

KRIEGBOT

The future of robotic combat vehicles

By Matt & Philip Eklund

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CONTENTS

Introduction

Dice

Hard Kills (how to win)

Templates

Designing Your Robot

Attack and Defense Actions

Sequence of Play

Special Rules

Combat Examples

Scenario Rules

Basic Game Scenarios

Expansion KriegBot

Expansion Scenarios

Science Behind the Game

INTRODUCTION

KRIEGBOT, the future of robotic combat vehicles. Secretly outfit your robot with weapons like railguns, EMP blasters, and chainsaws. Add a couple of systems like targeting computers, incendiary munitions, or radar. Mount all of this hardware on a unique chassis, like a hovercraft or a helicopter, and then team up and battle it out with other kriegbots on a tactical terrain map.

KRIEGBOT is a game for 2 to 6 players, which takes an hour or two to play. It is designed by Matt Eklund of Sierra Madre Games. It comes with rules, 6 plastic playing pieces, 40 plastic tokens, 92 design cards, 6 vehicle templates, 3 special dice, and 1 color map.

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See the Kriegbot Living Rules in the Download Section of www.sierramadregames.com (courtesy John Menichelli).

Questions? Search for Kriegbot in www.yahogroups.com, and post your questions and experiences there!

A freshet of steam from the coolant tanks rockets me out of the ground clutter, closing with the target still zigging between patches of forest. I spin up the gatling and take down an incoming missile. The target, a UFO-shaped hoverbot, stops dodging, obviously diverting engine power to its primary weapon, an awkward array of electronics. I close range and strafe its hull with a storm of 20mm incendiaries. It gratifyingly mushrooms into flame, but not before unleashing a powered up EMP blast. My cockpit erupts into a cacophony of klaxons and blinkers. I quickly land and prepare to reboot. But another robot clatters from the nearby forest. It's the hoverbot's partner, a hulking robotank... and it's got a chainsaw...

KriegBot is a team-based sci-fi game about machines of war, for two to six players. Each player assembles his robot using design cards. Some contain a human pilot, others run by artificial intelligence. The choice is yours.

Cutting Out the Cards. There are six sheets of card stock: three for team green and three for team yellow. Cut along the red solid lines. You should end up with the 46 green design cards, and 46 yellow design cards.

Robot, Disable, & Damage Markers. Included in your game are six figures for the six robotic vehicles. There are also about 20 orange disks, called disable markers. A design card with an orange disk on it can't be used. There are also about 20 black disks, called damage markers, which represent damage when placed on design cards.

Playing Surfaces. You can play Kriegbot on a hex map or in a miniatures setting. If the latter, see the "Miniatures" rules (p. 9).

Communications. In multi-player games, after the robots are designed, all communication between players must be open to every player; no secret notes or away-from-game meetings. (Everyone can decrypt each other's radios).

DICE

Your game includes three special six-sided dice, numbered from zero to five, rather than from one to six.

Note: Additional "Hard Dice", named for their debut in the game *Hard Vacuum*, are available from www.sierramadregames.com, product FMG4035. If you wish to use a standard 6-sided dice, read any roll of six as zero. Read all other results normally.

Add dice. A roll of 5 is a special case. Keep the original 5, then roll an additional dice and add it to the total. This new dice is referred to as an add-dice. Add-dice can generate further add-dice on a roll of 5; there is no maximum limit to any given roll. *All dice rolls in the game operate this way, without exception.*

Attack dice. Generally, when rolling an attack it is important not only to add up the values on the dice to see if you hit, but also to preserve the individual dice that have been rolled to see *where* you have hit. Short range attacks roll 3 attack dice, medium = 2 dice, and long = 1 dice. This is abbreviated on the weapon

cards as 3D6, 2D6, and 1D6, respectively. See the last example on p. 4.

HARD KILLS (How to Win)

AI Robots. A robot designed without a pilot system card is called an AI (artificial intelligence). An AI robot is destroyed if its *power core* is destroyed.¹

Piloted Robots. If your design includes a pilot card, your design is called a *piloted* robot. The robot and pilot are blown up if your power core is destroyed. The robot lies abandoned and lifeless if your pilot is killed or bailed-out.

Note: A robot with a disabled *pilot* or *power core* may not perform any actions except bail-out or reboot. A robot with a disabled *drive* must skip either its movement phase or reboot.

Unpowered Robots. A damaged power core leaves your robot unpowered! Each attack or defense action taken disables the card used. You cannot reboot or power up (p. 3).

TEMPLATES

There six vehicle templates:

Rocketbot Template

Pros. As a rocket, it is the fastest and hardest to hit. Shoots first and can strafe (special attack during movement). Moves over any terrain. Its drive (basically a big propellant tank of water) is easy to hit but resilient to damage.

Cons. Only has two systems. As a rocket, it must move first and can rotate only once. Very easy to get in an unfavorable position.

Note: the Rocketbot enjoys a special rule that allows it to switch to Biped status at the start of its movement phase. This gives it a movement of 2, and an extra rotation. It also makes it move and attack last, and disallows strafing.

¹ The **power core** includes the robot's batteries and capacitors, storing up to 80 MJ of energy. (For comparison, a Sears Lifetime auto battery can store up to 1 MJ.) If the core catastrophically releases its energy all at once, it would be the equivalent to detonating 4 to 20 kilos of TNT.

Helibot Template

Pros. Fast and hard to hit. Flies over all terrain. Can sideslip twice per turn. Can strafe. Lots of weapon pylons (3).

Cons. Moves early. Only one rotation per turn. Vulnerable drive and power core.

