions include a capability for movement under its own power, sensory apparatus to allow input from the environment, and the ability to interpret and act upon information. These assumptions are not necessarily inviolable; some circumstances may arise which call for exceptions.

THE CLASSIFICATION OF BEINGS

The concept of artificial beings dictates a classification system which is based on the natural beings being emulated. This is possible within a two dimensional context, ranging from the natural to the artificial and from the biological to the mechanical. For example, human beings are both natural and biological while the traditional concept of robot is mechanical and artificial.

Figure 1 shows this two-dimensional context, with the ranges for most types of the beings shown. It is important to remember that rarely will a category occupy only a point on the table; many humans are completely natural, but the addition of fillings in teeth, eyeglasses, replacement joints, or artificial nails prompts some shading into the artificial range. Similarly nical replacement of organs with

ref's notes



cloned organs dictates shading from the purely natural toward the artificial.

DEFINITIONS

The following definitions of various beings should provide a framework within which future ref's notes on this subject will build.

Being: A self-aware, self-powered individual with the capacity to sense its environment and react to it. Humans, intelligent aliens, robots, and androids are all beings.

Robot: A mechanically-based artifact manufactured to some set of specifications. A robot may or may not be anthropomorphic. Examples of robots include Robbie from Forbidden Planet and C3-P0 from Star Wars.

Android: A biologically-based being created to a set of specifications for some purpose or duty. Androids exhibit life, in that they are biologically living; their distinction is that they were created, rather than having evolved. Androids generally are incapable of reproduction, and can be identified by close inspection. Some suggestions concerning androids in science fiction include permanent identifying marks such as tattoos or a dyed skin. Ash, from Alien, may be an android.

Clone: A biological copy of an existing being. A clone is a duplicate repro-

duced through the use of technology; alterations in the being's attributes or qualities generally do not occur. The relicts from Jack Vance's novel, *To Live Forever,* are clones used to produce a form of immortality for certain individuals.

Prosthetics: Replacement parts of biological beings. Prosthetics are intended to duplicate ordinary capacity for individuals who have lost organs or limbs through accident or disease.

Bionics: Enhanced replacement parts for biological beings. Unlike prosthetics, bionics provide a function better than the original organ or limb.

Cyborg: A biological individual who has been replaced in great part by mechanical components, usually (although not always) for purposes for which natural attributes will not function. A cyborg may be equipped with a very tough artificial skin, special vision lenses and provision for special energy sources, thus making possible activity in vacuum or under great pressure.

Having laid a groundwork for discussion, we will now examine the construction and purchase of non-player-character robots, and outline some rules for their use in a Traveller campaign.

Specific details of the economic aspects of robots for a particular campaign must be determined by the referee to suit his or her own situation, but here are some suggestions. The minimum tech level at which a robot may be manufactured is 12, and therefore, robots may not be manufactured on planets with tech levels lower than that. As with all items, however, robots may be imported to planets where they cannot be manufactured. The increase in price would depend on individual circumstances. Also, it is possible that used or damaged robots might be available at reduced prices, and "hot" or stolen robots might also be available.

Armed robots and warbots (military models) will naturally be subject to legal restrictions on most planets. The referee should use the law level of a particular planet as a guide here. Additionally, planets might have other restrictions on the use of robots. A planet might restrict importation out of a desire to protect local jobs, out of anti-mechanical paranoia, or for some obscure sociological or religious reason.

CONSTRUCTION

If a player does not wish to purchase a standard model, and if he or she has access to a manufacturer or manufacturer's representative, a robot may be custom built to a player's specifications. The procedure is similar to that for building a starship (see book 2). The player(s) decide what is needed, then run through the construction checklist (given below). This checklist is then presented to the manufacturer, who will produce a robot. The factory will require a down payment of 30%, with the balance payable on delivery. The actual price of the robot is determined by the sum of the cost of its components. Standard models and models which are produced in lots of 100 or more are granted a 25% discount off purchase price due to economies of scale. Other discounts may be available depending on individual circumstances.

BASIC COMPONENTS

A robot requires a brain, a power plant, a frame or chassis to which the other components are attached and which provides some protection to the delicate workings of the robot, a basic sensor package, and some means of

moving from one place to another.

