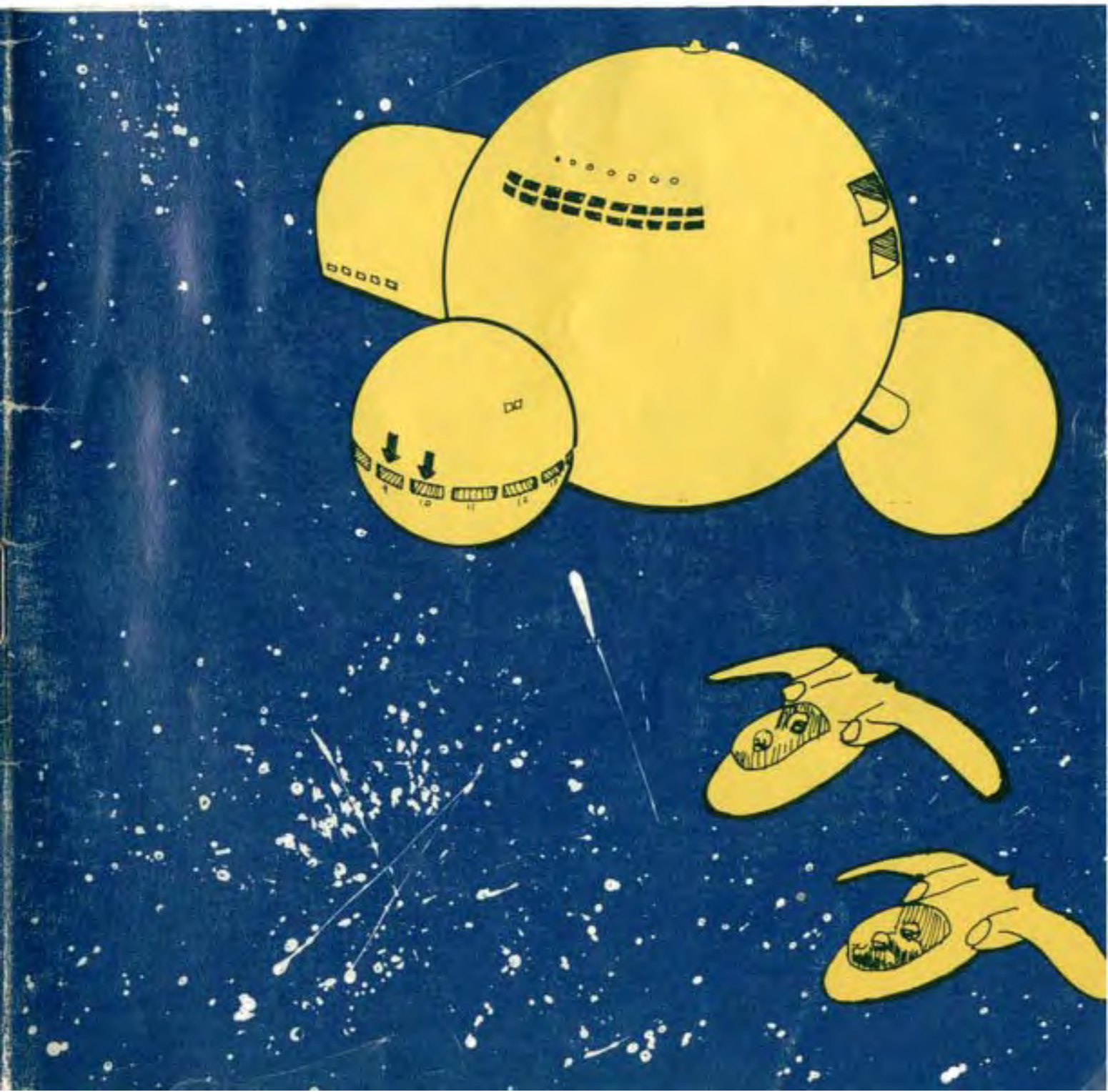
COMPUTER GAMES THINKERS PLAY

EDYX

INVASION ORION



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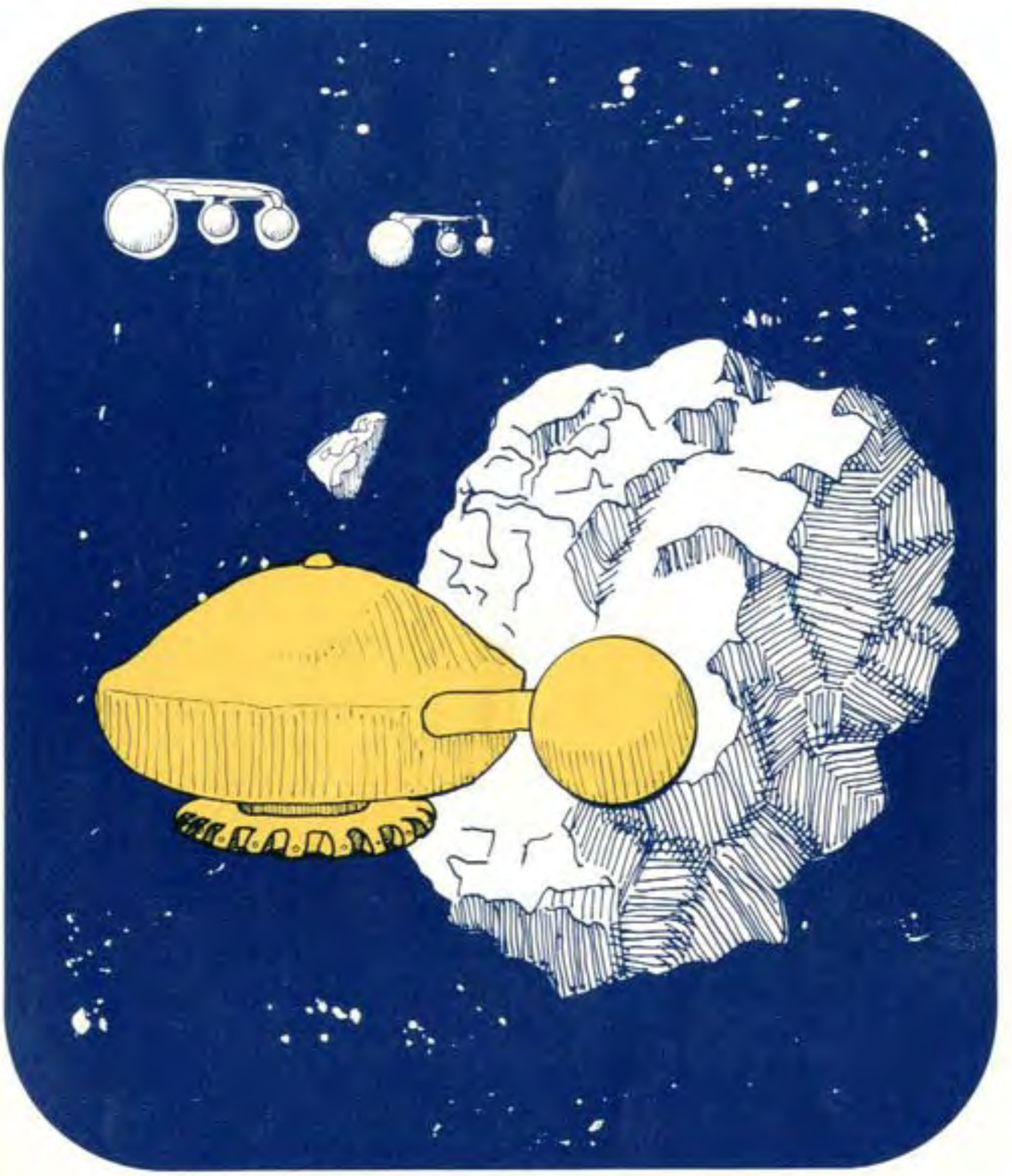

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1.0 INTRODUCTION

The human settlements in the constellation of Orion are threatened by an inimical force. INVASION ORION will provide you with many enjoyable hours of starfleet command while you fend off the Klaatu hordes. This Battle Manual, together with the ship control pad and the disk or cassette program, turns your computer into a command console. While you maneuver your starships, the computer (or a combative compatriot) will move its units in an attempt to destroy you.

We think you'll find the computer a challenging and enjoyable opponent. Although the scenarios in INVASION ORION have been specifically designed for play against the computer, you can, if you prefer, let the computer referee a contest between you and another person. (See Sections 3.0 and 3.5 and the notes following each scenario.)

To familiarize yourself with the ORION game system, read through the rules, Section 2 of this manual, and try Scenario #1 or #2 (both of which are on the enclosed cassette or disk). You'll find you can learn the mechanics of play quite rapidly. There are ten scenarios in all, each explained in detail and prefaced with fictional introductions in Section 3. You can construct the data files for the remaining eight scenarios (which are already on disk but not cassette versions) and others of your own devising using the scenario builder program. (See Section 2.9.)

For those of you interested in how the computer plays its side, the decision models used are discussed in Section 4.

Have fun, and good shooting!

2.0 RULES AND INSTRUCTIONS

2.1 PLAYING THE GAME (THE SPACE BATTLE PROGRAM)

To begin play, you must load the program and data files into your computer. Refer to the separate instruction sheet for details appropriate to your machine.

When the computer asks you for the scenario you want to play, type the name (without quotes) and ENTER. The computer then asks whether you want it to play Side 1, Side 2, or neither (if you prefer a human opponent). If you assign the computer to one side, you will get the other, and the computer will ask whether you want it to play as a beginning, intermediate, or expert player. (Human players don't give you a choice.)

If you have the cassette version, rewind and remove the cassette after the ships appear on the screen.

You are now ready to play INVASION ORION.

2.2 BASIC DESCRIPTION

INVASION ORION Is a hypothetical simulation of the various kinds of conflicts that might arise between starships of opposing powers sometime in the far future. The playing surface, represented on the computer screen, is an invisible matrix 34 spaces high and 62 spaces wide (about 20 spaces high and 40 spaces wide for the PET and Atari). All calculations of distance (for movement of ships, firing of missiles, beam effectiveness, etc.) are based on this "grid." Ships which move out of this area become, henceforth, out of play for the rest of the game; they are considered to have evaded pursuit, escaped detection, reached safety, whatever. The third dimension is present only to the degree that any number of ships may occupy the same space without crashing or causing other mishaps.

The output of each ship's power plant is rated in Energy points; these constitute the ship's energy "income" for each turn. The strengths and capabilities of every ship's Drive engines and weapon systems have been similarly quantified. Generally, it takes one Energy point to activate or "energize" one point of a system. Conversely, no system can use more Energy points than its maximum rating would indicate. Thus, a ship with 10 Energy points and a (nominal) Beam of 5 could allocate 3 Energy points to the Beam and produce an actual projected 3-point Beam; a full-strength Beam would cost 5 Energy points, which is the most that particular system could possibly utilize. The computer, of course, keeps track of these capabilities, displays them at your command, and prevents errors in their use.

2.3 SUMMARY OF PLAY

Although movement and combat for both sides are resolved simultaneously, instructions for your ships are entered separately and individually, and play is divided into distinct turns. On each turn, you decide how to use the energy available to each of your ships (allocating some energy points to Drive, to move the ship; some points to the various weapons systems available; and some to the Shield to protect the ship from enemy fire) and enter these data/decisions into the computer. You may have any or all of your ships perform any action or series of actions of which they are capable. The only constraints are the amounts of energy available from each ship's power plant and the capacities of the individual ship systems to utilize that energy. Energy cannot be saved up from turn to turn nor transferred from ship to ship. However, like most of its systems, a ship's Energy "renews itself" (less any damage it has sustained) each turn. On the other hand, when a ship has launched its supply of missiles and torpedos, it must do without for the rest of the game. Few ships are identical, and any ship's capabilities are reduced by damage. With the tactical situation constantly changing, choosing when to move "full speed," when to attack with maximum beam and multiple missiles, and when to divert energy to the Shield for protection is a constant challenge every time you play.

In the two-player game, you and your friend should alternate entering your orders into the computer; whoever is not at the keyboard should be comfortably ensconced somewhere *out of sight* of the screen. (And no peeking, or the Curse of Greyface will be upon you!) When the first player has finished, typing N (for "NEXT PLAYER") will prepare the computer to accept the other's orders. Since the computer expects whoever plays second on one turn to go **first** the next turn, and since it is undesirable for one player to go last all the time, anyway, be kind to the machine (and each other) and alternate entering orders first. (The poor thing is only a tiny chip of silicon at heart and is even more easily confused by human behavior than you are.)

After all human players have entered any orders they wish to give, rendezvous at the computer and type M (for "MOVE"). (In the one-player version, if you have entered the orders for **all** ships/planets/asteroids on your side, the computer is bright enough to notice, and you won't need to type M.) In either case, the computer then proceeds to calculate its move (if it is controlling one side), process the data, clear the screen, and display the ships in their new (post-movement) positions. All ships that are hit by enemy beams (regardless of the actual damage inflicted) will flicker. Asterisks indicate missile explosions and a moving dot shows the track of torpedos. Any ships that have been destroyed by the attacks during the round explode and vanish from the screen. That is the end of the turn.

Play continues until you or the computer have accomplished the objective defined for the scenario and/or all the ships on one side have been destroyed or disabled.

2.4 COMBAT RESOLUTION

At the end of every turn, after determining whether the various beams have actually hit the ships they were aimed at, the computer subtracts the Armor factor of the defending ship(s) from each individual attack upon it, then adds up the points of damage in excess of the Armor factor scored against the ship by beams, missiles, and torpedo hits, subtracts from this adjusted gross total any energy points the defending ship had allocated to its shield on that turn, and randomly distributes any remaining (net) damage points among the ship's various systems. This damage, if any, will reduce the number of points usable by the systems in subsequent turns. Any system reduced to zero is disabled and cannot be utilized again. Whenever damage causes the Energy level of a ship to fall below zero the ship blows up. It cases other than total destruction, you cannot tell the nature and extent of the damage to the computer's ships. The condition of enemy ships can only be inferred by their behavior (e.g., how far they move, or how much damage their Beam is still inflicting on your ship).