Hoverbot Template

Pros. Can move over water & sideslip twice per turn. Nice all-around turret.

Cons. Can't rotate while moving. Moves early. Can't enter woods or buildings.

Note: The Hoverbot enjoys a special rule that allows it to reface in any chosen direction after it has completed its movement phase (even if it rebooted or powered up).

Spiderbot Template

Pros. Drive is resilient to damage. Moves freely through woods. Rotates 3 times/turn.

Cons. Relatively slow and easy to hit. Its only pylon is rear-firing.

Robotank Template

Pros. Has a lot of systems (4). Has a 360° turret. Drive not slowed by damage. Moves freely through woods. Moves late.

Cons. Slow and easy to hit. Can only rotate once per turn. Shoots very late.

Robocar Template

Pros. Fast. Moves late.

Cons. Can only rotate once per turn. Can't enter woods. Drive vulnerable to damage.

Important: It is a disadvantage to move early, because generally all robots must move before any can shoot. Therefore, a robot that moves last will know exactly where its opponents will be when the shooting starts. Note also that a robot's maximum speed is important for its defense! Fast robots are hard to hit. Slow robots are easy to hit.

DESIGNING YOUR ROBOT

So you want to design a Kriegbot? Easy! After being assigned one of six templates, pick two weapons cards, one skin card, and usually three system cards to place on the template. That's it! You should secretly coordinate your choices with the others on your team, to make for the most effective combined-arms fighting unit.

Slots. The named areas on your template are called *slots*. Design cards are placed here: two *weapons* (rectangular cards), two to four *systems* (square cards), and one *skin* (skinny rectangle). There are two slots with a dashed perimeter. One is rectangular, with a circular bite, that is your *drive*. Drives are integral with the template, so no cards are placed here. The other is shaped like the Star of David, which is for your *power core*. Unless you are playing the expansion, no card is placed here either.

Secrecy. To design a robot, fill up the weapon, system, and skin slots, using design cards of the appropriate shape. Robot designs are done in secret. Place design cards face-down on your template, so your opponents will only be able to note your template, not your cards.

Note (disclosure): *You need reveal a card only when you receive a benefit from it, or use it in any way. Once a card is revealed, it remains face-up, able to be inspected by any player for the rest of the game. You should not reveal an unused item, even if it is damaged or destroyed!*

Items. The slots for weapons, systems, the drive, and the power core are referred to as items. The skin is not an item (unlike items, skins can't be disabled or damaged).

Note: *A pilot is optional, but no more than one may be taken.*

Pylons. Some of the system slots have a pointer indicating an arc of fire. These slots are called *pylons*. For instance, the "dorsal turret" on the Robotank is a pylon with a 360° arc. System cards with the "pylon



arc" icon (), should be placed only in pylon slots. (Otherwise, they have no arc and cannot use their attack medium.) Any system may be placed in a pylon, regardless if it has this icon.

Status. A marker in the *status bar* of your template indicates whether your robot is *powered up* (used its drive to energize its batteries this turn), *on fire* (ignited by an attack), or *painted*. The status bar starts with no markers.

Note (Biped status): *The Rocketbot has an additional status: "Biped". A marker here means that the Rocketbot chose to move and attack last, with a maximum speed of 2.*

ATTACK AND DEFENSE ACTIONS

You have one *attack* action and one *defense* action that you may use during your turn. Spent actions are recovered at the beginning of every game turn.

 Attack actions must be used during a robot's attack phase (unless it is used to reboot, strafe, or ram). A red triangle  on a function indicates that the robot's attack action must be expended to use that function.

 Defense actions can be spent at any time during a turn, and can interrupt another robot's movement or attack. The red shield  indicates that a robot's defense action must be expended to use that function.

Some attack or defense actions are marked with a star (), which designates them as electric actions. These icons are only used in the expansion game (see p. 14).

SEQUENCE OF PLAY

1. Movement Phase (all robots),
2. Attack Phase (all robots),
3. Status Phase (all robots).

Let's discuss these three phases in order:

1. MOVEMENT PHASE

Movement Order. Robots move in this order: Rocketbot (if not in biped status), Helibot, Hoverbot, Spiderbot, Robotank, Robocar, Rocketbot (if biped status).

Movement Options. When it is your turn to move, you may do **ONE** of the following five things:

1. Move. Move your robot figure up to the number of hexes indicated by its drive on its template. (These are the numbers in the squares, according to the number of damage markers on the drive.) You can rotate and *sideslip* (see next section) up to the maximum number of times listed on its template.

Note (Rocketbot): *The Rocketbot has two "Move" options: **rocket** or **biped**. As a rocket, it moves at the speed indicated by his drive, and is allowed one rotation. As a biped, it moves up to two hexes, and is allowed two rotations. Additionally, a marker is put into the "Biped" status, to show the reduced silhouette (of 2) throughout the turn. As a rocket, the Rocketbot*

both moves and attacks first, but as a biped, it both moves and attacks last.

2. Move plus Strafe/Ram. Same as the "Move" action except that you also use the Strafe or Ram special rules (p. 6). This is limited to certain robots, and costs your attack and defense action for the turn.

3. Maneuver. Without moving, rotate your robot to face any hexside. This costs your defense action for the turn.

Note: *Hoverbot doesn't have this option, since it can reface any hexside at the end of any of its movement options.*

4. Reboot. Immediately remove all disable markers from your robot (p. 1). This costs both your attack and defense action for the turn. Can't move or reface.

5. Power Up. Place a marker into the "Powered Up" position in your status. This allows use of all benefits

marked with an  icon on your item cards.² Remove this marker during the Status Phase. Can't move or reface.