Brain: The brain is the most important component of a robot, and the most difficult to manufacture. A complex sponge-matrix of semi-conducting pseudo-neural pathways, the brain is the center of the robot's "intelligence". There are several models of brain, each progressively more complex and more compact, and each available at a different tech level. The mass, tech level of availability, cost, and power requirements of the types of brains are listed in the appropriate section of the brain table. Brains are very sensitive to shock, extremes of temperature, and excessive radiation. Certain robots come in two or more sections, in order to protect the brain from damage. These robots have a "master" section, which contains the brain and a power plant, and one or more "slave" sections, run from the "master" by remote control.

Chassis: This is the framework to which all other components are attached. In addition, the chassis provides an outer covering which provides protection from outside contaminants such as dust, and from prolonged exposure to hard vacuum conditions, but not from corrosive or insidious atmospheres. The chassis can be constructed to generally resemble a human being (two arms, two legs, torso and head) or can be made almost indistinguishable from a human, at great loss of flexibility and increased cost. This is covered later, in the section called *anthropomorphism.* The chassis section of the components table lists the characteristics of the various types of chassis.

Basic Sensor Package: This includes auditory, visual, and olfactory sensors capable of performance comparable to the human senses. This package is required as a base for all other sensory apparatus.

Power Plant: This is a hydrogen/oxygen fuel-cell capable of thirty days continous operation before refueling is needed. Other types of power plant may be devised at the referee's option. The power requirements of a particular robot may be determined by totalling the power requirements of the robot's components as listed on the components table. A robot may not use components in excess of the rating of its power plant.

Locomotion: Every robot, with rare exception, must be able to get from place to place under its own power. there are four basic types of locomotory apparatus in common use. These are wheels, which take up the least space, and are the most inexpensive, but have limited ability to traverse rough terrain; legs, which are very space consuming, but provide excellent rough terrain capability; tracks, a compromise between expense, speed, and rough terrain capability; and anti-gravity units, which are compact and enable the robot to cross any terrain with ease, but are extremely expensive. The mass, cost, and power requirements of each type of locomotory apparatus for each type of chassis are given on the components table.

ADDITIONAL COMPONENTS

Players will, of course, wish to add additional components to tailor their robot to a specific function. What these components are and what they do are described briefly below.

Arms—

These are sensor or tool equipped extendable limbs, any number of which, (within the mass limits) may be installed on a robot. No arm may carry components with a total mass greater than its rated capacity without damaging itself. The characteristics of all three arms are listed on the components table. There are three types. *continued on p 42*

COMPONENTS TABLE: Part II

Chassis:

Type:	Total Unit Mass (kg):	Chassis Mass (kg):	Cost (100 Cr)
I	50	5	75
II	75	8	95
III	100	10	10
IV	200	20	20
V	400	40	30
VI	1000	100	40
VII	2000	200	50

Power Plants:

Type:	Power Output:	Mass (kg):	Cost (1000 Cr):
A	10	20	.6
B	20	30	.8
C	30	70	1
D	40	150	1.2
E	50	300	1.4
F	70	400	1.5
G	90	500	2

Mass includes fuel for 30 days operation.

Locomotory Apparatus:

Wheels

Chassis Type:	Mass (kg):	Power Requirement:	Cost (1000 Cr):
I	7.5	4	.4
II	12	7	.5
III	15	9	.5
IV	30	16	.6
V	60	30	.7
VI	150	75	.8
VII	300	140	1

Tracks

I	10	5	.5
II	15	8	.6
III	20	10	.8
IV	40	20	1
V	80	40	1.2
VI	200	80	1.4
VII	400	150	1.6

COMPONENTS TABLE: Part I

ITEM:	MASS (kg) (ammo not incl.):	POWER REQUIREMENTS:	COST (1000 Cr):
Armaments:			
Body/Snub Pistol, modified	1	1	.7
Auto-Pistol, modified	2	1	.7
SMG, modified	5	1	.8
Auto-Rifle, modified	5	2	1.5
Laser Carbine, modified	8	5	3
PGMP-12, modified	10*	10	11
PGMP-13, modified	18*	10	70
PGMP-14, modified	27*	15	325
FGMP-14, modified	12*	10	125
FGMP-15, modifed	30*	15	450
LAG, modified	4	3	820
Lt MG, modified	60	2	1.4
Auto Grenade Launcher, modified	7	2	1
RAM Grenade Launcher, modified	7	2	1
**These weapons may only be installed on chassis types VI and VII.*			
Sensors:			
Basic Sensor Package	2	1	.2
Enhanced Night Vision	1	1	.2
Passive IR	1	1	.2
Active IR	2	2	.3
Passive Ultra-Violet	1	1	.2
Active Ultra-Violet	2	2	.3
Subsonic Audio	1	1	.2
Ultrasonic Audio	1	1	.2
Telescopic Visual	2	1	.2
Low level Audio	1	1	.2
Communications:			
Standard Freq Radio	1	1	.1
Multi-Freg Radio	1	1	.2
Counter ECM package	2	2	.3
Televisual Camera	3	4	.2
Voder/Vocorder	1	2	.2
Remote "Master" unit	2	3	.4
Remote "Slave" unit	2	2	.2
Work Arms:			
Light	10	2	.5
Medium	20	5	.7
Heavy	50	10	1
Work arms may support up to two times their mass in installed components.			