Table 1. Basic Commands for INVASION ORION

Command	Response	Entry	Use
C	—	—	Clears bottom lines of screen
S	Ship?	Any ship number on your side.	Displays the current status of the ship indicated. Includes energy, drive, beam, shield, launchers, missiles, and torpedos
O	Ship?	Any ship on your side for which orders have not been entered.	Allows you to tell your ships what to do for the turn. See Table 2.
N	—	—	Prompts the computer to accept orders from the second player (*two-player games only*)
M	—	—	Executes all orders for the current turn. An interim display shows the results of the action.
W	Do you want to save the current game?	Yes	Saves a game so that you can continue it later where you left off.
		No	Returns to command level without saving the game situation on tape or disk.

2.5 THE COMMANDS

There are five or six basic Commands involved in play (see Table 1). The tactical display—the positions of the ships on the screen—remains visible during all Commands, except, of course, that M causes those positions to change. IMPORTANT: None of these Commands can be followed by a carriage return. Type only the letter.

Table 2. Order Subcommands in INVASION ORION

Prompt	What you enter
X MOVE (-LEFT) MASS = .81 ?	Enter the number of spaces you want to move in the horizontal direction. To move left, enter a negative number. The Mass is the mass of your ship. Enter 0 for no move.
Y MOVE (-DOWN)	Enter the number of spaces you want the ship to move up or down.
TRACTOR, MAX = (#) ?	Enter how many points you want to apply to the first tractor beam. You must have sufficient drive and energy points left. You indicate a pressor beam by entering a negative number.
ENERGY LEFT = (#) BEAM ?	Enter the number of points of beam to be applied. (Energy always indicates remaining points of energy.)
TARGET ?	Enter the number of the target ship (1-9, or A-I).
ENERGY LEFT = (#) SHIELD ?	Enter the number of energy points you want to allocate to your shield.
ENERGY LEFT = (#) MISSILES	Enter the number of missiles you want to launch. Each missile uses one launch tube. These launchers are the same used to launch torpedos.
X(-LEFT) ? Y(-DOWN) ?	Enter the X and then Y displacement of each missile launched. This question is repeated for each independently.
TORPEDO DIRECTION	Enter the *direction* in which you want to launch the torpedo. See Figure 2, Section 2.6.6.
ANY PROMPT	R- tells the computer to give you the range to another ship. When done you will resume entering your orders where you left off.
RANGE TO ?	Ship letter or number of the ship you want the range to.
X:(#)Y:(#)RANGE:#-OK ?	Gives X distance, Y distance, and actual range to the other ship. You will automatically return to your command after a few seconds. Enter R again to find range to a second ship.

2.6 STARSHIP ORDERS

The most important Command is O. Orders—your decisions for the turn—are the heart of the game. You may give orders to all of your ships each and every turn. You may move any or all of them and you may have each use any or all of the weapon systems available to them. But the computer will only let you enter orders for your own ships. Typing the letter O initiates a string of Subcommand queries that must be finished before any other Commands or orders for any other ship can be given. These subcommands are shown in table 2. If you enter the wrong thing, you will get one of the messages in table 3.

Remember that while there is no Subcommand for Energy, the energy points available to a ship each turn determines what it can do; each action ordered—a move or a weapon system activation—represents an allocation of energy. When all the Energy possible for the turn has been expended by a ship, that ship can do nothing else until the following turn. Similarly, if your ship does not possess, for instance, a Shield, the computer will not query you about the missing system.

Table 3. Error Messages You May Encounter During Play of INVASION ORION

Message	Meaning	What You Must Do
ENERGY SHORT	You tried to do something that needed more energy than you had left.	Re-enter your last subcommand, but be less ambitious.
DRIVE SHORT	You tried to do something that needed more drive than you had left.	Re-enter your last subcommand, but be less ambitious.
TOO MUCH BEAM	You tried to use more beam strength than you have.	Re-enter the order for your beam, but with fewer points allocated.
TOO MUCH SHIELD	You tried to put up more shield than you have.	Re-enter your shield with fewer points.
NO LAUNCH TUBES	You tried to launch more missiles than you have launch tubes.	Re-enter the number of missiles to be fired, but fire fewer.
TOO FAR	You tried to fire a missile farther than it could go.	Re-enter the X and Y displacements with a total displacement less than the maximum range for your missiles.
TOO MANY MISSILES	More than 35 missiles have been fired on the current turn.	You will be unable to fire any more missiles on the current turn. This is a highly unlikely occurrence.

2.6.1 Movement: Mass gives you the relative mass of the ship, which allows you to calculate how far you can move. Dividing the relative Mass into 1 gives you the number of spaces (which may be a fraction) you can move for each Energy point you expend. Dividing the relative Mass into your current Drive level gives you the number of spaces you can move at "full speed" for the turn. (A ship with a Mass of 1 could move one space for each point of energy allocated to its Drive engines; a Drive capacity of 6 would allow that ship to move a maximum of six spaces at a cost of 6 Energy points.)

With sufficient Energy and Drive, you can move in both dimensions on the same turn. In fact you can move anywhere within a circle whose radius is your maximum one-dimensional move. See figure 1. For rough calculations, a "diagonal" move requires almost one-and-a-half times the energy of a one-space move horizontally or vertically. Thus, a move of three spaces in either single direction costs about the same as moving two spaces in both (i.e., "diagonally"). A 5-space move in one direction costs exactly the same as a combined move of 3 in one dimension and 4 in the other. (If you can recall your plane geometry, you may recognize the Pythagorean theorem lurking in there; if not, the approximation above will serve reasonably well.)

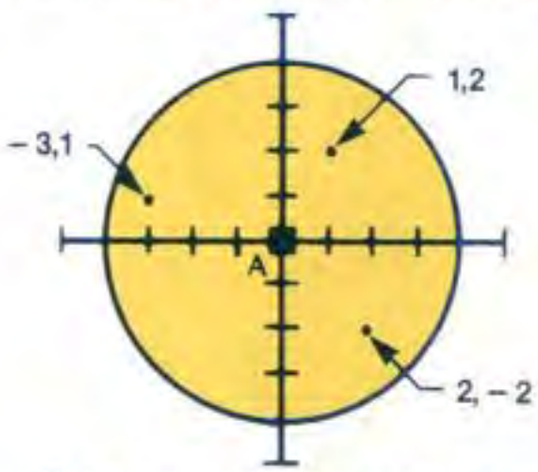

Figure 1. Potential move: For a ship starting at point A, with a maximum move of 4. Such a ship could move 1 in X and 2 in Y, – 3 in x and 1 in Y,2 in X and – 2 in Y, or anywhere within the circle.

If you attempt to move off the screen, the computer will give you a chance to change your move before taking you out of play. The message, "ENTER Y FOR ESCAPE" appears. To redo your move, enter anything but Y. If you enter Y, that ship goes out of play for the remainder of the game.

2.6.2 Tractor Beams: The Tractor Beam allows you to pull other objects directly toward you, or as a pressor beam, push them directly away from you.

There are a number of points to remember concerning the Tractor Beam:

1. Since it uses the Drive engines, you can't move at "full speed" and use the Tractor in the same turn.
2. On the other hand, if you have the necessary Drive capacity and the available energy points, you may use the Tractor to affect more than one ship; further, you may push some and pull others.
3. Since the Tractor/Pressor Beam causes no direct damage to the "target" ship, it may be used against a friendly ship as well as one of the computer's.
4. You can't use a Pressor Beam against a ship in the same space as the ship you're ordering; the computer has no way of knowing in what direction to push it. However, if the target ship is friendly, you can move that ship first, in the direction you want it to go, and then use a Pressor Beam from another ship to "give it a boost."

5. Since you are effectively substituting the ordered ship's Drive for the target ship's, the Tractor/Pressor Beam is most effective when used by a large ship on a much smaller one. The more points you apply to a Tractor Beam, the more spaces it will move the target ship. Conversely, the farther away the target ship is, the less effective will be the Tractor's pull.
6. IMPORTANT: Unlike the weapon systems, the Tractor Beam applies to the positions of the ships as of the moment its orders are entered.

The use of Tractor/Pressor Beams is not recommended until you become familiar with the mechanics of movement; for this reason, several of the introductory-level scenarios omit them. The computer never uses Tractor/Pressor Beams.

2.6.3 Beam: The Beam is one of your ship's primary offensive weapons; it is much like Captain Kirk's phasers or Luke Skywalker's lasers. The more Energy points you allocate to Beam, the more damage it will do to the target ship if it hits. The closer you are to your target, the better the chances of hitting it, and the more damage your Beam will do: at extremely close range—less than five spaces away—the Beam will do *more* points of damage than the Energy points allocated to it; at long range, the Beam will do fewer points of damage than its basic allotment. Also, the bigger the target and/or the higher the Beam Quality (a variable specified in the scenario description), the more likely it is that the Beam will hit.

2.6.4 Shield: The Shield is a defensive force field that absorbs damage from enemy beam, missile, and torpedo attacks. Every point of energy you allocate to the Shield subtracts one point of damage from the total you would otherwise sustain.

2.6.5 Missiles: A Missile causes an explosion at its ordered point of impact that will cause damage to any ship occupying that space and, a lesser amount of damage to all ships in adjacent spaces. (The amount of damage is specified when the scenario is created; for instance, a direct hit by a missile may cause 10 points of damage, while a near miss may produce 4 points.) You may launch more than one missile; however, you may not launch more missiles than you have functioning Launch Tubes or energy to activate them. Regardless of the Mass of the ship, it takes one energy point to activate one Launch Tube and fire one missile.

Missiles move in much the same way as ships, X = 10,Y = 5 will cause a missile to explode ten spaces to the right and five spaces above the position of the ship *after its move* (so don't forget to take the ship's own movement into account). X = 6,Y = 3 will cause a Missile to explode six spaces to the right and three spaces below the ship's position. Don't forget that the first number you type is the horizontal (right and left) dimension; the second number is the vertical (up and down) dimension. Note that the position displayed for missiles is only approximate. A missile at any of three different points will appear in the same place (for display purposes only).

Missiles have a range specified when the scenario is created, usually 15 spaces; provided you have at least one Energy point available to launch a missile in the first place, this range is independent of the ship's Drive and Energy.

2.6.6 Torpedos: Torpedos are in many ways your most potent weapon. Like a missile, a torpedo can only be fired from an available Launch Tube. Unlike missiles and ships, however, which move from one spot to another without traversing the intervening distance, torpedos travel in a straight line in a series of very rapid micro-jumps. Also unlike missiles, which explode even if there is no ship nearby, a torpedo

will strike only if it finds a target—and then only against a single target—but it does have a limited capacity to "home in on" a potential target. Instead of selecting a point (as you did for missiles), you select one of eight *directions* (see figure 2); the torpedo will then move in that direction up to the limit of its range (usually 48 spaces) and will seek out and attack the first object—planet, missile, friendly or enemy ship—that lies within *two spaces* (on either side) of that line of direction. Like missiles, torpedos do not distinguish between friend and foe, so watch where you're firing them!

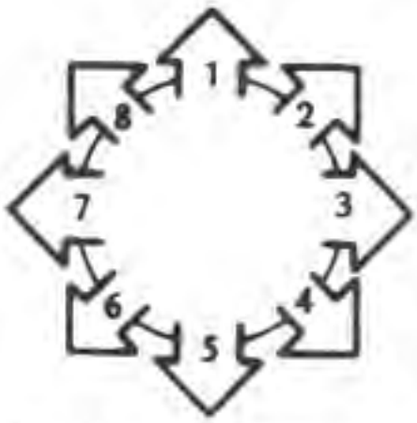

Figure 2. Torpedo Aiming Directions

2.7 CONTINUING A GAME AT A LATER TIME

Since some of the scenarios are rather long, INVASION ORION provides you with a special command—W—to stop a game in the middle and continue it at a later time. This command writes out the current situation just as if it were a starting scenario. (Caution: If you have a cassette, it will not automatically move to a blank spot on the tape to record, so don't use the program tape for this purpose. If you have a disk, don't give the interrupted game the same name as a scenario already on disk, or you'll lose the original.) W should be executed before either player enters orders for the coming turn. After the game is recorded, you can turn off the computer. To continue the game where you left off, just load INVASION ORION normally, and read in the in-progress scenario you saved with the W.

2.8 STARTING OVER

If for any reason you wish to stop in the middle of a scenario and start over on the same scenario, rerun the program according to the procedures detailed on the separate instruction sheet. If you have the cassette version, you'll have to rewind the data tape.

2.9 SCENARIO BUILDING

After you have played the Pilgrimage and Challenge scenarios (which are already on cassette) once or twice, you will wish to try some of the others. This is mostly just a matter of "filling in the blanks"—that is, answering the computer's questions. The first step, however, is to look through the Battle Manual and find the scenario you wish to play; they are arranged roughly in order of complexity. When you have chosen a scenario, you must transfer the data given in the Battle Manual onto a cassette tape so that it can then be processed by the main Battle Program. This data transfer is accomplished by the "Builder" program. Note that tapes built for INVASION ORION can be used with STARFLEET ORION and vice versa.

Load and start the "Builder" program according to the directions on the separate instruction sheet.

NOTE

You may use one cassette to hold both the programs and the scenario data; however, to prevent the possibility of erasing something vital (like the program), we strongly suggest *using a separate cassette to store this data.* If you are doing so, rewind and remove the program cassette for safekeeping.

The Builder Program is set up to facilitate storing a series of scenarios, successively, on the same tape; to do this properly (without recording over previously constructed scenarios), you must enter the name of the scenario nearest the end of the tape (normally, the one most recently entered). Simply type the name (e.g., CONVOY) and ENTER.

Then, on the next line, as requested by the program, enter the name of the scenario you are planning to work with. Do not put this name in quotes. Then hit ENTER, as usual.

At this time, following the program's instructions, insert the cassette you are using as a data tape and press *RECORD* and *PLAY* on the tape controls, and hit ENTER. (Don't forget to advance past the leader if your tape has one.)

2.9.1 General: Regardless of the number of players or the number of ships actually controlled by the player, for scenario-building purposes there are only two sides, and no more than nine ships may be specified for each side. The ships designated here as belonging to Player One will be represented on the CRT (the screen) by the numbers 1-9. Player Two's ships will be shown as the letters A-I and will be referred to as such.

2.9.2 Planets: The computer's first question involves the existence of a planet. If the scenario calls for a planet, type YES and carriage return; if not, type NO and carriage return. (Note that, if there is a planet, data for it must be entered, at the appropriate point, as if it were Ship #1 of Player Two; it will appear on the screen labeled with a "P" and in the course of play it will be referred to, targeted, and ordered as Ship P.) Planets cannot move and cannot be blown up.