Note: *With a disabled pilot or power core, your only movement option is #4 (reboot). With a disabled drive, you must skip your movement phase, or reboot (option #4).*

Moves and Rotations. If you select option #1 or #2, move your robot a number of hexes up to your maximum speed. With the exception of sideslipping (next paragraph) and reversing (using a special system card), you must enter the hex you are facing. Each template allows a certain number of hexside rotations, which can be used at any point during your move. These rotations do not cost movement points, which you expend only when entering a new hex. See the movement example on the last page.

Important (dancing): *When you choose option #1 or #2, you are not forced to spend any of your movement points. You can stay in the same hex without moving, and still get the silhouette benefits of moving, as long as you choose #1 or #2. This is called "dancing".*

² A **power up** means that the robot is using its drive engines as a generator to charge up its capacitors and batteries for use by its weapons and systems.

Sideslips. *Sideslipping* is moving into one of the adjacent hexes in front of you without changing facing. This costs a movement point because you are entering a new hex. The template (Hoverbot or Helibot) or design card (Hotshot pilot) specifies how many sideslips per turn are allowed. See the *movement example on the last page*.

Movement Restrictions. All hexes cost one movement point to enter, but certain drives cannot enter certain types of terrain, as specified on their template. Some must stop upon entering water hexes (they are still allowed to rotate). See the **terrain movement restrictions** on the last page.

Stacking. You can move through other robots, but cannot end your move in the same hex as another robot.

Paint Washing. If you end your movement phase in a water hex, remove "painted" and "on fire" status markers.

2. ATTACK PHASE

After all robots have moved, the *attack phase* begins. When your individual phase occurs, choose one of your available attack actions (marked with a ▲) to perform. Attack actions must be performed during your attack phase.

The only exceptions are Rebooting (movement option #3), and Strafe or Ram Attacks (p. 6), which are all performed during your movement phase.

Important: Each robot performs its attack phase in the same order as for movement (see above).

Attack Medium. Certain attack actions, labeled GUN, BEAM, BOLT, MISSILE, or MELEE, indicate the attack medium used against your target. Certain defenses work best against certain media. Regardless of the medium, each attack is resolved the same way. You determine if your target is in your *line-of-sight* and *firing arc*, calculate a number of *attack dice* based upon the range, and make your attack roll, which simultaneously determines *if* and *where* your target was hit.

Note: *If the weapon card says "robot", the attack affects robots only. But if it says "target", it affects all targets (robots, infantry, and buildings).*

Line-of-Sight. Declaring an attack requires designating a target within your 360° *line-of-sight*.

Woods and building hexes block line-of-sight. So do hills, unless either the attacker or target, or both, are on a hill. Measure from center of hex to center of hex, using a thread or straight-edge. Half hexes are included in the line-of-sight. *Being painted affects line-of-sight, see the matrix and example on the last page.*

Weapon Arc. Declaring an attack requires that the target be within your weapon arc. This arc is specified either on the card (for weapon cards) or on the template (for system cards). There are four arcs, each based upon your facing:

- 1° arc (used only during strafing, this is a line directly in front of your robot. See the arc diagrams on the last page.)
- 60° arc (half hexes are included)
- 120° arc (**Note:** the Spiderbot has a 120° pylon arc in the rear, coming from the three rear hexsides).
- 360° arc

Note: Your weapon arc does not include the hex you are in. See the arc diagrams on the last page.

Important: Some system cards contain weaponry.

These will have an arc labeled "pylon arc"  which means their arc is as listed on the slot in which the system is placed.

Attack dice. Once you have declared your attack, reveal your attacking card, count the range to your target (in hexes), and compare it to the range diagram on the card. This will determine the number of attack dice (3 dice for short ranged attacks, 2 dice for medium, and 1 dice for long).

Note: You are not allowed to attack at range zero.

Example: The weapon shown (Guided Missile) cannot attack at ranges 1 or 2, gets 2D6 when attacking at medium range up to 8 hexes, and gets 1D6 up to its maximum range of 18.

RANGE	2	8	18
not allowed	2D6	1D6	

Range Diagram

Silhouette. The higher a target's silhouette, the harder it is to hit. If a robot moved this turn or has not

yet had the opportunity to move, it defends with a base silhouette equal to its maximum speed as listed on its drive. (This slows down the instant the drive takes damage.) If the target had instead rebooted, maneuvered, or powered up, or its drive, power core, or pilot is disabled, it has a base silhouette of one.

Note: A base silhouette can be modified by various systems or capabilities (like Holo-blur, Chaff, & Silvered or Chameleon skin). It can also be modified by systems that change the maximum speed (like Jump Boosters or Reverse).

Example: You attack Helibot. It already has one damage to its drive, so its maximum speed is 3. If it has moved this turn, its base silhouette is also 3. Any other movement option would give it a silhouette of 1.

Defense Response. After committing to your attack, but before rolling any dice, check to see if any defender wishes to use his defense action  (if still unused this turn) or reveal any item to defend himself. Any action or item that affects the number of attack dice or silhouette must be revealed before the attack dice are rolled.

Attack Roll. If you have a choice on the number of times to attack (i.e., Gatling Gun, Guided Missile, or the expansion electric attack actions), announce this choice before rolling. Then roll your attack dice, these dice are collectively called the dice pool. If the sum total of all the dice in the pool is **equal to or greater** than your target's final silhouette, then you hit the target! Remember to include the add-dice if any 5's are rolled (see p. 1).