COMPONENTS TABLE: Part III

Locomotory Apparatus (cont.):

Chassis Type:	Mass (kg):	Power Requirement:	Cost (1000 Cr):
	Legs		
I	15	8	.6
II	23	12	.8
III	30	20	1
IV	60	28	1.2
V	120	60	1.4
VI	300	90	1.6
VII	600	200	2
	Anti-Gravity Units		
I	6	10	1
II	10	15	1.5
III	12	25	1.75
IV	25	35	2
V	50	75	2.2
VI	120	100	2.4
VII	250	250	2.5

Brains:

Tech Level:	Programming Capacity:	Mass (kg):	Cost (1000 Cr):
12	2	8	100
14	3	6	500
15	5	4	1000
16	7	3	2000

Light Arm: The light arm is approximately one meter in length, and is usually equipped with a manipulatory device duplicating the human hand. This eliminates the need for a "swiss army knife" contraption on the end of the arm and permits the robot to use tools shaped for human hands.

Medium Arm: The medium arm may carry a "hand" similar to the one used above, or may be fitted with one of the other components listed below.

Heavy Arm: The heavy arm has the same general characteristics as the light and medium arm, but has a greater capacity.

Sensors—

Enhanced Night Vision: This apparatus permits the robot to see in all lighting conditions but the complete absence of light.

Passive IR: This unit permits the robot to see by detecting naturally present IR radiation. It does not project infrared.

Active IR: This unit acts as does the passive unit, but emits IR radiation, like a searchlight. This unit has a greater range, but can be detected by other IR sensors very easily.

Active and Passive UV: These units act as the IR units mentioned above but

using ultraviolet rather than infrared radiation.

Subsonic Audio: This unit detects sounds too low in frequency for the human ear.

Ultrasonic Audio: This unit detects sounds too high in frequency for the human ear.

Telescopic Visual: This unit enhances the robot's vision in the visual spectrum, acting as binoculars.

Low Level Audio: This unit detects sounds too faint in volume for the unaided human ear.

Communications—

Standard Frequency Radio: A single channel radio unit, for inter-robot and robot/human communication.

Multi-frequency Radio: A multi-channel radio for inter-robot and robot/human communication.

Counter ECM: Equipment to counteract jamming of radio communications.

Televisual Camera: A unit for the transmission of information from the robot's visual sensors to a reception unit elsewhere.

Voder/Vocorder: A device for the conversion of speech to electronic impulses which a robot can understand and vice-versa. This permits robots and humans to converse.

Remote Control Unit: This equipment comes in two parts, the "master" unit and the "slave" unit. This equipment permits a robot engaged in a hazardous occupation (fire-fighting or military activities) to do so at a reduced risk to the robot's brain. This arrangement requires at least two chassis and two or more power plants.

Armament—

The weapons listed in the components table represent versions specially modified for use in robots. The weapons include provision for increased ammunition supply, ventilation and cooling where required and links to sensors for aiming and firing the weapon. If a robot is equipped with the proper manipulative appendages, it may reload itself also. Normal visual sensors are adequate for aiming and firing, but enhancement may be desirable in some conditions.

Next, we will outline some rules for using robots in a Traveller campaign. Please bear in mind that these are only suggestions, and are not meant to be exhaustive. Individual referees should feel free to modify or add to these rules as they see fit.

GENERAL NOTES

Robots should be treated as non-player-characters by the referee. While they are intelligent and capable of some independent action, they are limited by their programming in the actions they may take. Referees might find it convenient to consider them to be about the same mental caliber as an anthropoid ape (chimpanzees, gorillas, etc.).