2.9.3 General Entries for One Side: When the message, PLAYER ONE, #OF SHIPS, appears, type the number called for by the scenario and ENTER. (IMPORTANT: Enter numbers normally, as 1, 2, 3, etc., not 01, 02, 03. Don't spell out numbers, ever. Don't spell out "ENTER" either; it's the *ENTER key* that is called for.)

DAMAGE AND RANGE OF MISSILES: This determines the damage that one player's missiles do when they hit, as well as the distance they can be projected from their "parent" ships. Three numbers, separated by commas, are required. The first specifies the number of gross points of damage (before being modified by the armor or shield of the target ship) caused by a "direct hit"—the damage inflicted on any ship located in the space in which the missile explodes. The second number specifies the number of gross points of damage caused by a "near miss"—that is, by a missile that explodes "next to" (in any direction, including diagonally) a spaceship. (This number may be 0.) The third number is the range of the missiles—the number of spaces they can be projected by the ships that launch them. (Most scenarios call for a range of 15 or less.) From the scenario data in the Battle Manual, enter the appropriate number for a direct hit, comma, the number for a near miss, comma, the range, and ENTER (e.g., 12,4,15).

DAMAGE AND RANGE OF TORPEDOS: This is similar to the previous entry, except that, since Torpedos do not explode unless they find (and hit) a target, there is no specification for a "near miss." The maximum range for Torpedos is 64, but some scenarios require a lower number. Type the number for damage, comma, the range, and ENTER (e.g., 15,40).

2.9.4 Creating the Individual Ships: To simplify the duplication of physically identical ships, there is the question, IS THIS SHIP THE SAME AS THE PREVIOUS SHIP? Typing YES and ENTER allows the computer to "copy" the physical characteristics of the ship you entered previously while still allowing you to give the new ship a different Beam Quality and location. This short cut, obviously, cannot be used to enter the initial ship; nor would it be appropriate if you were entering a ship different from the previous one. In these latter cases, type NO and ENTER.

The responses to the prompting messages ENERGY, DRIVE, BEAM, SHIELD, LAUNCH TUBES, MISSILES, and TORPEDOS follow a common format: two numbers are required, separated by a comma but no spaces. The first number is the ship's starting specification; the second number is the number of hits it has sustained (before the game starts) on that particular function. (This second number—"hits"—is usually 0.) The difference between these two numbers represents its current condition at the start of the scenario. Again, this data is specified in the scenario description in the Battle Manual. For example:

ENERGY
?10,0
DRIVE
?5,0
BEAM
?5,0
SHIELD
?2,0
ARMOR
?1
LAUNCH TUBES
?2,0
MISSILES
?12,0
TORPEDOS
?0,0

X,Y: This determines the ship's starting position on the screen. The 'X' coordinate represents the horizontal dimension, from 1 on the extreme left to 62 on the extreme right. The 'Y' coordinate represents the vertical dimension, with 1 being a location on the bottom line of the field and 34 being a space on the top. 32,18 is thus in the center of the screen. Note: entering a 0 (zero) in either or both dimensions means that the computer will assign a random starting position (one that will be different each time the scenario is played) *for that dimension* (e.g., 1,0 means that the ship will start *somewhere* on the far lefthand side of the screen; 0,0 allows the computer to assign the ship a position *anywhere* on the board). Enter the number for the X (horizontal) dimension, comma, the number for the Y (vertical) dimension, and ENTER. To accommodate the different computers for which INVASION ORION has been designed, there are in many instances two sets of X,Y coordinates (and, less often, other specifications) for each ship listed in the scenario descriptions: in such cases, the second set of figures (in parentheses) applies to the PET and Atari; the first pair of numbers is to be used on all other computers. Except where later noted (generally as a number in parentheses), all other specifications are the same for all versions.

BEAM QUALITY: This number represents the efficiency of a ship's beams—that is, the marksmanship of the crew and equipment. It can be a positive or negative number; 0 is a poor value; −2 is worse; 5 is average. Enter the number and ENTER (as for ARMOR: e.g.).

2.9.5 Errors: If you type in the wrong number and notice it *before* you have typed ENTER, simply correct the error normally, as you would any other error. If you see an error later, the computer gives you two more chances to correct it. First, it asks for your approval of each ship's specifications, individually; at that point, enter NO if you wish to make no changes; if alterations are required, type YES and ENTER, and the computer will allow you to redo that ship from the beginning. After the data for all the ships on one side have been entered, the computer will display them all in a group and again ask for your approval. Again, if you type YES, you will be allowed/required to do *all* the ships *on that side* over again from the beginning. If you are satisfied that you have entered your data correctly, simply enter NO (no change) in response to this final checkpoint, and the computer will then ask for the other side's ships.

2.9.6 Player Two: Enter the data for the ships of Player Two just as you did for those of Player One (see Sections 2.8.3, 2.8.4, and 2.8.5).

2.9.7 CAN YOU FIRE ON YOUR OWN SHIPS: it is obviously undesirable to fire on your own ships by mistake; entering NO in response to this question prevents you from accidentally beaming your own ships. Entering YES here allows you to beam enemy ships the computer thinks are "friendly." (Note: since missiles and torpedos have no way of distinguishing friend from foe, miscalculation on the part of a player will allow him to blow up his own ships, even if the "failsafe" beam option is chosen.)

2.9.8 ARE TRACTOR BEAMS PERMITTED: Use of tractor beams (and their converse, pressor beams) should be reserved for players with some experience; to prevent confusion and to speed up play, a NO entered here will delete tractor beams (and the questions about them) from the play of the scenario. If, on the other hand, the scenario calls for tractor beams, enter YES (and ENTER, as ever).

2.9.9 Completing the Scenario: When the data for both sides have been entered and all questions answered, the computer will announce that the scenario is prepared. At this point, press *STOP* on the tape controls, and then rewind the cassette back to the beginning.

3.0 SCENARIOS

INVASION ORION was designed primarily as a solitaire game: the computer itself can control and direct the opposition without human aid. You will find the computer a challenging opponent, but it is not the same as playing against another person. Limitations of memory size do not allow the computer to keep track of a multitude of options, victory conditions, and courses of action. Like a rather young human player, the computer single-mindedly wants to destroy enemy ships. Period. (It can, however, be quite good at that.) Yet, this "limitation" can be turned to advantage. Scenario #7, **Last Trump**, for instance, can't really be contested between two players; it would be terribly one-sided and quite boring. With the computer, however, it is fast-moving, tense, and exciting.

Just as many of the STARFLEET ORION scenarios can be adapted to solitaire play, it is possible to play most of the scenarios herein as contests between two players. Generally, the less experienced player should control the Klaatu; if both of you are roughly equal in ability and experience, some adjustments may have to be made to eliminate the advantage often given the Klaatu side. (For more details, see the Designer's Notes in Section 3.5 and the notes that follow each scenario.) Like the scenarios themselves, the sections following have been designed to complement rather than duplicate the information found in the STARFLEET ORION Battle Manual.

A note on play: We suggest you play a new scenario at the Beginner level. (We've always found it discouraging to get blown to smithereens the first time around.) Thereafter, your own experience can tell you how quickly to progress to Expert.

3.1 HISTORICAL BACKGROUND

Just for the moment, suppose that somewhere, sometime, there existed a race of intelligent beings who lived, died, argued, agreed, made love and war (sometimes simultaneously), built cities and hated crowds, read machine-printed books by electric light and despised technology, gave themselves ulcers and heart attacks doing jobs that were supposed to raise their living standards, outlawed slavery but instituted a military draft, condemned robbery but approved of taxes. People like us, in short—but different. Call them the Krell.

You may imagine them with arms and legs, like us, or with tentacles, claws, or pseudopods. Picture them with long hair or short (or none); dress them in pants or kilts or robes or nothing but a hard exoskeleton. It really doesn't matter. In their own eyes, some of them were beautiful, some ugly, and many more plain, but most were any or all of those things depending on who was doing the looking. Again, rather like human beings.

Suppose further that not everyone was satisfied with this diversity; that some of the Krell did not enjoy seeing new faces; didn't care to interact with minds different from their own; found no thrill in discovering new views, tastes, or thoughts shaped by different backgrounds and abilities. Suppose they believed that all Krell were created equal and by God they ought to stay that way!

I know it's hard, but try to imagine such a thing.

The military, for instance, might have had just as much difficulty as *our* military has getting people to march in step. Some of the Krell might want to keep their feathers long, or paint their claws in something other than the official hue, and some might be brave while others were cowards, and how was a general supposed to know what to expect? Some Krell might even question the value of getting killed to occupy a perfectly useless hill in an inhospitable country when he knew that, a few days later, someone higher up in the hierarchy would notice the hill was useless and abandon it and, sometime later, someone still *higher* up the hierarchy would finally notice the country was inhospitable and abandon *that*, too. And how can you run an army of oddball individuals who can't be trusted to carry out their orders?

The idea might appeal to politicians, as well. Dictatorships wouldn't work very well because the Krell might not like being ordered about, and, besides, if they weren't all alike, how could one Krell know what all the rest of them should do, anyway? Democracies wouldn't be much better. I mean, how could a politician represent thousands of Krell on issues like death and taxes and war and peace (not to mention crime and punishment) when no three of his constituents could agree on such vital concerns as which saucerball team should win the Krell Cup, or which actress had the most attractively curved thorax, or even whether it was all right to squeeze the Charmin.

And there might have been bureaucrats who were tired of Krell who preferred names to numbers and didn't fill out forms properly and refused to occupy the slots projected and planned for them. Like their human counterparts, they'd have been happier had every Krell worked 8:00 to 5:00, five days a week, got married at 24, had 2.3 children (a good trick, that), retired at 65, and died at 69.

And let's further suppose that one day someone—we might as well call him Rossum (I mean, if it was good enough for Karel Capek...)—came up with the politician's prayer, the bureaucrat's ideal, the general's delight: robots. Androids. Mechanical men. (Mechanical Krell, if you want to get picky.) Only he called them the Klaatu, perhaps because it was an acronym for the Krell equivalent of Krell-Like Automatous Autoplastic Telophasic Unit. (Or maybe for some other reason. Who knows?)

Since the Klaatu were made in the image of their creator, they were efficient, industrious, logical, orderly, meticulous, single-minded, and humorless. And intolerant.

They were made not to free the Krell from doing boring, repetitive, or dangerous tasks; not to increase productivity or raise living standards or give the Krell more time to enjoy life. No, Rossum the Krell simply wanted reliable soldiers, workers, voters, consumers, and form-fillers. The Klaatu were designed to replace the Krell—or at least those of the Krell who couldn't be planned by the politicians, ordered by the military, and processed by the bureaucracy.

For this they were ideal. They pleased the politicians: there were no upsets, suprises, dark horse candidates, or referenda, and nothing so inconvenient as recall elections. In fact, since you knew exactly how the Klaatu would vote, every time, there really was no need for elections, so eventually they stopped having them. (This rather obviated the need for politicians as well, but the Krell who hadn't noticed this before still failed to do so.) The military was ecstatic: when the Klaatu were put into uniform, they were uniform! Even the bureaucrats were content

(which is the most one can get out of a bureaucrat): the Klaatu obediently filled out forms in triplicate, dotted *i*'s and crossed *t*'s. If they did something wrong, a simple adjustment—a minor bit of repair—would correct the matter. The Klaatu followed orders, regulations, and procedures so thoroughly and completely that there really was no need for a bureaucracy to keep track of such things. But since the real purpose of a bureaucracy was, and always had been, to perpetuate itself, this, too, was not apparent for some time.

I must remind you that the Krell, despite their similarities, were different from human beings. I say this because otherwise you may have a hard time imagining the universal acceptance of the Klaatu by the Krell. Oh, there were a few dissidents who argued that if the Great God Tao had wanted everyone alike, everybody's scales would be the same color, but every race has its lunatic fringe, and nobody else took them seriously. You didn't have to worry about the Klaatu going on strike, getting pregnant, letting their hair grow, or smoking unapproved substances, and while you might not want one to marry your daughter, you had to admit they did what they were told.

Gradually, those of the Krell who did not fit the approved model (i.e., the Klaatu) failed to survive the new order of things. By that time, it was very hard to tell the Krell who remained from the Klaatu. Eventually, because new generations of Krell continued to bring more unwanted variation, and because, after all, the Klaatu were more suited to their lifestyle than what were, despite their best efforts, no more than pseudo-Klaatu, the last of the Krell died.

After that, for a long time no one disturbed the neat, orderly existence of the Klaatu.

3.2 INTRODUCTORY SCENARIOS

Scenario One: PILGRIMAGE

Acey Transit frowned at the incomplete array on the table in front of him. He needed a Four of Storms to open up the left side of the layout; without it, he could manage only one or two cards to the network each run-through. It was hard actually to *lose* a game of Network Solitaire, but this one was just too bureaucratically slow.

He dropped the remainder of the deck on the table and got up, pacing restlessly about the limited confines of the control room. So comfortable when he was alone, the *Eon Eagle* always seemed cramped when someone else was aboard.

And he was bored. Four and a half weeks of looking at rocks was enough to bore anyone. Or anyone except his passenger. He looked over at the figure in white and shook his head. The man was called Parsifal after the manner of his sect, but, in Acey's opinion, he was not entirely human. He had spent most of the voyage sitting equally impassively, his only movement for hours at a time the flicker of his eyes across the computer readouts on the screen in front of him. And that wasn't human!

"How can you *do* that?" The question was asked so involuntarily that Acey didn't realize he had spoken until the other man turned to face him, and once again he felt the shock of those eyes.

"Do what?" The question was stated simply; the face was innocent, but the eyes—those piercing blue eyes—were knowing. More than anything else, that's what got Acey—the eyes. The gold amulet around Parsifal's neck—a circle inscribed with a triangle in which another, smaller circle was inscribed—proclaimed

him a Fellow of the Society of Truth, and the white robes were the badge of a Senior Initiate, but it wasn't just the way he looked that set the man apart: it was the way he *looked*.

He recovered with a start; he'd been staring. Again. "Look at those readouts all day," he said, in answer to the question.

"How not? What I'm looking for may be there. Besides, you exaggerate: surely I don't spend more than ten or fifteen hours a day at the console."

Acey muttered to himself.

"Yes?"