Example: You have two attack dice against your target. You roll a 0 and a 5. Because you rolled a 5, roll another dice. If this result is also a 5, roll a fourth dice. If this final dice is a 1, the sum of all four dice together is an 11. Your target, a Rocketbot with a silhouette of 8, is hit! The hit effect is according to the hit type, see below.

Hit Types. There are five types of hits, as listed on the card:

1 Damage. If hit, your target receives one damage marker in one of the locations rolled (attacker's choice, see Hit Location), placed directly on the card affected. (One-Damage weapons include the Free Electron Laser, Howitzer, Flail, Tesla Gun, Gatling Gun, Grenade Launcher, and Electrolaser).

Example: Your Grenade Launcher rolls a 1 and 2 in a medium range attack. If the silhouette is no greater than 3, you hit! Place a damage marker on your choice of location 1 or 2.

1 Damage (2 if doubles)³. As above, except that if you roll doubles (or triples, etc.), and you choose that number as the hit location, the location indicated receives two damage instead of one. (Includes TOW Missile, Mag Claw, Particle Beam Accelerator, Guided Missile, Rocket Pod, Bazooka, and the Recoilless Rifle).

Example: Your Bazooka rolls a 4, 4, and 3 in a short range attack, hitting your target. Since you rolled doubles for location 4, you have the choice of inflicting two damage to location 4, or one damage to location 3.

Note: Rolling two or more 5's does NOT inflict two damage, because 5 cannot be chosen as a hit location. For instance, a roll of 5, 5, 3 in a 1D6 attack would inflict one damage on location 3.

2 Damage. If hit, your target receives two damage markers in one of the locations rolled (attacker's choice). (2-damage weapons include Railgun, Chainsaw, Viral Bayonet, and Smoothbore "Sabot").

Burst. If hit, your target receives one damage marker in every location rolled by the attack dice. Each location only receives damage once, even if you roll a location more than once. (Bursts include EMP Blaster, Flamethrower, and Heavy Machine Gun.)

Example (Burst): Your Flamethrower rolls a 3 and 4 in a medium range attack. Locations 3 and 4 each suffer one damage (assuming a target silhouette no greater than 7). If instead you roll a 4 and 4, location 4 would be hit once.

1 Paint. If hit, your target's status changes to "Painted" if it was previously unpainted. (Weapons and systems that inflict 1 Paint include Radar, Targeting Laser, and Chemical Rockets (targeting gel)).

Hit Location. If you hit with a weapon that inflicts damage or disable markers, unless otherwise specified you choose which single dice in the dice pool will determine the hit location. The red numbers on the target's template show which cards are hit by

which number. For instance, here are the location numbers for the Robotank:

Roll of 0 = Hull

Roll of 1 = Drive

Roll of 2 = Secondary Weapon

Roll of 3 = Primary Weapon

Roll of 4 = Dorsal Turret

5 cannot be chosen as a hit location

Important (bleed through): If the slot in a hit location is empty (because the item there was destroyed or bailed-out), then any damage or disabled inflicted at that location bleeds through to the next slot. If that slot is also empty, it bleeds further. A white "bleed" arrow on the template shows where the hits bleed to. If an item is destroyed in an attack, extra hits inflicted in that attack also bleed through to the next location.

Example: You roll a 5, 5, 1, 4 against a Rocketbot. You can choose location 1 (drive) or 4 (warhead). Suppose the card in location 4 is missing. If you choose it, the damage bleeds through to location 2.

Note (disables): Certain weapons (Tesla Gun, Nemo Battery, some Chemical Rockets) inflict disable markers in locations of the defender's choice. The defender must choose locations that are not already disabled.

Hit Effects. The black disks indicate damage, and the orange disks indicate disabled. Here are the hit effects:

First damage marker = no effect on weapons or systems (except those marked "destroyed with one damage"). Place drive damage in the blue circle indicated on the drive, and the robot moves and defends at the reduced speed shown. One damage on a power core leaves the robot unpowered. (See "HARD KILL", p. 1).

Second damage marker = item destroyed, remove its card, along with all markers on the card.

Exceptions: A drive with two hits is NOT destroyed, but moves with the reduced speed shown on its card. After two hits (three for the Rocketbot), all drive hits bleed through to the power core, per the white arrows.

Note: A destroyed card is out of the game, (unless the "Clanking Replication" action is invoked, see the "Nano Glue" system).

³ These are armor-piercing rounds, such as shaped-charge and HEAT.

Note: If a pilot or the power core is destroyed, see "HARD KILL" (p. 1).

Disable marker = item inoperable. If a pilot, drive, or power core is disabled, see HARD KILL (p. 1). There is a maximum of one disable marker per item. Further disables inflicted on an item already disabled are wasted.

Paint marker = place a marker in the "painted" status position. This makes you easier to attack, see the Line-Of-Sight Matrix (last page). There is a maximum of one painted status marker per robot. Further paints are wasted.

Flame marker = place a marker in the "on fire" status position, with a maximum of one flame status marker per robot. Further flames inflicted are wasted. See next section for effects.

Note: After the attack roll, the defender may reveal cards or expend actions that modify the attack damage or location, or initiate a counter-attack (like Nemo Battery).

3. STATUS PHASE

Flaming Robots. If you have an "on fire" status, roll one dice (this is abbreviated "1D6"). If a 5 is rolled, no damage is applied, and your "on fire" marker is removed. Any other roll indicates a location that receives a damage marker.

Painted Robots. If you have "Silvered" skin, you may remove your "Painted" status marker (if any).

Powering Down Robots. Remove your "Powered Up" status marker (if any).

Biped Robots. Remove your "Biped" status marker (if any).