Robots are used by some societies in jobs that are considered too dangerous, too demeaning, or too tedious for human beings. In addition, although they are initially somewhat expensive, robots are usually cheaper than humans in the long run. A starship captain, wishing to save on crew salaries and staterooms, might purchase a robot to act as a steward or even as a pilot or navigator. A military base on a planet far removed from the trade lanes and not likely to be attacked for years (but vital nonetheless) might be manned by robots. An outpost on a planet with an environment in which humans could not operate efficiently might be staffed by robots. Other jobs that robots might fill include fire fighting, mining, exploration and surveying, maintenance, and service (valet, butler, etc.).

PROGRAMMING

The various actions a robot performs are controlled by the instructions which it is given. These instructions are called programs, and the process of instructing a robot in a given task is called programming.

A program tells the robot all it needs to know to perform a single job. Since some jobs are more complex than others, some programs are longer than others. The total number of programs a robot can "know" at any one time is governed by the capacity of its brain. Each brain has a maximum capacity for storage and use of programs (called programming capacity). Each program is given a size quantification on the program tables. A robot may contain any number of programs as long as total size of the programs does not exceed the program capacity.

A robot has access to all programs in its brain at all times, and may use any or all of them simultaneously, as long as the two do not actually interfere with each other.

The programs table lists a number of representative programs, their sizes, and the costs to purchase them initially or to have a robot reprogrammed with them, and any equipment necessary to do the job for which the program is intended.

The descriptions below give the minimum equipment requirements for a given program. Other equipment may be added if desired.

Referees will undoubtedly wish to devise programs of their own. The following definitions and descriptions will serve as a guide.

The following programs duplicate skills found in Traveller book 1.The basic program is equal to the first level of a particular skill (i.e. pilot-1, and so on). Additional levels of skill may be added at additional cost and increased space. Details are given under the add'l level columns of the programs table.

Pilot: Permits the robot to function as a pilot, as per book 1, p. 19. Requires two light work arms or direct interface with controls.

Navigator: Permits the robot to function as a navigator per book 1, p. 19. Requires two light work arms or direct interface with controls.

Steward: Permits the robot to function as a steward per book 1, p. 19. Requires one light work arm (two preferred) and voder/vocorder.

Medical: Permits the robot to act as a medic, per book 1, p. 20. Two light work arms are required.

Air/raft: Permits the robot to operate an air/raft, per book 1, p. 16. Requires two light work arms or direct interface.

Ship's Boat: Permits the robot to operate a ship's boat per book 1, p. 17. Requires two light work arms or direct interface.

ATV and AFV: Permits the robot to operate either an ATV or an AFV per book 1, p. 17. Requires one light work arm or direct interface.

Gunnery: Permits the robot to act as a starship gunner per book 1, p. 19. Requires two light work arms or direct interface.

Electrical: Permits the robot to operate, maintain and repair electronic devices per book 1, p. 18. Requires two light work arms and proper tools.

Mechanical: Permits the robot to operate, maintain and repair mechanical devices per book 1, p. 18. Requires two light work arms and proper tools.

Engineering: Permits the robot to operate and repair jump and maneuver drives and to operate, maintain, and repair starship power plants per book 1, p. 20. This program requires two light work arms and the proper tools.

The remaining programs do not duplicate any particular skill, but are job programs. They cannot be added to or expanded in any way.

General Vehicle: Permits the robot to operate most classes of land vehicle (such as AFV, ATV, automobile, etc). This does not include primitive or specialized vehicles. Requires two light work arms or direct interface.

Valet: Permits the robot to act as a body servant, laying out clothes, cooking, running errands, and so on. Requires two light work arms and general human shape.

Weapon Handling: Permits the robot to operate and maintain any weapon, similar to Gun Combat skill in Mercenary. Restricted to one type of weapon. Light work arm optional if weapon is installed.

General Weapon Handling: As above, but not restricted to one weapon. Requires at least one light work arm.

Zero-G Movement: Permits the robot to move in zero or low gravity conditions by using handholds, thrusters, and so on. Zero-G movement package useful, but not required.

Minimum Security: Permits the robot to act as a security guard for minimum security installations. The robot will patrol a specified area at irregular intervals and report any unauthorized personnel or extra-ordinary events such as fire, etc. Weapon and enhanced vision equipment are advantageous, but not required.

Medium Security: As minimum security, but the robot will detain any unauthorized personnel entering a specified area. Weaponry and enhanced vision are required.