"Um, surely not," agreed Acey, eyeing his left toe. "But, I mean, how do you know it's not just a rumor? You said yourself you had only some old legends and the word of some old character on Whistlestop to go on. And he was *from* Bellon."

"So?"

"Half the floaters and flameouts in the galaxy drift there."

"Your implication is a *non sequitur*," said the Verific. "As to your question, of course I don't know the truth of the rumor, and I won't until I find what I'm seeking. But how else can one ascertain the truth of a rumor?"

"It just seems like a waste of time."

Humor glinted briefly in the Verific's eyes, like the winter sun off ice. "Do you have an urgent appointment?"

"Only with the cards," Acey said, giving up. "And that's not very urgent."

As Acey returned to his game, the Initiate stood up and, without raising his arms, stretched his body in the odd way that had become familiar. Then, surprisingly, he came over to the card table.

Acey found the presence of the other man distracting but couldn't justify asking him to leave. After several minutes, the Verific asked, "What was your starting card?"

Acey pointed. "That Four."

Parsifal nodded briefly. "As I thought." He said nothing further, but his look, on someone else, would have approached a smirk.

Acey ignored the expression long enough to turn over nine more cards, in threes, and recognize the same cards he had seen the last two times through the deck. Tax it, he *had* lost the game! He transferred his scowl from the cards to the other man—with as little effect. "So what are you looking at?" he demanded irritably.

"The two Fours. According to the rules of Network, which is what you seem to be playing, you can't play *those* two Fours next to each other: they don't form a triplet."

"Well, the other Four of Storms is buried someplace, and I'm stuck, anyway."

"Only because you keep turning over four cards at the bottom of the deck instead of three."

"Huh? What are you talking about?"

"What I said. Cards often stick together when they are old and greasy." When Acey hesitated, the flash of humor returned. "Seek and ye shall find. Look and see."

Very deliberately Acey counted the cards out singly. He almost missed it, even so, but stuck underneath an Ace of Spells was (of course) the Blue Four of Storms. "Forms and taxes," he muttered. How had the Verific noticed what he had overlooked half a dozen times? This bothered him enough that it was several minutes before he thought of something else. "How'd you know that was an illegal play, anyway?" he asked suspiciously.

"I'm somewhat familiar with Triad games."

Acey considered this for some time. Finally, he said, "Would you like to play cards?"

The Verific cocked his head. "A bit of diversion would be pleasant," he said after a moment. "But not with *those* cards."

Acey shrugged indifferently. "Sorry, but they're the only ones I have."

"Then I'll get mine."

When Parsifal brought back a double deck, engraved on the back with the Society's circle-triangle-circle, Acey knew he'd been sandbagged.

* * *

Acey's subsequent defeat at two-person Network, followed by a shutout at Interlock, did not improve his mood the next day. "Mighty unpromising neighborhood around here," he complained, after losing a chess match to the computer.

As usual, they were prowling through the pieces of a ruined system, hunting for something unknown and probably imaginary.

"Mecca is where you find it," answered Parsifal.

"Huh?" There was no further comment, but something in the Verific's tone—a hint of tension normally absent in tone and posture—brought Acey over to the DataComp console. "Looks like a rock to me," he said after a moment. He was almost disappointed.

"It doesn't look like a rock to me."

"What do you think it is?"

"I don't think it is anything," said the Verific carefully. "I do not have enough information to form an opinion. But I think it is *not* just a rock. Can you bring us closer?"

Acey shrugged. "You're paying the freight."

There was a blink of no-time and the rock became a fair-sized asteroid.

Abruptly, Acey swore. "Three ships just came out of nowhere. Warships, looks like." He swore again. "Death and taxes! Two more on the other side."

"How close?"

"They're still a ways away," he conceded reluctantly.

"Can you make it to the surface in one jump?"

"Um, yeah, but—"

"I did not come all this way to leave without learning anything. Land us, please!"

Acey sighed but made the jump. From the surface, they saw a lean shark-shape flash by overhead. "Taxes! A torpedo!" he cried. "We're leaving."

"Wait! Not without that."

"What is it?" he asked, glancing at his screens.

"I don't know," admitted the initiate, "but it may be important."

"Maybe so, but I'm not going out there to get it. The next torpedo might not miss."

"Then grab it with a tractor beam and jump."

"We're already gone," said Acey, as he did those things.

The asteroid exploded behind them.

Side One (Player): Missiles: 0,0,0 (none) Torpedos: 15,35

1. *Eon Eagle*: E-5,0; D-3,0; B-4,0; S-1,0; A-1; L-1,0; M-0,0; T-4,0; X,Y-27,0 (25,0); BQ-

Side Two (Computer): Missiles; 11,5,17 Torpedos: 16,25

1. Klaatu Corvette: E-7,0; D-4,0; B-0,0; S-4,0; A-0; L-3,0; M-16,0; T-4,0; X,Y-20,33 (3,8); BQ-0
2. Klaatu Corvette: Same as #1 except X,Y-40,33 (15,20)
3. Klaatu Destroyer: E-12,0; D-6,0; B-5,0; S-5,0; A-0; L-3,0; M-16,0; T-2,0; X,Y-30,33 (9,14); BQ-5 (3)
4. Klaatu Destroyer: Same as #3 except X,Y-25,1 (30,2)
5. Klaatu Destroyer: Same as #3 except X,Y-35,1 (39,11)
6. Asteroid: E-22,20; D-0,0; B-0,0; S-0,0; A-2; L-0,0; M-0,0; T-0,0; X,Y-0,0; BQ-0
7. Asteroid: Same as #6
8. Asteroid: Same as #6
9. Asteroid: Same as #6 except X,Y-32,17 (20,10)

Special Rules: No Tractor Beams allowed. The *Eon Eagle* cannot fire before being fired on. Until you *are* fired on, you must try to land on Asteroid I (#9 above); after landing on the asteroid *or* being fired on, you may try to exit the screen off any of the four sides.

Victory Conditions: You win a Major Victory if you land on Asteroid I *and* exit the board; you win a Minor Victory if you exit the board without landing on the asteroid. Any other result is a loss.

Playing Time: 15-30 minutes.

Notes: This scenario is short and, despite the large number of objects on the screen, easier to play than it appears. Missiles were not included on the *Eon Eagle* partly to keep it small (and hard to hit) and partly so that first-time players would have only one launched weapon system to contend with.

Tactically, you should avoid getting into a battle; the wisest course is flight as soon as the rules allow. If possible, stay away from potential torpedo paths or use the scattered asteroids to block them.

Since the computer is programmed with only a limited set of objectives, it is not feasible to reverse this scenario and have the computer handle Side One. If you wish to add a bit of variety, enter the X coordinate of the five Klaatu ships as 0.

The Triad deck mentioned in the story—the first really new idea in playing cards in a hundred years—does exist and will be commercially available one of these days.

Scenario Two: CHALLENGE

"What do you make of it?"

"It" was a prolate spheroid of silvery metal with a comparatively slender tube, bulbous at the tip, projecting from one end. As one wag among the crew was later to put it, "like a football trying to suck a golf ball through a short straw." Or, as another preferred, "a fat rat with a swollen tail."

But that was later. The immediate response from Kelso, seated at the DataComp screen, was less picturesque but more to the point. "Regulated if I know. But it's not from the Stellar Union, at least."

"I don't think we can make that assumption," the Captain said slowly. "Unless you know anybody else within two hundred light years who's building battleships," he added with mild irony.

"And it's too big to be anything else," put in Su-Ling, studying her own monitors.

"If that's a Stellar Union battleship, then I'm a citizen," insisted Kelso adamantly. "That's no more a real battlewagon than we are."

Su-Ling shook her head without taking her eyes from the screens. "Bigger. Much."

"Only in diameter. The mass doesn't jibe."

"The mass is light," admitted Su-Ling.

"Then what is it?" asked Captain Braun. "Another bastardized job like this one?" There was no disparagement in his tone; he was as attached to the freighter-turned-pocket battleship as anyone in the crew of the *Camelot*. It had survived the Battle of Autarchia, and there were few ships on either side that could make that claim.

"No," said Su-Ling and Kelso together.

"More like the battlecruisers they built on New Zion," Kelso went on. "Only..." He hesitated. "Only the density is still wrong. If such a thing could be, I'd say it was a warship without armor."

"It *is* a warship." Half statement, half question.

"No question. Guns and launch tubes for certain."

"That'll give us an edge, then, won't it?" chipped in the astrogator. "I mean, if it comes to that."

"Maybe. Maybe not. The mass has to be coming from somewhere. Could be a bigger shield or beam or more missiles."

"With four launchers, it's got to carry more missiles and torpedos than we do," commented Kelso.

"And it's not likely to be slower than we are," continued Braun.

"Nothing," stated the astrogator, with the same sardonic affection the Captain had displayed earlier, "is slower than the *Camelot*."

"Any response from it yet, Takei?"

"No," said the com officer.

"Yes!" cried Kelso simultaneously. "It's coming at us."

Side One (Player): Missiles: 15,5,15 Torpedos: 20,35

1. *Camelot-B*: E-27,0; D-10,0; B-15,0; S-10,0; A-3; L-2,0; M-16,0; T-4,0; X,Y-0,0; BQ-5

Side Two (Computer): Missiles: 13, 7, 17 Torpedos: 22, 25

1. Klaatu Battlecruiser: E-35,0; D-13,0; B-20,0; S-10,0; A-0; L-4,0; M-24,0; T-4,0; X,Y-0,0; BQ-5

Special Rules: No Tractor Beams allowed.

Victory Conditions: Destruction of the enemy ship.

Playing Time: 20-30 minutes.

Notes: As is true of most human-Klaatu encounters and especially of this one, you can't win simply by exchanging beam blasts. You must make combined attacks: beam and missile or beam and torpedo.

If you wish to make the game last longer, or to reduce the importance of missile weapons (as opposed to beams), give both sides the missiles and torpedos specified in Scenario #3. If you want more of an edge, give Side One (only) the missiles and torpedos described in the three Advanced Scenarios. You *can* reverse this scenario and play Side Two yourself, but the computer will be at something of a disadvantage. (In general, the computer is a better opponent when it gets to play the Klaatu.)

Scenario Three: WAR GOD

"I still think this is a waste of time," declared Jerel Pourven, unknowingly echoing Acey Transit under somewhat similar circumstances. His tone was, in theory, of the sort that would brook no argument, but, in practice, it inevitably had the opposite effect.

Not this time, however: despite the frowns that showed above the cards on a few faces, most in the Junior Officers' Lounge of the *Ares* agreed with him.

"Wish some of the higher-ups thought so," grumbled Borzov, Gunnery Third, to muttered assent.

"I suspect they do, Piotr," commented Grabowski cheerily from the console in the corner.

"How do you figure?"

"If they took it seriously," the Second Engineering Officer replied, "they'd have sent a more experienced crew or a bigger ship. Maybe even a squadron."

"Is there something wrong with us?"—That from Pourven, of course.

Grabowski grinned disarmingly. "Well, I've suspected that some of you clowns picked up a few social diseases back on Felara." There were chuckles, catcalls, and several nominations around the card table. "But seriously, Jer," he continued, "how many of us have actually been in combat before? And even if we had, what are we supposed to do if we come across a hostile cruiser squadron—tell 'em to surrender in the name of the Stellar Union?"

Pourven frowned, trying to take offense but unable to see how.

Amid the renewed laughter Grabowski's comment provoked, Pourven's fellow astrogator, Altschuler, reminded him, "Fifteen to you, Jer."

It was Pourven's presence, more than that of a potential seventh player, Grabowski, that kept the six men around the table, by unspoken consent, at poker rather than Grand Triad: no one wanted to be partners with the belligerent Astrogator Second.

"Hast won the war yet?" inquired O'Donnoughue in the thick New Erin accent that sounded like a foreign language. The Engineering Officer Fourth swore he spoke the same Terranglic everyone else aboard ship did, but no one believed him.

"Not this time," answered Grabowski. "I'm down to my last two cruisers, and one's lost its launch tubes and the other can't move. If I survive another two turns, it will be evidence of divine intervention."

Pourven frowned automatically at this casual reference to a Deity he, at least, took seriously, but he was too concerned with his hand to say anything.

"Wouldst join us then, when 'tis over?"

Grabowski shook his head. "Not a chance. At least the computer won't take my shirt."

Eventually Pourven added three chips to the pile in the center, leaving only he, Altschuler, and Borzov still in.

"All blue," said Altschuler, exposing his hand.

"Cheap hand," commented Almaviva, one of the early dropouts.

"By me," grunted Borzov.

Pourven threw his cards down disgustedly. "Who dealt this damn hand, anyway?"

"You did, Jer," said Altschuler, as he raked in both chips and cards for the next deal.

Scowling blackly, Pourven responded to the resulting laughter in typical fashion. "Well if you ask me, we ought to be hunting Orion rebels, not chasing imaginary alien raiders."

"I don't think anyone asked," said Borzov coldly.

Hoping to make it a joke, Altschuler interjected at once, "I didn't ask. Did you, Tony? Niall?"

Almaviva smirked and said nothing, but O'Donnoughue picked it up. "Nah. Didst ask, 'Cisco?"

As the sixth man, Vasquez, hesitated, Grabowski, as usual, tried to call a cease-fire. "You can't get killed chasing imaginary aliens," he said, "which is fine with me."

"Not everyone in the Navy of the Interstellar Union is as ...passive as you are, Grabowski," said Pourven, utterly unappeased, "or as incompetent as those who allowed the Orion Rebellion to succeed."

"*Madre de Dios!*" whispered Vasquez, as Altschuler went white.

Borzov slammed his chair back with such force it bounced off the wall. "*What did you say?*"

Grabowski wanted to scream in Pourven's ear, "You ass! Don't you know his brother was on the *Gaugamela*?" But he was too far away, and it was too late, too late.

Only the blaring of Battle Stations kept them from killing each other.

Side One (Player): Missiles: 12,4,15 Torpedos: 15,35

1. *Ares*-DL: E-15,0; D-7,0; B-7,0; S-4,0; A-2; L-2,0; M-12,0; T-2,0; X,Y-0,0; BQ-5

Side Two (Computer): Missiles: 11,5,17 Torpedos: 16,25

1. Klaatu Corvette: E-7,0; D-4,0; B-0,0; S-4,0; A-0; L-3,0; M-16,0; T-4,0; X,Y-30,20 (15,8); BQ-0
2. Klaatu Corvette: Same as #1 except X,Y-40,15 (25,12)

Special Rules: No Tractor Beams allowed.