SPECIAL RULES

Strafing. Strafing allows you to attack during your movement phase, rather than your attack phase. There are some special requirements for performing a strafe attack:

- Available only to the Rocketbot (not in biped status), Helibot, or a robot using jump boosters.
- Costs both the attack and defense actions to perform.
- Must be performed with a GUN, BEAM, or MISSILE.

- May be used at any point during your movement phase.
- Must attack a target that is directly in line with the your facing at that moment; see the 1° arc diagram on the last page. (For the Spiderbot rear pylon, the attack is straight out the rear facing).
- Must roll one less attack dice.
- Your target defends with a base silhouette equal to its maximum speed, unless it has already done its movement phase and had chosen to reboot, power up, or maneuver (or its drive, power core, or pilot is disabled), in which case its base silhouette is 1.

Ramming. You may intentionally ram another robot only if it has a lower maximum speed, and it is either painted or within your line-of-sight at the beginning of the move. This expends your attack and defense actions. A collision costs one movement point, and you must end your move adjacent to and facing your target. You receive 1D6 damage on your 0 location, and your victim receives an equivalent number of damage in random locations. If one of the robots is destroyed in the collision, the other is now on fire.

Bail-Out. If your robot is piloted, you may decide to use your attack action to bail-out, as listed on your pilot card. If so, remove the pilot from the template, and he exits play (if playing with the expansion, he appears in an adjacent hex as infantry).

Note: If you have a Self-Propelled Recoilless Rifle, then your pilot may bail-out inside this system, using its "Phoenix-Bot" attack action. This destroys the vacated robot. The "Phoenix-Bot" lifeboat uses the pylon arc and drive characteristics that it had when it was part of your robot. The Phoenix-bot may deploy without a pilot as well. (It contains the AI.)

Targeting Structures. The TV towers, boat shed, gas station, dam, and bridge may be targeted using a base silhouette of 1. All of these except the dam and bridge are buildings that interfere with line-of sight (see last page). They are destroyed with two damage: 1st damage places a black marker; the 2nd damage places an orange marker.

- Destroying the **TV tower** closest to the opposing team's side means that team cannot communicate with each other.
- Destroying the **gas station** puts an on fire marker on all targets in or adjacent to that hex.
- Destroying the **dam** causes all robots in the flood plain to disable two items of their choice and take

one damage in a random location. Flood plain hexes become water hexes.

- A **bridge** allows a robot to ignore that water hex during movement. Destroying the bridge causes robots in that hex to receive a disable on two items of his choice.

Miniatures. If instead of a hexmap, a miniatures setting is used, each robot is moved using inches instead of hexes. Each rotation is 60°, use an angle template for this. Robots are not allowed to be so close that they touch each other. Ranges are also in inches, but you are not allowed to use measuring devices or threads until after you declare your attack. To determine arcs, use thread and stretch two straight lines starting from the corners of the robot's base. If any part of the target's base is within the area bounded by the thread, the target is within the arc.

COMBAT EXAMPLES

HOWITZER BARRAGE

Rocketbot thinks it is safe to switch to the maneuverable (but slow & easy to hit) biped status while behind a forest. But his opponent uses the power-up option of his Howitzer to ignore terrain. He rolls a 2, just enough to hit. He rolls 4D6 for locations of damage, rolling a 0, 1, 1, 3. Rocketbot then reveals his Electro-reactive skin, and sacrifices it to cancel that damage. He is immune from damage for the rest of the turn.

MAG CLAW CLAMP & ATTACK

Rocketbot moves first, but before he can move, the Robotank next to him announces that he is using his defense action to clamp with his Mag Claw. Rocketbot is stuck in that hex and facing. The tank has a Combat pilot, and during his attack phase, he makes a 3D6 attack using his Bazooka. Rocketbot defends with a silhouette of 8.

FLAMETHROWER STRAFE

Helibot moves two hexes behind Robocar. He wants to shoot before the car gets a chance to move away, so he announces that he is strafing with his Flamethrower. A medium range strafe rolls one attack dice. He has a Phased-Array Antenna, which adds one die (due to electronic steering). He rolls a 2, 4, totaling 6: barely a hit. The Flamethrower is a burst weapon, so each of these two locations takes one damage. However, Robocar reveals his Super-steel skin, which cancels the damage. But Robocar is not unscathed, as he still suffers an "on-fire" status marker.

CHEMICAL ROCKET & GUIDED MISSILE

Spiderbot announces that he is firing a chemical rocket with a targeting gel warhead against Robocar at range 9. The defender wants to use his Gatling's point defense action, but cannot since the attack comes from outside the Gatling's arc. The long range (1D6) attack rolls a 5, plus a 1 with the add dice. This is just enough to hit his target, which has a maximum speed of 6. Robocar is now painted. Spidey's partner Robotank, during its attack phase, uses its Guided Missile against the car. The missiles are allowed to attack, even from behind a hill, because the target is painted. Because Robotank chose to power-up rather than move this turn, he can select ripple-fire and make three attacks. The missiles come from within the arc of Robocar's Gatling gun, so he uses its point defense action to reduce these attacks by one attack dice (1D6). Therefore, each medium range attack rolls only 1D6 instead of 2D6. The car's silhouette against the missiles is one because it is painted. (The Guided Missile can only be used against targets that are painted or have moved this turn.) The first two missiles each happen to damage the Gatling gun, which is blown off with the second damage. Therefore, the third missile is allowed to roll 2D6, since the car no longer has point defense.