Maximum Security: As medium security, but the robot will fire on unauthorized personnel entering a specified area. Weaponry and enhanced vision are required.

Ground Combat, Infantry: Gives the robot the rudiments of ground combat, permitting it to act as an infantryman. Weapon required, enhanced vision is advantagous.

Ground Combat, Armored: As above, but the robot is acquainted with armored and vehicular combat. This program includes AFV skill. Weapon optional but two light work arms or direct interface required.

Fire-fighting/Rescue: This program permits the robot to battle all forms of conflagration, to rescue humans from disasters, and to administer rudimentary first aid. One light and one medium work arm are required.

Cargo Handling: Permits the robot to load and unload space ships, starships, helicopters, boats, and other air and ground vehicles. Medium or heavy work arms are required depending upon the exact nature of the tasks.

The above list should not be taken as comprehensive. Other programs are certainly possible. The referee should use the above descriptions as a guide in formulating any new programs or changes in old ones.

ROBOT'S RULES OF ORDER

What follows is a quick rundown on using robots in Traveller. Most of the specifics are left up to the individual referee. He or she should decide the role that robots are to play in his or her personal universe.

Movement: The movement ability of a robot depends upon the mass and the type of locomotory apparatus of the individual robot. The movement table gives the maximum speed over various terrain types for wheels, tracks, and a/g units. Leg equipped robots of chassis I through V move at the same rate as humans and are subject to the same restrictions (see book 1, pp. 28-29).

Leg equipped robots of chassis types VI through VII move at half human speed, and are prohibited from rough terrain and areas such as swamps or bogs (due to their high ground pressure, they become mired down more readily than those equipped with tracks or wheels). Wheeled robots, tracked robots, and a/g robots should be thought of as AFV's, ATV's, and air/rafts respectively, as an aid in determining how terrain and other factors affect their movement.

For the purposes of *Snapshot,* consider robots to have 20 action points. Other restrictions will have to be decided upon depending on the size and nature of the robot.

Combat: Unless specially armored, robots are as easily damaged as humans by combat. Combat involving robots should be adjudicated as per book 1, but with the following modifications:

The basic throw to hit is the same for robots as for humans. This throw should be modified according to the robot's size and other factors.

A robot is considered to be armored as if it were a human wearing cloth. After determining that the robot was hit and the total points of damage done, the referee should determine what portion of the robot was hit. To do this, roll two six-sided dice, and compare the results with the following:

2 = Brain
3-4 = Locomotory App.
5-6 = Work arms, if present, otherwise locomotory apparatus
7-9 = Power Plant
10 = Weapons, if present, otherwise power plant
11 = Sensors
12 = Commo Gear

If a brain receives damage points, it is destroyed, and the robot ceases to function.

If a locomotory apparatus takes damage, the extent of the damage will vary with the size of the unit. Consult the table below.

If commo gear or sensors take damage, divide the damage points among all components in that classification. If a particular piece of equipment takes one point or less of damage, it is reduced to 50% effeciency (what this means in game terms is up to the referee to decide). If it takes more than one point damage, it is reduced to 10% effeciency. If it takes two or more points damage, it is destroyed.

If a power plant takes one hit per 5

DAMAGE TO LOCOMOTORY APPARATUS

Type:			*Points of damage inflicted:*
Wheels I-III	2-4	5-8	9+
Wheels IV-V	3-5	6-9	10+
Wheels VI-VII	4-6	7-10	11+
Legs I-III	1-3	4-7	8+
Legs IV-V	2-4	5-8	8+
Legs VI-VII	3-5	6-9	10+
Tracks I-III	3-5	6-9	10+
Tracks IV-V	4-6	7-10	11+
Tracks VI-VII	5-7	8-11	12+
A/G I-III	1	2-5	6+
A/G IV-V	2	3-6	7+
A/G VI-VII	3	4-7	8+
	-50% speed	*-75% speed*	*Loc. app. destroyed*

kilograms of its mass, its power output is reduced to 50%. If it takes three hits per 5 kilograms of its mass, it is reduced to 10%. Four hits per 5 kilograms destroys the power plant. Each time a power plant is hit, there is a chance that it will explode, destroying the robot. Roll 2D for 11+ each time a power plant is hit.