Victory Conditions: Destruction of the enemy ship(s).

Playing Time: 30 minutes.

Notes: For variation, put in Tractor Beams (a minor advantage to Side One) or let the computer play Side One.

3.3 INTERMEDIATE SCENARIOS

Scenario Four: GAUNTLET

"Will it hold?" asked Captian Jon Braun as he looked at the patched hull of the battered *Camelot*.

"Well, we really need another week to do a decent job," began the ship's chief engineer, hedging automatically, "and I doubt it will stand up to a direct hit, but, uh, I suppose it will do until we get back to the yard on Autarchia."

"I hope so," said Braun, knowing that if Manfred Whitehurst said it would hold, it would hold.

"*Hope* so?" The engineer looked briefly shocked before he realized Braun was teasing.

"Have you heard anything about the missiles?"

"Uh, better talk to Simbana."

The hesitation that time meant bad news.

It was, as Braun discovered when he found the Fire Control Officer supervising the loading of the new weapons. He recognized them immediately: they were just like the ones he'd carried aboard the *Valkyrie*, much less powerful than those the *Camelot* usually bore. He didn't bother asking the obvious: the fight with the alien battlecruiser had exhausted their ammunition, and if suitable replacements could be had, Simbana would have found them. "Same with the torpedos?"

"Uh-huh."

He swore, but it was what he had expected.

She flashed white teeth. "Better than popcorn, leastways, and if there's anything bigger around, they're hiding it."

"Jon."

"Captain Braun."

The first voice belonged to Angela Su-Ling, the second to a white-robed man he'd never seen. After introductions were made all around, the Verific, whose name was Parsifal, said, "I wish to go with you to Autarchia."

Even under the circumstances, their return home was hardly a secret, but Braun's reply was cool. "The *Camelot* is not a passenger liner, and our trip will be no pleasure cruise."

The Verific appeared undaunted. "I am aware of both those things, Captain. I even know of your valuable cargo, the alien missile with its so very interesting dispersion field." Behind him, Su-Ling signaled frantically that she was not responsible for his knowledge. The Verific ignored both that and Braun's more controlled but nonetheless visible reaction. "But I, too, would bring to Autarchia something I believe to be of greater value to the human race than that weapon: other evidence, information, and conjecture regarding the Klaatu."

"The what?"

Parsifal shrugged, as if to apologize. "The term may be in error, but it is my rendering of the name of the aliens who attacked the ship I was traveling in as well as your own. If I am even somewhat correct, it is important for me to share my knowledge with others, and the ship I mentioned is more damaged that this one. May I join you?" he finished calmly.

"Perhaps you'd better," said Braun wonderingly.

"Thank you. I will make ready. Blessed be," he added, before turning away.

Angela Su-Ling looked curiously from Parsifal's departing back to the stunned faces of her two fellow officers. "Is that the way they say goodbye?"

"No," they chorused. "Not usually," Braun added. Leaving Su-Ling puzzled, he said to Simbana Kavubu, whose religious beliefs were near his own, "How did he know?"

"How did he know any of it?" she returned.

After a moment, Braun shook himself visibly and said, "I guess we'd better make it back to Autarchia."

Side One (Player): Missiles: 12,4,15 Torpedos: 15,35

1. *Camelot*-B: E-27,0; D-10,0; B-15,0; S-10,0; A-3; L-2,0; M-16,0; T-4,0; X,Y-5,5 (2,2); BQ-5

Side Two (Computer): Missiles: 11,5,17 Torpedos: 16,25

1. Klaatu Destroyer: E-12,0; D-6,0; B-5,0; S-5,0; A-0; L-3,0; M-16,0; T-2,0; X,Y-28,32 (22,20)
2. Klaatu Heavy Destroyer: E-16,0; D-7,0; B-8,0; S-5,0; A-0; L-3,0; M-16,0; T-4,0; X,Y-32,28 (26,17); BQ-5
3. Klaatu Light Cruiser: E-20,0; D-9,0; B-10,0; S-6,0; A-0; L-3,0; M-16,0; T-4,0; X,Y-36,24 (30,14) BQ-5

Special Rules: Tractor Beams are allowed.

Victory Conditions: The *Camelot* wins if it exits off the right side of the screen and loses if it is prevented from doing so. If the *Camelot* destroys all three Klaatu ships but its Drive is so damaged that it cannot move, you may consider the game a draw. (The computer will tell you you won, but "historically" it's a loss.)

Playing Time: 30-40 minutes.

Notes: This scenario adds another ship to the opposition and the use of Tractor Beams. Against a human opponent, Tractor/Pressor Beams can be used to throw off missile and torpedo fire. While this tactic won't work against the computer (which always knows where its ships are), such beams can be used, at least on the two smaller ships here, either to draw them within the *Camelot's* (shorter) missile range or to push them out of their own.

Remember that your prime objective is to get off the screen. To do this, you will have to fight the Klaatu ships, but if you dally in an attempt to destroy all three of them, you will very likely get crippled.

For more of a challenge, start the *Camelot* at 5,0 (2,0). Alternatively, to get more of an edge, give the *Camelot* its normal (larger) missiles (15,5,15) and torpedoes (20,35). The scenario also reverses fairly well, although if the computer is running the *Camelot* it will make no attempt to leave the screen; it will simply go after the three Klaatu ships.

Any resemblance between this scenario and the pursuit of the *Graf Spee* is *not* coincidental, except that the opposition forces have been considerably scaled down to give the pocket battleship the chance it lacked in World War II. (Despite Allied propaganda, which made an inevitable outcome into a great and surprising triumph, the German commerce raider's battle against a CA and two CL's was almost as one-sided a contest as the sinking of the *Bismarck* by practically the entire British Navy.)

Scenario Five: OUTPOST

"...This is the mining outpost Big Rock calling anyone within range. We are under attack by unidentified warships. Repeat: we are under attack by a pair of warships of unknown design. They will not acknowledge our calls; they will not heed our willingness to surrender; and they are systematically destroying every outpost here in the belt. We cannot defend ourselves and cannot escape. Repeat: we are helpless and cannot escape. They will be here soon. Can anyone help us? Please, is anyone out there? Somewhere? Anywhere?

"This is Big Rock calling anyone. We are under attack..."

Side One (Player): Missiles: 12,4,15 Torpedos: 15,35

1. *Amazon*-DE: E-10,0; D-5,0; B-5,0; S-2,0; A-1; L-2,0; M-8,0; T-2,0; X,Y-25,10(15,5); BQ-5
2. *Britomartis*-DE(M): E-10,0; D-5,0; B-5,0; S-2,0; A-1; L-2,0; M-12,0; T-0,0; X,Y-30,7 (20,3); BQ-5
3. *Jeanne d'Arc*-DE(T): E-10,0; D-5,0; B-5,0; S-2,0; A-1; L-2,0; M-0,0; T-6,0; X,Y-35,4 (25,1); BQ-5
4. Asteroid Outpost: E-5,0; D-0,0; B-0,0; S-0,0; A-1; L-30,0; M-0,0; T-0,0; X,Y-20,0 (13,0); BQ-0
5. Asteroid Outpost: Same as #4 except X,Y-40,0 (28,0)

Side Two (Computer): Missiles: 11,5,17 Torpedos: 16,25

1. Klaatu Destroyer: E-12,0; D-6,0; B-5,0; S-5,0; A-0; L-3,0; M-16,0; T-2,0; X,Y-0,0; BQ-6
2. Klaatu Destroyer: Same as #1

Special Rules: No Tractor Beams allowed. Also, remember that you must enter "orders" (just zeros, of course) for the two outposts before the computer will take its turn.

Victory Conditions: You win if you can eliminate the two Klaatu destroyers before they wipe out *both* outposts (i.e., reduce their Energy to 0; they need not actually be blown up). If you manage to destroy the Klaatu but lose the outposts, that counts as a draw, despite what the computer prompt will show. (What does it know?). If, by displaying extraordinary tactical skill, you manage to save both outposts, you will of course be awarded the Blue Cross with Orion Cluster (and possibly the Silver Chalice or the Holy Grail).

Playing Time: 45 minutes.

Notes: Reversed (with the computer handling Side One), this makes a very challenging scenario if you attempt to destroy both the ships and the outposts. (It's not too hard just to get the outposts; the computer doesn't know what you are doing and will, consequently, make no real effort to stop you *per se*. It will try to blow up your ships, but that's not quite the same thing.)

Scenario Six: INCIDENT AT NESHABUR

A billion kilometers galactic west of the planet Neshabur, a cruiser squadron of the Interstellar Union—headed by the flagship *Smilodon*, Captain Vassily Andrianov commanding—encountered the enemy for the first time.

"Do you think they were going to raid Neshabur, Captain?"

"I don't know, Pinsker, but they aren't if we have anything to say about it. What are they, Arnold?"

"Hard to say, sir. It's the Klaatu, all right—whatever they are—but their ships are so different from ours: no armor, more launchers. Just using mass equivalents, I'd say it looks like three heavy destroyers and a battlecruiser."

"I'll take the destroyers," said Andrianov. "I don't like the battlecruiser. We can take it if we have to, I guess. Mireille, get me *Tylosaur* and *Mosasaur* on joint beam."

Almost immediately, the com officer nodded. "Any time, sir."

"Looks like it's time to earn our keep," Andrianov announced into the com screen. "Jake, you and I will take on the destroyer on the right flank, double fork with missiles and torpedo. Mac, give us what beam you can spare, but keep your shield up. Follow us over and just try to slow them down with missiles. With a bit of luck, we'll roll right up their flank.

"Questions? Then let's go."

It started out according to plan. *Smilodon* and *Tylosaur* fired topedoes down an alley of missiles, but they were intercepted by the enemy's defensive missiles. The combined beams did some damage. *Mosasaur* was hit hard, but the shield absorbed most of it. A lucky missile hit shortly after knocked out *Mosasaur's* launch tubes, leaving it easy prey to a torpedo.

"Don't be a hero, Mac, get out of there. We'll cover."

"Can't, Vass; that last one got the drive. Sorry. The beam's still good; we'll hold out as long as we can. Uh, Vass, will you tell Kathy for me?"

"Sure, Mac," Andrianov croaked. "I'll tell her."

They were working on the second destroyer when *Mosasaur* became, briefly, a miniature sun.

Side One (Player): Missiles: 15,5,15 Torpedos: 25,35

1. *Smilodon*-CA: E-23,0; D-10,0; B-12,0; S-8,0; A-2; L-3,0; M-16,0; T-6,0; X,Y-32,4 (6,5); BQ-7
2. *Mosasaur*-CA: Same as #1 except X,Y-28,6(6,9); BQ-5
3. *Tylosaur*-CA: Same as #2 except X,Y-36,6 (10,3)

Side Two (Computer): Missiles: 13, 7, 17 Torpedos: 22, 25

1. Klaatu Heavy Destroyer: E-16,0; D-7,0; B-8,0; S-5,0; A-0; L-3,0; M-16,0; T-4,0; X,Y-24,27 (23,18); BQ-6
2. Klaatu Heavy Destroyer: Same as #1 except X,Y-36,27(29,9)
3. Klaatu Heavy Destroyer: Same as #1 except X,Y-42,25(30,3)
4. Klaatu Battlecruiser: E-35,0; D-13,0; B-20,0; S-10,0; A-0; L-4,0; M-24,0; T-4,0; X,Y-30,30 (28,15); BQ-6

Special Rules: Tractor Beams are optional.

Victory Conditions: Destruction of the enemy ships.

Playing Time: 1 hour.

Notes: For more of a challenge, reduce the torpedos on Side One from 25,35 to 20,35 and/or reduce the Beam Quality by, say, two points per ship. For a *real* challenge, replace the destroyers with light cruisers. If, for a change, you wish the computer to play Side One, change its missiles to 15,6,15 and reduce the Beam Quality on Side Two.

Scenario Seven: LAST TRUMP

Her name was Aurore de Londres-Lee, and her face had the kind of character that only maturity brings. Like her hair, her smile was like the dawn seen from a high hill in the country, and, in the opinion of Captain Giuseppe d'Aquili, she was attractive in a way a younger woman could never be. She was also the Planetary Director of Whistlestop, and she was not smiling.

"*Athena* and *Minerva* must leave at once," she said abruptly, without preamble. D'Aquili was stunned. "What? But why, Aurore? What is wrong?" They were alone, in a small drawing room inside the Great House where, in days past, they had dispensed with the formalities of office.

"The Klaatu."

"*Accident!*" That explained the hasty summons, but not the message. "But we must fight," he protested.

"No!" Then, more quietly but equally firm: "It would be suicide. You must get away, warn Autarchia, New Zion, the others. Together, they might have a chance, if they know."

"But what of your world, here? You have defenses, surely."

"So did Spring," she said grimly, "and this is worse than anything the Stellar Union threw at us. Much worse."

"Can't the people be evacuated?" he asked, his hands gesturing feebly, helplessly.

"Three million people in half an hour? Don't be silly, Joe." Her grim smile was a shadow of the one he'd come to know.

"Of course, of course. But at least we can take you, a few others."

She shook her head firmly. "I can't leave; I'm the Planetary Director. Whistlestop's my responsibility. That's why they elected me."

"But not for this," he protested, now alarmed in a way he had not been even moments earlier. "Not to throw your life away in a disaster you can do nothing about!"

"Perhaps not," she admitted, undeterred. "But it's rather like marriage, you know, 'for better or worse...til death do us part'...at least until the next election." Her smile at that had a hint of real humor in it.

To d'Aquili the conversation, the scene, was becoming more and more unreal...fantastic...*bizarro*. Last night there was wine, music, dancing, a walk in the gardens, candles casting highlights in her hair and catching them both in their net. This morning she was talking calmly about the end of the world.

"No, no, I cannot permit it."

"*Permit*?" A cloud flitted across her face but did not stay, as she heard what he did not say in what he did. "Would you abandon the *Athena* under similar circumstances?" she asked with great gentleness.

"I—That is not the same thing."

"*Plus ca change*," she murmured. "But it is not your choice, at all events, and I could not, even if I wished," she continued. "Rumors fly already. If I were seen leaving for the port in the company of the Captain of the *Athena*—and I would be—some would guess, and there would be trouble, riots, and we would not get either ship away in time. And we must."