EXPLOSIVE CAPACITOR - EMP BLASTER

Hoverbot fires its EMP Blaster at a range of one. He expends his defense action and damages his explosive capacitor, which allows his blaster to attack as if powered-up (using its "Flux Compression" function). The six attack dice results are: 0, 1, 2, 4, 4, 4, disabling the Robocar target in its chassis, drive, primary weapon, and cupola. Note that the triple disable against location 4 (cupola) achieves only one disable marker. The Robocar happens to be missing its system card in location 0 (chassis), so this disable result "bleeds" to the power core. Thus the Robocar is deactivated until it can reboot or bail-out next turn.

PHOENIX-BOT BAIL-OUT

Robocar, badly mauled in the preceding examples, decides to bail-out its Combat pilot during his attack phase, using the "Phoenix-bot" function of his self-propelled Recoilless Rifle. This requires one attack action, per the bail-out rules. On the next Robocar movement phase, the Phoenix-bot may move six, using an undamaged subset of the original drive. (Imagine the engine and front wheels separating from the wreck and driving off.) This vehicle is armed with the Recoilless Rifle, plus the Bazooka of the Combat pilot. Both use their original pylon arcs, so if either weapon system was in a non-ylon slot, that weapon can't be used in the Phoenix-bot.

SCENARIO RULES

Most Kriegbot scenarios are two teams (Team Green and Team Yellow), each composed of 1-3 robots.

Template Assignment. To start a scenario, generally the six templates are shuffled and equal numbers are given to each team. The players on each team then choose (secret from the opposing team) which template they will use. They announce their choice before the Design segment.

Design. The Design cards are separated by color (yellow and green), and given to each team. Each team designs their robots in secret, and unused cards are put out of sight.

Map Setup. Unless otherwise specified, each team is randomly assigned a map edge (top or bottom). They setup in edge half-hexes of their choice (optional - setup in movement/combat order).

Fleeing. Unless otherwise specified, a robot may only exit off of its edge of the map.

Bombardment. If bombardment is specified, at the very beginning of the Status Phase, each painted robot is subjected to a 1D6 attack that does two damage if it hits.

Fragile Robots (optional). For a faster game, robots can be designated as Fragile. This means that weapon and system items take only one damage to destroy instead of two. Drives and power cores take damage normally.

BASIC GAME SCENARIOS

1. Showdown (2 to 6 robots)

After Drive Assignment and Design (see above), the two teams start at opposite sides.

Victory. First kill⁴. For piloted robots, a kill counts only if the pilot didn't bail-out & escape. Last active robot also wins.

Note:

2. Kill the Human (4 to 6 robots)

Each team may only field a single piloted robot. All other robots are AI robots. No robots may flee.

⁴ Exchange attacks which involve the destruction of robots from both teams (ramming, suicide nukes, etc.) do not count as first kills.

Victory. If a team's lone human is killed or bailed-out, the opposing team immediately wins.

3. The Honcho (2 to 3 players)

Team Green has two robots; Team Yellow has one piloted robot. This pilot is a honcho, a super-pilot who can use the attributes of all four pilot cards and is allowed two rather than one defense actions per turn.

If Playing the Expansion. The honcho can bail-out using one of the four pilot bail-out actions. Thereafter, he wears a holo-blur sneak-suit (adds two to his silhouette), and moves (only) during the Infantry movement phase, and attacks (only) during a phase that precedes all the robot's attack phases.

Victory. First kill. For piloted robots, a kill counts only if the pilot didn't bail-out & escape. Last active unit also wins.

4. Capture the Flag (4 to 6 robots)

In this scenario, robots attempt to escape the map carrying a flag marker.

Setup. After Drive Assignment, place an orange marker next to the gas station to represent the *flag*.

Special Rules

- A robot must immediately pick up the flag if it enters the flag's hex (take the flag marker off of the map and place it on the template of the flag-carrying robot).
- A flag-carrying robot is attacked as if he is "painted", even if it does not have a painted status marker.
- A flag-carrying robot that receives any damage markers (from enemy action), immediately drops the flag in the hex directly behind it (but not off the map). If there is a robot currently in that hex, it now carries the flag!

Victory. If a robot carrying the flag exits his side of the map, its team immediately wins.

5. Crypto Capture the Flag (4 to 6 robots)

This is the same as Scenario #4, except the game begins with no "Flag". Instead, any robot (or Phoenix-bot) destroyed is replaced by a crypto marker of its color (black or orange), representing its cryptography gear containing invaluable codes if stolen.

Targeting Crypto. Robots may attack a *crypto marker* (silhouette = 4), which is destroyed with one damage.

Victory. A team wins by exiting their side of the map carrying an enemy crypto. *Robots may pick up their own color crypto and exit their side of the map, but this is not a victory.*

6. When Cyborgs Rule (3 sides, 4 or 6 robots)

The cyborg masters of the world have split into two factions. One faction (the yellow minions) is controlled by a central supercomputer. Their rivals (the green samurai) are a coalition of mercenary warriorbots. Two recon squads of these factions meet in a field, each with orders to steal their opponent's crypto-gear, so that enemy transmissions can be decrypted. However, a human mole has infiltrated one of the factions, piloting a disguised robot by remote-control. He also has orders to steal any crypto-gear and deliver it to the human underground. There are three sides: the minions, the samurai, and the humans. It plays best with exactly four or six players, each with one robot.

Mole Assignment. Make a stack of system cards, all the same color, consisting of one pilot, and the rest non-pilots. There should be one card for every player. Each player draws one at random. One will have drawn the pilot; he is the mole. All the cards are returned and reshuffled, so that nobody else knows who the human mole is.

Design. All designs are unpiloted. (The human mole pilots his robot by remote control.)