A work arm is reduced to 50% lifting capacity when it takes 3 points of damage if light, 6 points if medium, and 9

PROGRAMS

	BASIC LEVEL		ADD'L LEVEL	
Programs:	*Space:*	*Cost:*	*Space:*	*Cost:*
Pilot	2	5	.4	1
Navigator	2	5	.4	1
Steward	1	3	.2	1
Medical	2	5	.5	1
Air/raft	1	4	.4	1
Ship's Boat	1	4	.4	1
ATV & AFV	.7	3	.4	1
Gunnery	1	4	.3	1
Electrical	1	4	.2	1
Mechanical	1	4	.2	1
Engineering	2	4	.4	1
General Vehicle	2	4	–	–
Valet	1	3	–	–
Weapon Handling	.5	3	–	–
General Weapon Handling	1	4	–	–
Zero-G Movement	.5	2	–	–
Minimum Security	1	2	–	–
Medium Security	2	3	–	–
Maximum Security	2.7	3	–	–
Ground Combat, Infantry	2.5	4	–	–
Ground Combat, Armor	3	5	–	–
Fire-fighting/Rescue	2	2	–	–
Cargo Handling	1	2	–	–

Cost is in 100 credits

MOVEMENT (kms/hour)

		Terrain Type		
Chassis Type:	*Road:*	*Cross-country:*	*Rough:*	*Mountainous:*
Wheels I-II	150	75	40	20
Wheels III-V	120	50	20	10
Wheels VI-VII	100	30	10	prohibited
Tracks I-III	75	40	40	30
Tracks IV-V	50	20	30	10
Tracks VI-VII	40	15	20	5
A/G I-VII	200	200	200	200

Terrain equivalents (see book 3, p 26)

Cross Country = clear, desert, plains, beach, shore.

Rough = hills, foothills, forest, woods, jungle, rainforest, swamp, marsh.

points if heavy. It is reduced to 10% lift if it takes 6, 9, and 12 points respectively. Any further points destroy the arm.

Other aspects of combat must be worked out by the referee.

Maintenance: All robots require maintenance twice per year. This must be done on a planet of at least Tech level 12. Maintenance costs Cr500 plus the cost of any replacement parts needed. Damaged parts may be repaired at a cost of one-half original purchase price.

Additional Components: The following additional components are available:

Armor: A robot may be equipped with the equivalent of reflec armor at a cost of Cr100 per 100 kg total mass, at no additional mass. A robot may be equipped with the equivalent of battle dress at a cost of Cr500 per 100 kg of total mass. Uparmoring in this way increases the weight of the chassis by four, and must be done when first built.

Zero-G Movement Package: A set of gas-operated maneuver thrusters and magnets which permits a robot to operate in a zero gravity environment.

Direct Instrument Interface: The robot's circuits are connected to the control circuits of a ship or vehicle. Both the robot and the vehicle must be prepared ahead of time, at a cost of Cr1500 per ship or vehicle. A player with mechanical expertise can make the necessary connections with the needed components costing Cr750. The interface may be broken or reconnected at any time. This arrangement has the advantage of faster information transfer (and thus, reaction time), giving the robot a better chance to avoid mishaps.

ANTHROPOMORPHISM

Robots can be made to generally resemble humans in shape (two arms, two legs, head, torso, etc.). This is usually done when the robot is to spend a great deal of time amongst humans, or where it must use human tools and furniture. At increased expense and loss of flexibility, robots can be built to be almost indistinguishable from humans.

There are, of course, restrictions:

—The robot must be built on chassis types I, II, or III and no others, using legs for locomotion.

— It may incorporate internally no weapon other than a body/snub pistol, at twice normal cost. This weapon may be concealed only in the hand or chest.

— It must allocate 10% of the total unit mass available to smooth contours and external covering.

— Chassis, brain, and power plant costs are doubled for such robots.

Referees will have to devise their own rules to cover such creations.

FINAL NOTES

After the publication of the Robots articles, reader Terry Scofield wrote to suggest the following rules changes:

"Any size power plant may be built, (within reason) to fit individual needs, at a 20% greater expense than for standard models. The table below was designed assuming that power output equals mass and that the cost equals the cube root of the quantity output times Cr500 (plus 20% for non-standard).

Plant Output & Mass:	*Cost (Cr1000):*
5	0.85
10	1.08
15	1.23
20	1.36
25	1.46
30	1.55
40	1.71
75	2.11

Another change we suggest is to try making the light work arm 5 kg instead of 10. Other arms are unchanged.