"Come, my friend," she said briskly, "there is no more time. You must go now, and quickly."

"But there must be something I can do!" he cried in his agony.

"There is," she said fiercely, but so low it was almost a whisper. "If you would. My daughter. It is selfish of me, I know, when so many must stay, but I want her to have her chance. It is not her fault she has a stubborn mother."

"I see." There was no thought of refusing. "Of course, I will take her."

Anxiously still: "And Greta?"

He nodded, almost beyond speech.

"Thank you." She kissed him briefly and then, after a moment, moved quickly to a button concealed behind a curtain.

Immediately a door opened, and a ten-year-old blonde entered the room. Behind her d'Aquili recognized the little girl's nurse and mentor, a fair-haired young woman bearing a pair of small overnight bags and a look of utter determination.

The daughter raced over to her mother and, as Aurore bent to meet her, threw her arms around her neck without letting go of the disreputable-looking teddy bear clutched in her left hand. "Mother, what's happening? Where are we going?"

Her mother shifted them so that they could look into each other's faces. "Lora, you're going away with Captain d'Aquili for a long ride in a spaceship. I want you to be good, and try not to get in the way, and do whatever he or Greta asks. Will you do that for me?"

The child looked uncomfortable. "Aren't you coming with us?"

"I can't."

"Then I want to stay with you."

"I'm sorry, darling, but it isn't safe."

"Oh." A long silence. Then: "Mother, are you going to die?"

D'Aquili's breath sucked in audibly, but no one appeared to notice.

"Everyone dies sooner or later," said the Planetary Director of Whistlestop.

"I understand," said her daughter. Without another word , Lora returned to her nurse to clutch one wrist in her free hand and hide her face from anyone's glance.

"Always remember I love you, Lora."

"I love you, too, Mother. And so does Rascal." But she didn't show her face.

Aurore de Londres-Lee straightened and, to d'Aquili, said quietly, "I've given them what I could. Whistlestop money won't be worth much after this, but I've some offworld holdings and friends on New Zion who'll take care of her. But would you...look after her? I know it's a great thing to ask, but I've no one else."

"You are asking a very great thing of me, but that is not it," he replied in the same tone.

"I know. I'm sorry."

As she hustled them out of the room, she said, "Goodbye, *cher. Adieu*."

"*Arrivederci*," he said deliberately, correcting her, but he knew he was fooling no one.

Side One (Computer): Missiles: 13,7,17 Torpedos: 22,25

1. Klaatu Light Battleship: E-35,0; D-11,0; B-15,0; S-15,0; A-0; L-5,0; M-40,0; T-10,0; X,Y-5,20(2,16); BQ-4
2. Klaatu Light Battleship: Same as #1 except X,Y-55,20(38,16)
3. Klaatu Light Battleship: Same as #1 except X,Y-15,25 (7,17)
4. Klaatu Light Battleship: Same as #1 except X,Y-45,25 (33,17)
5. Klaatu Battleship: E-44,0; D-12,0; B-20,0; S-18,0; A-0; L-4,0; M-28,0; T-6,0; X,Y-20,28(12,18); BQ-4
6. Klaatu Battleship: Same as #5 except X,Y-40,28 (28,18)
7. Klaatu Dreadnought: E-50,0; D-14,0; B-25,0; S-20,0; A-0; L-5,0; M-36,0; T-6,0; X,Y-25,30 (16,19); BQ-4
8. Klaatu Dreadnought: Same as #7 except X,Y-35,30 (24,19)
9. Klaatu Dreadnought: Same as #7 except X,Y-30,33(20,20)

Side Two (Player): Missiles: 15,5,15 Torpedos: 25,35

1. "Whistlestop"-planet: E-150,100; D-10,0; B-25,0; S-25,0; A-5; L-88,80; M-52,0; T-8,0; X,Y-30,10(20,5); BQ-5
2. *Minerva*-DD: E-12,0; D-6,0; B-5,0; S-4,0; A-1; L-2,0; M-12,0; T-2,0; X,Y-30,10 (20,5); BQ-5
3. *Athena*-DD: Same as #2

Special Rules: Tractor Beams are allowed/required.

Victory Conditions: You win if you can get either destroyer off either *side* (not the bottom) of the screen.

Playing Time: 30 minutes.

Notes: To win this scenario, you must—even more than was the case with GAUNTLET—single-mindedly pursue the Victory Conditions. At least one and probably both destroyers must leave the planet on the first turn; use Whistlestop's drive to give one a big boost over and down, and keep using it (as a Pressor beam, of course) as long as you can. Don't forget a defensive missile screen, either.

Since the Klaatu in this scenario reappear in Scenario #10, you may wish to record the ships' status at the end of the game and use that data to build the final scenario.

The computer cannot play Side Two.

3.4 ADVANCED SCENARIOS

Scenario Eight: JUGGERNAUT

Sudden Smith slowly moved into the room. The leg worked perfectly, really, but there was a constant pain where the reconstructed hip joined the artificial limb. So he limped. He tried putting pressure on the spot with his bionic hand, but that didn't help, either. It rarely did.

"*You're* Sudden Smith," repeated the fellow next to him, a Stellar Union officer, when introductions were made all around.

"So I'm called."

The officer, whose name Smith had missed, derived vast amusement from this. "You don't look very sudden to me," he said, laughing aloud.

He stopped laughing when Smith's arm—the newer one—appeared in front of his nose. A bit more tension on the carefully flexed fingers and the built-in blaster would take off the tip of Smith's middle finger and the center of the other man's face.

Smith was tempted. His general attitude remained perilously close to being the only good Stellar Union flink was a dead etcetera, but it wouldn't, he supposed, be much of a way to start a joint conference. He decided he was getting old; people were taking advantage of him. He relaxed amid general cries of alarm and returned his left hand to his lap.

The heart of the meeting was what Parsifal, a Senior Initiate of the Society of Truth, had to say. During a pause, someone said, "That sounds like a repeat of the juggernaut that nearly got Spring...before the Stellar Union did."

That provoked a predictable reaction from those present, but Parsifal inexorably brought things back to the subject at hand. "When it is finished, I fear it will be very much the same. I do not believe it is quite the instrument of planetary destruction the Dirge was, but, unlike that ancient weapon of the Alrashid Empire, this Juggernaut—if you wish to call it that—will have the support of a mighty fleet. Furthermore, there is nothing to prevent the Klaatu from building more than one, as long as the facilities remain intact.

"It is my opinion that this Juggernaut must be destroyed before it is made fully operational and that the station with it—a floating factory—must be eliminated as well."

"Is that necessary?" asked Abdel Bjorklund, Captain of the Stellar Union's *Marathon*. "Couldn't the factory satellite be reprogrammed, put to work making ships for us?"

"That's what you tried to do with the Dirge, isn't it? And look what happened there." That was old Chris Paxton, head of Sagittarius Spacelines. He wasn't much more enthusiastic about this meeting than Smith was himself.

It went on like that, always threatening to break up into something little short of armed conflict, and always brought back together by the charisma and determination of Parsifal and the general respect accorded the Society of Truth, which had made the meeting possible in the first place. The Society was above governments, above politics, and whatever outsiders thought of their aims, their Initiates never lied.

It came back to the question of how to destroy the thing without denuding planets of their defenses. "We beat the Dirge with nothing but fighters," said someone, inevitably. "Why not again?"

When everyone looked over, Smith knew why he had been included. There were a few hopeful faces out there, but they didn't remain. He shook his head. "Not a chance. In the first place, I don't think there are enough fighters left in the whole Orion cluster to consider it. Second, they'd be too vulnerable to missiles, torpedos, and beam fire—but especially torpedos—from the killer satellites you say are surrounding the thing. The only way to even try it would require Pressor Beams big enough to kick the fighters all the way past the satellites. And that means battleships—several of them."

Everyone followed his gaze to Bjorklund. Battleships were *de facto* a Stellar Union monopoly; nobody else could afford them.

Bjorklund shook his head with what looked like honest regret. "The Interstellar Union will not risk a fleet—or a battleship squadron—on something that might prove to be either a wild goose chase or the deadliest weapon since the Dirge. I'm authorized to accompany whatever force you can muster with my two cruisers, but that's all."

There were many complaints, but this was more than many of them had actually expected. Old animosities died hard.

"But who'll lead it from your end," pursued Bjorklund a bit later, "and in what?"

"I will," said Jon Braun, to general astonishment.

It took Christopher Paxton a long moment to recover. "Not in the *Camelot*," he said firmly. "Not while we don't know where the Klaatu will strike next."

Braun seemed unusually tense, but his answer was matter-of-fact. "The *Camelot* is too slow and too big a target. We need something small, fast, and elusive, but capable of doing great damage to a stationary or, at worst, slow-moving target."

"Which is?" prodded Paxton, who seemed fascinated almost in spite of himself.

"Missile boats. Torpedo boats. I had half a convoy blown out from under me by them once."

Blank looks met startled ones. "Are there any around"?

Braun cast an oblique look at Bjorklund. "The Stellar Union didn't have trouble finding any, once upon a time. I'll get some."

As Sudden Smith limped out of the meeting, the officer who had annoyed him was remarking, in a voice full of amazement, "He was actually going to *hit* me."

"No," corrected the Verific, to whom he was complaining, "he was going to kill you."

Smith pretended not to hear and continued on his way.

Outside, Christopher Marlowe Paxton caught up with the ex-Captain of Sagittarius Spacelines' *Camelot*. "What kind of a damnfool stunt are you trying to pull?" he demanded. "Are you trying to get yourself killed?"

"Somebody's got to do it," Braun answered defiantly.

"All right, but why you? Who's going to command the *Camelot* while you're gone?"

"You'll find someone."

"Will I find another prospective son-in-law if you don't come back?"

"Hah!" Braun said bitterly.

The older man looked hurt, confused. "Did I do anything wrong, say something...?"

"Huh?" It was Braun's turn to look startled. "No, of course not. No."

"You and Nola have a fight?"

"Why don't you ask her?" the younger man called, moving away despite Paxton's efforts to restrain him.

Muttering, Christopher Paxton turned and caught sight of Smith a few meters away. "Don't you and Ameena have a daughter," he suggested sourly.

Smith did not reply.

Side One (Player): Missiles: 15,6,15 Torpedos: 25,35

Player One (Orion colonies):

1. *Greylace*-MB: E-3,0; D-3,0; B-0,0; S-0,0; A-2; L-2,0; M-16,0; T-0,0; X,Y-10,0(3,0) BQ-0
2. *Sacred Chao*-MB: Same as #1
3. *Scorpion*-TB: E-3,0; D-3,0; B-0,0; S-0,0; A-2; L-2,0; M-4,0; T-6,0; X,Y-10,30(3,17); BQ-0
4. *Erinye*-TB: Same as #3 except X,Y-10,5 (3,4)

Player Two (Stellar Union):

5. *Marathon*-C(W): E-16,0; D-9,0; B-0,0; S-10,0; A-2; L-5,0; M-40,0; T-10,0; X,Y-7,15 (1,13); BQ-0
6. *Starstreak*-CA(B): E-28,0; D-10,0; B-15,0; S-10,0; A-2; L-0,0; M-0,0; T-0,0; X,Y-7,20 (1,8); BQ-7

Side Two (Computer): Missiles: 13,7,17 Torpedos: 22,25

1. Klaatu Defensive Satellite: E-16,0; D-2,0; B-10,0; S-4,0; A-0; L-4,0; M-20,0; T-4,0; X,Y-20,0(15,0); BQ-4
2. Klaatu Defensive Satellite: Same as #1 except X,Y-24,0 (18,0)
3. Klaatu Defensive Satellite: Same as #1 except X,Y-28,0 (21,0)
4. Klaatu Defensive Satellite: Same as #1 except X,Y-32,15 (24,10)
5. Klaatu Defensive Satellite: Same as #1 except X,Y-36,28 (27,17)
6. Klaatu Defensive Satellite: Same as #1 except X,Y-40,4 (30,4)
7. Klaatu Factory Satellite: E-15,0; D-0,0; B-10,0; S-10,0; A-0; L-22,20; M-12,0; T-4,0; X,Y-49,15 (37,10); BQ-4
8. Klaatu Heavy Dreadnought ("the Juggernaut"): E-60,10; D-10,0; B-30,0; S-25,0; A-0; L-5,0; M-40,0; T-8,0; X,Y-49,16 (37,11); BQ-2

Special Rules: Tractor Beams are allowed. Players may *not* fire on ships on the same side (even if they're being run by a different player). The scenario may be played by one player (handling all the ships on Side One) or two, as indicated above.

Victory Conditions: For Side One to win, regardless of the number of players, Klaatu units #7 and #8 (G and H on the screen) must *both* be destroyed. The fate of Satellites 1-6 (or, indeed, the ships of Side One) is not relevant.

For the two-player game, Player One wins if Klaatu #7 (G) is destroyed before the Juggernaut; Player Two wins if Klaatu #8 (H) is annihilated before Klaatu #7 (G). But note that *neither* player wins if *both* of the Klaatu objectives are not destroyed.

Playing Time: 2-3 hours.

Notes: This, which might be called "Son of DEATHSONG" (for those of you familiar with the STARFLEET ORION scenarios), is arguably the most challenging scenario in INVASION ORION. If there is only one player, or if both players are cooperating, good use can be made of the cruisers' Pressor Beams to move the smaller MB's

and TB's, especially if the little ships' drives get damaged. Player One must be very careful in the early going, since a hit by almost anything will cripple a ship, and he cannot afford to use much ammunition on the lesser satellites. He must save some for his objective, and one or more of his ships will probably have to combine with the cruisers on some turns to attack the Juggernaut, which is, to say the least, not easy to stop. Player Two's best course, on the other hand, may well be to clean out the satellites on the way in. The beam cruiser must get reasonably close to do significant damage, but it must be protected from torpedo attack by the war cruiser's missiles. It is also, clearly, the concentrated attack of five missiles per turn from the war cruiser that has the best chance of blowing up the Juggernaut.