Victory. This scenario plays with the rules of Scenario #4. There are three types of crypto markers: Samurai, Minion, and (secretly) Human. The game ends the moment any crypto is carried off the map. The Samurai win if they carry a Minion crypto off the Samurai map edge. The Minions win if they carry Samurai crypto off their side. The humans win if they carry crypto of any faction off of the OPPOSITE side of the map as the edge they started on. Any other result (for instance Samurai exiting the map with their own crypto, or Human crypto) is a draw.

7. The War of the Worlds (2 to 6 players)

An alien spaceship orbits Earth, and a landing craft touches down in the Rockies, disgorging alien warriorbots. The aliens do not respond to negotiations, so the Earthlings decide to destroy the landing craft which is generating power for the invaders. Unless this scenario is played with the expansion game rules, the aliens will have a small advantage.

Setup. Both sides get equal numbers of robots. During design, the alien player can have no pilots, and the human robots all must be piloted. The TV Tower on the alien side is the alien landing craft, which uses all building rules.

Alien Landing Craft. The Landing craft is armed with a Free Electron Laser, and has one attack action and one defense action per turn. It takes its attack action before any of the robots do. If it is destroyed, none of the alien robots can power up or reboot.

Orbital Bombardment. Until the landing craft is destroyed, the alien player may employ the Bombardment rules (p. 7).

Victory. First kill. For piloted robots, a kill counts only if the pilot didn't bail-out & escape. Last active robot also wins.

8. The Hacker (3 or 5 players)

An insidious hacker has managed to insert a Trojan Horse into the programming of the enemy robots. This hacker is able to send a modulated signal via laser beam to an inflicted target, and the compromised program responds by sending spurious signals to the various "fly-by-wire" systems of the target.

Setup. The hacker team gets one less robot than their rivals. One of their robots (the hacker) includes the Targeting Laser system in its design.

Hacking. If the hacker hits an opponent with his Targeting Laser, he may additionally immediately perform one attack or defense action using one of the enemy's revealed non-pilot items. He may, for example, use the enemy's Radar to paint another robot, or disable his Flamethrower to create a smokescreen. He may perform this even if the weapon has already been used this turn. The system or weapon used cannot be used by the enemy for the rest of that turn.

Artillery Bombardment. The Hacker side may employ Bombardment rules (p. 7) until the TV Tower on his side is destroyed.

Victory. First kill. For piloted robots, a kill counts only if the pilot didn't bail-out & escape. Last active robot also wins.

9. The Sharks and the Jets, 2108 (3 sides, 3 to 5 players)

In a future metropolis, the police are enforcing a truce between two warring gangs, the Sharks and the Jets. And yet the rival leaders are itching for a fight. This is a three way scenario, for either three or five players. The three sides are: the Police, the Sharks, and the Jets.

Design. The police player designs two robots, with his choice of drives. He may use components from either the green or the yellow items, or some of each. Then the other two players (Gang leader Bernardo of the Sharks and gang leader Riff of the Jets) perform drive assignation and design, using the cards remaining. If playing with five players, each gang gets two robots. If playing with three players, each gang gets one robot. Each side must choose one (and only one) unrevealed pilot.

Setup. The police setup one of their robots (Officer Krupke) anywhere on the map. The other (Robocop) is held in reserve off map. Then the two gangs set up on opposite sides of the map.

Street Legal Weapons. It is illegal to attack a robot with any weapon except MELEE and BOLT weapons (the latter are legal because they are generally harmless to humans). The Nemo Battery is also street legal.

Police Restrictions. Officer Krupke cannot attack any unit, until it has attacked or damaged him or has used an illegal weapon. The Robocop backup can shoot at anyone indiscriminately. Police units cannot exit the map.

Police Reinforcement. Whenever an illegal weapon is fired, or Krupke is attacked, the police player is allowed to bring in his Robocop backup. If he chooses to do so, the Robocop must appear on the movement phase of the immediately following turn. He enters the map on the perpetrator's map edge.

Police Victory Points. For each gang robot destroyed (regardless of who destroys it), the police lose two points if it was innocent, gain one point if it fired an illegal weapon, or gain two points if it attacked a police unit. The police lose one point if they bring in their reinforcement, and one point for each police casualty.

Gang Victory Points. A gang leader receives two points if he survives or bails-out, plus one point for every police or rival robot destroyed (by any means).

However, any gang leader who exits or bails out while his rival gang leader is still alive is assassinated by disgruntled members of his own gang and loses three points.

10. Lizard-bot (4 robots)

One player controls a horrible giant lizard-like robot, and the others control the three defenderbots trying to keep him from getting to Tokyo.

Drive Assignation. Lizard-bot is assigned the Spiderbot template, and the three defenderbots choose from the remaining templates. The defenderbots must be piloted.

Special Rules. The defenderbots are Fragile (see p. 8). Lizard-bot receives +1D6 to its MELEE, BEAM, and Flamethrower attacks, and two damage fewer during rams.

Victory. Lizard-bot wins if it gets off the far edge (Tokyo).

EXPANSION KRIEGBOT

The cover depicts a VTOL attack motorcycle, a Russian hydrogen-powered Spiral GSR engaging a "Flying Peanut" (Canadair Bombardier), and the BAE NLOS (non-line of sight) Cannon. This last is a prototype hybrid-electric vehicle weighing only 23 tons. Its 155mm howitzer is able to engage targets identified by drones, similar to the game howitzer.

URBAN COMBAT

Cover. Robots in a building hex always have a base silhouette of 4, modified only by the Silvered skin, Holo-blur and Combat pilot cards (speed and all other modifiers are not used). You may attack only with your primary and secondary weapons, not pylon weapons. If you are attacked, only hit locations which strike the primary or secondary weapon hit you; all other locations hit the building instead.