The "hits" on the Juggernaut's Energy and its low Beam Quality are to reflect its unfinished state. If the scenario is not balanced to your liking, you can add hits to the Juggernaut's Drive, Beam, Shield, or whatever, or, alternatively, eliminate those specified and raise its Beam Quality; subtract from X,Y-20,0 (15,0) or add to 44,0 (33,0) a satellite; or juggle the satellites' Beam Quality. Side One in general and Player One in particular can be strengthened by the addition of another Missile Boat. If you simply wish to vary the starting positions somewhat, you can enter a 0 (zero) as the Y coordinate of any of the ships on either side (except, really, Klaatu #7 and #8).

Since the movement of the satellites is so limited, reversing roles here is boring; also, it would slow the game considerably, since the computer (playing Side One) will be in no hurry to get to its theoretical objectives.

Scenario Nine: DAMOCLES

"Boom-a-lay, Doom-a-lay,
Look for the aliens'
New Sword of Damocles
Up in the sky.
Will it descend while we're
Hunting the Juggernaut?
Will it be Ragnarok?
Are we to die?"

—Anonymous double dactyl, common on Autarchia, 163 E.E.

"Damocles had nothing on us."

—Graffito from the same period

Side One (Computer): Missiles: 13,7,17 Torpedos: 22,25

1. Klaatu Light Battleship: E-35,0; D-11,0; B-15,0; S-15,0; A-0; L-5,0; M-40,0; T-10,0; X,Y-15,30 (27,19); BQ-6
2. Klaatu Light Battleship: Same as #1 except X,Y-15,10 (35,4)
3. Klaatu Battleship: E-44,0; D-12,0; B-20,0; S-18,0; A-0; L-4,0; M-28,0; T-6,0; X,Y-12,25 (32,17); BQ-6
4. Klaatu Battleship: Same as #3 except X,Y-12,15 (35,9)
5. Klaatu Dreadnought: E-50,0; D-14,0; B-25,0; S-20,0; A-0; L-5,0; M-36,0; T-6,0; X,Y-10,20 (34,13); BQ-6

Side Two (Player): Missiles: 15,6,15 Torpedos: 25,35

1. "Autarchia"-planet: E-560,500; D-25,0; B-30,0; S-30,0; A-5; L-210,200; M-60,0; T-10,0; X,Y-40,18 (7,6); BQ-4
2. *Gilgamesh II*-FF: E-3,0; D-2,0; B-3,0; S-0,0; A-0; L-1,0; M-0,0; T-2,0; X,Y-40,18 (7,6); BQ-5

3. *Enkidu*-FF: Same as #2
4. *Camelot*-B: E-27,0; D-10,0; B-15,0; S-10,0; A-3; L-2,0; M-16,0; T-4,0; X,Y-40,18 (7,6); BQ-5
5. *Shangri-La*-B: Same as #4
6. Satellite: E-15,0; D-0,0; B-10,0; S-5,0; A-2; L-2,0; M-16,0; T-6,0; X,Y-28,10 (21,3); BQ-7
7. Satellite: E-25,0; D-0,0; B-12,0; S-10,0; A-3; L-3,0; M-20,0; T-6,0; X,Y-32,25 (14,14); BQ-7
8. Asteroid: E-31,20; D-0,0; B-0,0; S-0,0; A-2; L-0,0; M-0,0; T-0,0; X,Y-32,0 (15,0); BQ-0
9. Asteroid: E-65,50; D-0,0; B-0,0; S-0,0; A-2; L-0,0; M-0,0; T-0,0; X,Y-28,0 (20,0); BQ-0

Special Rules: Tractor Beams are allowed/required.

Victory Conditions: Autarchia must survive (with at least one point of Energy) for you to win. A case in which some ships or satellites survive, but Autarchia is destroyed along with the Klaatu, can only be considered a draw (at best).

Playing Time: 2-4 hours.

Notes: The asteroids are simply decoys that may draw the fire of the Klaatu for a turn or two; they are used to simulate the fact that Autarchia's "satellite" defenses would be hidden on and among similar chunks of rock. The tiny fighters are short-lived but can be valuable weapons if used correctly: you must employ the planet's powerful Pressor (Tractor) beams to hurl a fighter across the screen to a point from which, on the same turn, it can fire a torpedo at the undefended Klaatu flank or rear. Autarchia's Tractor/Pressor Beams can also be used to push an attacker out of missile range or, conversely, to pull the Klaatu within range of the planet's barrage.

If you want the computer to play Side Two, it will do a better job if you place the ships away from the planet in a vertical line or crescent. Since it does not utilize Tractor Beams, it gets something less than maximal use out of the fighters, but you may find it amusing to destroy a planet once in a while.

If, playing normally (with the computer on Side One), you persist in stomping the Klaatu, give them another light battleship at X,Y-17,5 (23,20).

Scenario Ten: JUDGMENT DAY

"Neither of you have to stay, you know," Brigham Young Barr, Captain-Admiral of the "fleet" of New Zion, said gravely.

Alberto Maria Rodriguez y Lopez y Jones, Captain of the cruiser *Wyvern*, negligently waved a hand containing a glass of cognac and what passed for a cigarette on Nueva California. "It is like old times, no? Starfleet Orion lives again in us, at least for the time. I stood by you then, and you me; I'll stand by you here."

Athena's Captain Giuseppe d'Aquili nodded shortly. "This is as far as I promised Aurore I would go. Her daughter is here, now, and I'll stay. My crew feels the same: we've got a lot to pay back."

Despite the grimness of the occasion which had brought them together, the atmosphere was not somber. A pile of logs blazed cheerily in the large stone fireplace, and, in the last orange rays of the dying sun, the dark wood of the den gave the big room an air of quiet serenity. The overstuffed, leather-clad chairs were comfortably soft, and the cognac (imported, of course) was as fine as anything distilled on Earth. Their host was a strict enough Mormon to be drinking mineral water, but not so strict as to deprive his guests of their pleasures.

"What do you think of our chances of stopping them?" asked d'Aquili, after a time.

"Not good," said Barr frankly, "not unless reinforcements from the Stellar Union arrive."

"I would not count on the Stellar Union," said Rodriguez.

"I don't, despite the Society of Truth. Nor," he added, "do I count on seeing another spring planting."

"That bad?" said Rodriguez doubtfully. "Not even with our ships, and your planet's defenses, and your two new battlecruisers, which are bigger and faster than the *Griffin* you lost to the Union?"

"Not when they're smaller than the least of the nine ships Captain d'Aquili says attacked Whistlestop."

"Just Joe," said d'Aquili.

The other two smiled politely. "Of course."

Silence, stretching like the shadows on the wall, was broken by a log's falling in a shower of sparks. Then Rodriguez remarked, "I think, if we make it through, I will introduce my son to the little girl. He is...what...fifteen standard years now; in a few more, he may be old enough for her."

D'Aquili looked at him curiously. "She's only ten."

Rodriguez nodded. "Yes. I have seen."

"Oh. Yes, she does have something of her mother in her."

"So you have said."

"I believe that deserves a toast," said d'Aquili, standing up. When the other two men had joined him on their feet, he continued, "To Lora de Londres. May she be allowed the chance to grow up to be half the woman her mother was."

"*Viva!*"

"Amen."

Three glasses smashed into the fireplace.

Side One (Computer): Missiles: 13,7,17 Torpedos: 22,25

1. Klaatu Light Battleship: E-35,0; D-11,0; B-15,0; S-15,0; A-0; L-5,0; M-40,0; T-10,0; X,Y-31,32 (7,20); BQ-6
2. Klaatu Light Battleship: Same as #1 except X,Y-32,4 (25,2)
3. Klaatu Light Battleship: E-35,6; D-11,1; B-15,3; S-15,3; A-0; L-5,0; M-40,10; T-10,3; X,Y-23,22 (19,18); BQ-6
4. Klaatu Light Battleship: Same as #3 except X,Y-25,14 (23,14)
5. Klaatu Battleship: E-44,0; D-12,0; B-20,0; S-18,0; A-0; L-4,0; M-28,4; T-6,1; X,Y-25,26 (15,19); BQ-6
6. Klaatu Battleship: Same as #5 except X,Y-26,10 (24,10)
7. Klaatu Dreadnought: E-50,0; D-14,0; B-25,0; S-20,0; A-0; L-5,0; M-36,5; T-6,1; X,Y-28,29 (11,20); BQ-6
8. Klaatu Dreadnought: Same as #7 except X,Y-29,7 (25,6)
9. Klaatu Dreadnought: Same as #7 except X,Y-22,18

Side Two (Player): Missiles: 15,6,15 Torpedos: 25,35

Player One (Orion colonies):

1. "New Zion"-planet: E-560,500; D-25,0; B-30,0; S-30,0; A-5; L-210,200; M-60,0; T-10,0; X,Y-46,20 (4,4); BQ-4
2. *Athena*-DD: E-12,0; D-6,0; B-5,0; S-4,0; A-1; L 2,0; M-12,0; T-2,0; X,Y-46,20 (4,4) BQ-5

3. *Wyvern*-C: E-20,0; D-9,0; B-10,0; S-6,0; A-2; L-3,0; M-16,0; T-6,0; X,Y-46,20(4,4);BQ-5
4. *Faith*-BC: E-34,0; D-13,0; B-20,0; S-10,0; A-1; L-2,0; M-16,0; T-4,0; X,Y-46,20(4,4);BQ-5
5. *Independence*-BC: Same as #4

Player Two (Stellar Union):

6. *Arbela*-C(W): E-16,0; D-9,0; B-0,0; S-10,0; A-2; L-5,0; M-40,0; T-10,0; X, Y-4, 13 (38,19); BQ-0
7. *Firestorm*-CA(B): E-28,0; D-10,0; B-15,0; S-10,0; A-2; L-0,0; M-0,0; T-0,0; X, Y-7, 10 (39, 16); BQ-7
8. *Hellstorm*-CA(B): Same as #7 except X,Y-10,7 (39,13)
9. *Ragnarok*-BB: E-38,0; D-12,0; B-20,0; S-11,0; A-3; L-3,0; M-16,0; T-6,0; X, Y-13, 4 (39,10); BQ-5

Special Rules: Tractor Beams are allowed/required. Players may *not* fire on ships on the same side (even if they're being run by a different player). The scenario may be played by one person (handling all of Side Two) or two, as indicated above.

Victory Conditions: For Side Two to win, regardless of the number of players, New Zion must survive (with at least one Energy point). If two are playing (against the computer), Player One gets one point for each point of Energy remaining on New Zion; Player Two gets fifteen points for each Stellar Union Ship that has at least one Energy point left. (But remember that Player Two cannot win unless New Zion survives. An even moderately passive strategy on the part of the Stellar Union will lead to a Klaatu victory.) Wiping out the Klaatu but losing New Zion is a draw.

Playing Time: 3-4 hours.

Notes: The "damage" (mostly expended ammunition) on Side One is nothing more than the simplified results of a game of Scenario #7. Use your own actual results if you prefer. Eliminating all such damage will, of course, strengthen the Klaatu slighlty. To weaken either faction of Side Two, you can substitute a lesser ship, insert damage where appropriate, decrease Beam Quality, and/or reduce the power of missiles and torpedos, although this last measure will tend to slow down an already long game, and it will not, of course, alter the balance *within* Side Two.

The computer can do a somewhat better job with Side Two here than in Scenario #9, but, again, if you reverse roles remember to move the ships off the planet before starting the game.

The Ships of the Klaatu

	Energy (E)	Drive (D)	Beam (B)	Shield (S)	Armor (A)	Launch Tubes (L)	Mssl (M)	Torps (T)	Mass	Value Points
Heavy Dreadnought	60	10	30	25	0	5	40	8	4	144
Dreadnought	50	14	25	20	0	5	36	6	3.5	126
Battleship	44	12	20	18	0	4	28	6	3	108
Light Battleship	35	11	15	15	0	5	40	10	2.67	96
Battlecruiser	35	13	20	10	0	4	24	4	2.5	90
Heavy Cruiser	27	10	13	10	0	4	24	4	2	72
Cruiser	24	9	11	8	0	4	20	4	1.75	63
Light Cruiser	20	9	10	6	0	3	16	4	1.5	54
Heavy Destroyer	16	7	8	5	0	3	16	4	1.25	45
Destroyer	12	6	5	5	0	3	16	2	1	36
Corvette	7	4	0	4	0	3	16	4	.67	24
Satellite	16	2	10	4	0	4	20	4	1.19	43

The Ships of the Orion Colonies and the Stellar Union

	Energy (E)	Drive (D)	Beam (B)	Shield (S)	Armor (A)	Launch Tubes (L)	Mssl (M)	Torps (T)	Mass	Value Points
BB Battleship	38	12	20	11	3	3	16	6	3	95
B Pocket Battleship	27	10	15	10	3	2	16	4	2.33	74
BC Battlecruiser	34	13	20	10	1	2	16	4	2.5	86
CA Heavy Cruiser	23	10	12	8	2	3	16	6	2	65
C Cruiser	20	9	10	6	2	3	16	6	1.75	57
CL Light Cruiser	20	9	10	5	1	2	12	4	1.53	52
CA(W) Heavy War Cruiser	18	10	0	11	3	5	40	10	2	62
C(W) War Cruiser	16	9	0	10	2	5	40	10	1.75	57
CL(W) Light War Cruiser	14	9	0	8	2	4	32	8	1.5	49
CA(B) Heavy Beam Cruiser	28	10	15	10	2	0	0	0	2	65
DL Heavy Destroyer	15	7	7	4	2	2	12	2	1.25	41
DD Destroyer	12	6	5	4	1	2	12	2	.97	34
DE Frigate	10	5	5	2	1	2	8	2	.81	28
DE(T) Torpedo Frigate	10	5	5	2	1	2	0	6	.81	28
DE(M) Missile Frigate	10	5	5	2	1	2	12	0	.81	28
CV Corvette	7	4	5	0	2	2	8	0	.67	21
GB Gunboat	6	3	5	0	2	0	0	0	.47	15
TB Torpedo Boat	3	3	0	0	2	2	4	6	.42	13
MB Missile Boat	3	3	0	0	2	2	16	0	.42	13
FF Fighter	3	2	3	0	0	1	0	2	.28	10
F Interceptor	2	1	2	0	0	0	0	0	.14	5
TT Transport	2	2	0	0	0	20*	0	0	.67	6

***Note:** Since the cargo capacity (represented here as Launch Tubes) of a transport does not reflect its ability to sustain damage, much of its bulk is "dead mass," and its Launch Tube entry is normally 20,18 (i.e., 18 hits).

3.5 DESIGNER'S NOTES

The Klaatu were designed both to explore the possibilities of armorless ships (a feature of the earliest versions of STARFLEET ORION) and to complement the computer's decision models. Since the computer, for instance, tends not to fire its maximum possible missiles, the Klaatu were given more launch tubes to encourage the computer to fire more than just defensive missiles. The large "near-miss" factor of the missiles was put in to alleviate the computer's difficulties (particularly at the Beginner and Intermediate levels) in hitting a target.

The computer's inability to use Tractor/Pressor Beams (which would have complicated its decision processes enormously), along with its other limitations, meant that its aim would always be straightforward destruction; if flight was to be involved, it had to be on the part of the human player. This had its compensations, however; for instance, the computer can be "fooled" or decoyed away from its "true" objective. Scenarios #5 and #9 show this in opposite ways. Furthermore, while a human opponent would ignore Autarchia's innocent asteroids after the first game (at least), the computer is as likely to fall for the trick in the tenth game as it is in the first.

With very small numbers of ships, the computer can pretty much hold its own, but in larger scenarios it must be given more and more of an advantage. This is partly due to its lack of Tractor Beams, partly to its failure (usually) to make use of its full potential, and partly because it cannot really coordinate the actions of a large number of ships. The computer's decisions are tactical, not strategic; it cannot conceive of an overall plan; nor can it detect one when a human opponent is carrying one out.

While INVASION ORION was designed with a computer opponent in mind, INVASION Scenarios #1, #2, #3, #4, and #6 all make reasonably balanced two-person games. A person playing the Klaatu in Scenario #5 would also have an edge unless the Victory Conditions were changed. The Klaatu player would also have an advantage in Scenario #9, though it would certainly be playable. Scenarios #8 and #10 could be played by two or three people, but, particularly in the three-person version, the Klaatu in Scenario #10 ought to be toned down a bit. Scenario #7, unfortunately, would be hopelessly unbalanced.

It is possible to use the twelve STARFLEET ORION scenarios with INVASION ORION, although not all work equally well as solitaire games. The computer could play either side of INTRO, STAR FOX, VIKING, SPRING, and FLANDRY. The others aren't so straightforward, though the computer could manage Side One of BLOCKADE-RUNNER and ARMAGEDDON and Side Two of RED SUN (particularly if the ships started offplanet) and DEATHSONG (though the flavor would be different). The ships in AMBUSH and CONVOY are really too small, and RELIC is simply impossible.

3.6 NOTES ON TACTICS

The first rule of tactics in INVASION ORION is *concentration of force*. This does not mean you should cluster your ships together; you shouldn't. It does refer to the firepower you bring to bear on a target. Because the ships of the Klaatu are usually larger and more powerful than those you will be maneuvering, and, particularly, because of the size of their shields, going one-on-one with simple beam attacks is a losing proposition. One or two beams fired from a distance of, say, 15 "spaces" or more will probably not overcome a Klaatu shield unless you can, in the same turn, score missile or torpedo hits on the same ship. An attack of 30 or 40 points every other turn is much more effective than 15 or 20 points each turn.

Since the Klaatu ships have no armor, even the relatively small beam of a destroyer can make a significant contribution to the task of overwhelming a Klaatu shield. By the same token, a missile attack that results in several simultaneous near-misses can be bothersome to a battleship of the Stellar Union but very dangerous indeed to one of the Klaatu craft. Remember, too, that a single missile can damage two or three (or more) ships if they are close enough. Try to keep your ships a safe distance apart, and take advantage when the Klaatu drift together.

It is difficult to combine missile and torpedo attacks in the same turn (against the same target; it is, of course, easy enough to fire at different targets), since a torpedo may home in on a missile (even one in the same space as the ship you're firing on) and explode harmlessly. The easiest way to combine the two is to fire missiles three spaces off the torpedo line to one side of the target ship (or both sides, if enough missiles are available). In this manner, if the ship escapes the torpedo, it may run into the missiles. (Obviously, the more missiles that can be brought to bear, the likelier this is to work.)

It is generally the case that if you can hit a ship with a torpedo, it can hit *you* with one. There is an exception, however. Consider the following case (figure 3) where * is a missile (or, for that matter, an asteroid or other object you don't mind getting hit); A is an enemy ship; 1 is your own; and the numbers in parentheses indicate the positions relative to your ship:

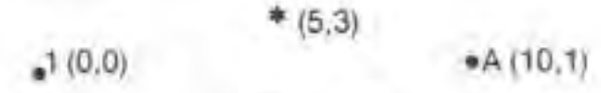

Figure 3

A torpedo fired from Ship #1 would strike A (unless additional defensive missiles were involved, which we have not assumed), but Ship A's torpedo fired in return would home in on the missile (which is within 2 spaces of A's torpedo line but not 1's). This technique can, with a bit of skill, be combined with that mentioned in the previous paragraph. Since you can't *know* where a Klaatu ship is moving or whether it will fire a defensive missile, neither technique is foolproof.

For a more general discussion of tactics, see the relevant section in STARFLEET ORION.

4.0 DECISION MODELS

How do you make a computer into an intelligent opponent? Particularly, how do you do that when there are a large number and variety of decisions to make and when these are not binary, yes or no, decisions? This is the problem in computerizing one side in the STARFLEET ORION game system. The objective of course, is not to have a program that optimizes play, but one that can give a good account of itself against a human opponent.

Approaching the problem anthropomorphically, the first key element in arriving at a move is establishing some notion of where the opposing ships will move. A player then chooses the targets of his attacks, moves his ships, and determines the kinds and extents of the attacks he will make. Layered on top of this are defensive maneuvers and weapons employments to evade the opponent's attacks and to confuse him. Even for a human player, such defensive maneuvers are somewhat random which is fortunate, since the computer readily does things randomly. The

decision process can logically be divided into four parts: projecting where the opponent will move, determining one's own move, allocating attacks, and making defensive maneuvers. Assume the overall objective is the destruction of the opponent.

The computer decision models are too lengthy, involved, and full of special cases to attempt to walk through the processes in the sense that a flowchart would. Rather, a general overview of the major decision areas is included followed by a discussion of several of the more interesting algorithms involved in the processes.

4.1 GENERAL DESCRIPTION OF THE MODELS

4.1.1 Solution of the Tracking Problem: Determining where the opponent's ships will move is a tracking problem. It's solution is fundamental to calculating the computer's move, choosing the weapons it will fire, and choosing targets. A simple inertial model can be used to predict a ship's position at time t, from known positions at previous times. See equation (1).

$$x_t = a_1 \times t-1 + a_2 \times t-2 + a_3 \times t-3 + \ldots \quad (1)$$

The coefficients a_i are weighting factors that sum to 1. They are used to make the older information less important than the more recent information. A similar equation can be used to predict the y coordinate.

Since movement in the STARFLEET ORION game system is non-inertial, the issue that immediately presents itself is whether it is valid to use an inertial tracking technique. Consider another essentially non-inertial movement system—a human walking. An inertial tracking equation will predict your movement when walking fairly well (at least on average and for short distances) not because of the character of the locomotion, but because of the underlying purpose of the walker. A drunkard's walk cannot be predicted, but yours can—you have a destination. Since the ships in a scenario will have an underlying purpose, the computer can use its inertial model. It can take advantage of the fact that it is playing against a human.

Looking ahead, critical in a chess or checkers sort of game, is neither feasible, nor terribly important in ORION. First, our tracking model is only valid for one or two turns ahead, both because of the non-inertial drives and also because everything is moving every turn, so the situation is fluid. Second, and perhaps more important, the ORION game system is probabilistic rather than deterministic. When we (the computer) do something, we can never be sure of the result. Consequently, the number of attainable states of the universe is incredibly large. Although a human player can set intermediate objectives toward attainment of an ultimate objective, the computer is pretty much constrained to play one turn at a time; it lives for the moment. The resulting play, however, is not necessarily very different from what a human player, attempting to look ahead, might do.

4.1.2 Determing Movement for the Computer's Side: To destroy an opposing ship in STARFLEET ORION, it's generally best to get in close, certainly within missile range, and, for beams, the closer the better. That says march to the sound of the guns—blast straight toward the enemy. Well, you need to be somewhat more subtle and unpredictable than that or your opponent will blast you, rather than vice versa. *Those* considerations are discussed under defensive tactics.

The problem remains, though, assuming there is more than one of "him," which "him" do you go after? Consider the decision criterion: choose the enemy ship nearest to the friendly center of mass. This is really nothing other than old Nathan Bedford Forrest's dictum about concentrating your efforts (getting thar' fust with the most). That criterion means the computer will try to concentrate his forces on the enemy ship closest, on average, to all of his ships. That's not a bad tactic for a human player to follow.

4.1.3 Offensive Tactics: Each of the computer's ships, in general, has three offensive weapons systems with slightly different decision requirements. The computer must select a target for its beam and the power to be allocated. It must select a target for missile attacks and the aim points for each of the missiles. It must select the aiming direction for torpedos. For both of the latter two systems, it must take into account the danger to its own starships. In all weapons, however, it is better to concentrate on a few targets rather than spreading the effort over many targets.

Beam targets are selected by finding the target most of the ships are most likely to hit and damage. On average, the computer will find the best target to engage. If one of the computer's ships is particularly close to a different human ship, the latter can be that ship's target since a "very close" target is vulnerable, even if no one else is firing on it.

To take advantage of the possibility of overwhelming a ship's shields, the computer will aim its missiles where it is firing its beam. The missile impact points will be randomly, but not uniformly, distributed around the target's last position. They will be most dense near the projected position, but can be aimed anywhere the target ship might end up.

The computer handles topedos somewhat differently, since one generally does not fire missiles and torpedos at the same target in one turn. If the computer elects to use its torpedos, it will fire no missiles (except possibly defensively). It also avoids firing in a direction where one of its own ships is present.

4.1.4 Defensive Tactics: Defensively, the computer does three things:

(1) puts a random component into its move,

(2) fires defensive missiles to intercept possible torpedos,

(3) energizes the shields on its ships.

Introducing the random component makes the computer less predictable overall, but is primarily a countermissile tactic. Similarly, defensive missiles are used solely to parry torpedos. The computer just puts out a missile along the most likely torpedo line in view of the positions anticipated for the enemy ships. Finally, since there is generally residual energy left after the computer has energized its offensive systems and drive, all of this energy is made available to the shield.

4.1.5 Levels of Play: INVASION ORION provides you with three levels of skill for the computer's play. These different levels are achieved by improving the quality of the "hunches" the computer has about what the human player is going to do. Since it's hard for the computer to come up with a real hunch, these are derived by using part of the information about where the human actually ordered his ships to move. For instance, instead of equation (1), the predicted position becomes:

$$x_t = a_h x_h + a_1 x_1 + a_2 x_2 + \ldots \qquad (2)$$

The h term is simply derived from where the human has ordered his ships to move. Similar information can be used about torpedo and missile firings. Obviously, the computer should not use all of the information available. That would result in perfect knowledge and a short game. Using some information, however, simulates good intuition.

4.2 SPECIFIC ALGORITHMS

4.2.1 Beam Target Selection: To select a beam target (for the fleet), the computer determines the hit probabilities for each potential target (P_{ij}, the probability of the beam from $_i$ hitting $_j$). It then chooses its target based on the sum of the hit probabilities for each potential target as compared to the cumulative probabilities for other potential targets. An inverse square term for the distance introduces the strong dependence of damage on range.

$$\text{probability of selecting target }_i = \frac{\sum_j (P_{ij}/d_{ij}^2)}{\sum_i \sum_j (P_{ij}/d_{ij}^2)} \qquad (3)$$

where $_j$ ranges over all ships on the computer's side. On average, this will select the target with the highest probability of being hit by the most and closest ships. At the same time, it is not obvious to the human player which target the computer will select.

4.2.2 Missile Targeting: In the case of missiles, each starship will select either the general beam target or it will select the target it is firing on. Given the number of missiles to be fired for the turn, the computer will try to position them where its target is likely to move. The possible moves for the target are contained in a circle of radius d, centered about its starting position P_S, where d is its maximum possible move (see figure 3). The most likely spot within the circle is P, the predicted position, at a distance R and angle φ

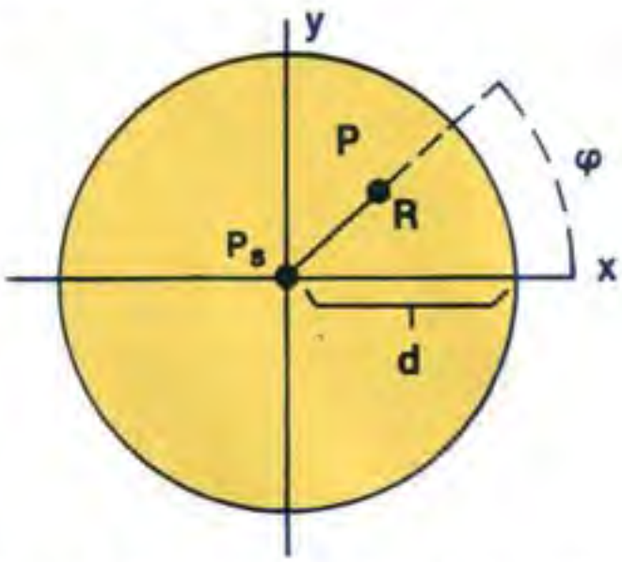

Figure 4. Selection of Missile Aim Points

The computer distributes the available missiles within the circle, but the distribution is not uniform. It peaks at point P. To achieve this, the computer picks points at a distance from P of r, distributed either on the interval R to d or on 0 to R. Again, this is a nonuniform distribution tending toward R in both cases.

Likewise, the angular distribution is nonuniform. It peaks at the angle φ, and is uniform on cosine squared.

$$\varrho = \cos^2(\theta - \varphi) \text{ where } \varrho \text{ uniform on } [0,1] \tag{4}$$

4.2.3 Torpedo Direction: To determine a torpedo direction, the computer calculates a "goodness" for each possible direction based on the distance off the path of the projected positions of each of the human ships. For direction $_j$, the goodness is given by

$$G_j = \sum_i 10/|d_{ij} + 1| \tag{5}$$

Where d_{ij} is the distance of the $_i$th ship from the $_j$th line and $_i$ ranges over all human ships. A large negative goodness is added if one of the computer's ships lies on that line. The computer can then select the direction with the highest goodness.

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