Note: A target in a building cannot be strafed, but the building can.

INFANTRY

Bailed pilots, and soldiers carried in Infantry Pods, are represented on the map by *infantry tents* once they bail-out. These tents are cut out and folded like a pup-tent. One team receives (as available units) all the tents shaded reddish, the other from those shaded blue. *Whenever infantry are placed on the map, they are drawn at random from a pool of available tents.*

Bail-out (expansion game). A bail-out action for a pilot places one infantry tent on the map in any hex adjacent to the robot (five hexes away in the case of the Civilian pilot). A bail-out action for an Infantry Pod places one or two tents adjacent to the robot. One tent is a *motorcycle* and the other *non-mechanized*, as indicated on the card. Infantry may perform no actions on the turn they bail out.

Move. Infantry move during the *Infantry Phase* (immediately preceding the Status Phase). Infantry have no facing during movement. Infantry have a maximum movement as printed on their tent: Non-mechanized (2), Helicopter (7), Motorcycle (6), Horseback (4). Helicopter, motorcycle, and horseback infantry are collectively called *mechanized infantry*.

Important (Movement order): *Infantry take their turn in alphabetical order to their name as indicated on their counter (Crowl, Turney, Zimmerman, etc.).*

Note (stacking): *Unlike robots, infantry are have no stacking limits and can collocate with robots. Unlike*

robots, they are allowed to attack at zero range. If hex with multiple infantry is attacked, hits are distributed in any manner the defender designates, with a maximum of one hit per infantry.

Boarding Robots. Infantry designated as a pilot can enter and start up a robot in his hex by expending the attack phase of the robot he is entering. At this point, he can examine all robot items and skin. The robot entered must have once held a pilot, and have an empty slot where the pilot once was. Alternately, he may board the Infantry Pod of the robot, if it has one.

Terrain. Infantry must stop when entering buildings, woods, or water, except for the helicopter which flies over all terrain.

Silhouette. The silhouette of an infantryman is his maximum speed if he is mechanized, or the range to the attacker if not. (In other words, non-mechanized infantry use chameleon-style armor.) All infantry add one to their silhouette while in woods or buildings.

Weapons. Instead of moving, infantry (including bailed pilots) may take an attack action: either shoot his rifle or laser designator. All weapons have a 360° arc, and can hit targets in the line-of-sight only (woods block LOS even for painted targets). All weapons can only be used while bailed-out.

- The rifle is a "GUN = 1 damage" with a 3D6 range of zero, a 2D6 range of two, and a 1D6 range of four.
- The laser designator is a "BEAM = paint" hit effect with a 2D6 range of five.

Note: *Infantry automatically pick up crypto or flags.*

Damage. Infantry are killed with one damage. They are immune to "disable". Infantry are immune to "painted" unless mechanized. Infantry cannot be rammed. A mechanized infantry in a building hex that is then destroyed performs an involuntary dismount (next paragraph).

Dismounting. Instead of moving, a mechanized infantry may convert himself into a non-mechanized infantry. This replaces his marker with an available non-mechanized marker.

EXPANSION CARDS AND CARD ACTIONS

Rectenna. The Rectenna allows you to receive microwave or laser energy beamed in from your TV tower, to charge your power core. The Rectenna

cannot be used to recharge your power core if the TV tower on your side of the map has been destroyed.

Superconductors. Disabling this system allows the ROF of your electric weapons to be doubled that turn.

Explosive Capacitors. As a defense action, this system can take a damage and the power core is recharged by its recharge value.

Suicide Nuke in a piloted robot. If you have both the Suicide Nuke and a pilot, you cannot activate the bomb until your pilot has bailed-out and moved off the map. (A pilot who moves off the map can detonate it during any of his movements thereafter.) If the pilot is killed, the Suicide Nuke automatically explodes (its wired to his vital signs).

POWER CORE

The six round design cards are called *power cores*. During drive assignation, each team is randomly given *three* of these cards. Each player can choose one of these as the power core for his design. The circular card fits into the appropriate slot on his template, starting in its fully charged position. Like other design cards, this card is revealed when first used.

Energy. The power core card has six points. Each point represents an energy level of the robot's "batteries". The uppermost point of the star is the current value. If the energy storage gains energy (as in power up), it is twisted one or more *energy steps* (points) counterclockwise, until it reaches its maximum. If it loses energy (as in firing an electrical weapon) the card is rotated one or more energy steps clockwise, until it reads "empty".

Power Up. A "power up" option adds energy to the power core, in addition to its other effects. The amount of energy steps added is equal to the *recharge* number in the center of the power core card. For instance, the MHD generator has a recharge of +4, so it can regain 4 steps each time that it powers up.

Reboot. A "reboot" action costs one energy step for each "disable" marker removed from items.

Using Electrical Weapons. Certain attack and defense actions, marked with the (★) icon, are called *electric actions*. Each electric attack action costs one energy step per shot fired. If you use an electric defense action or power up benefit, that costs one energy step.

Electric Weapon ROF. The number of times an item can attack during its electric attack action is called the *rate of fire* (abbreviated "ROF"). The ROF is found on the uppermost point of the power core card. For instance, with an ROF of two, a weapon can fire twice with one electric attack action. These attacks must be against targets in the same hex. Note that if the ROF is "zero" or "empty", electric actions cannot be performed.

Example: *A robot with a fully-charged compulsator power core has an ROF of 3. It chooses to fire its laser three times at a target. This fusillade turns the card three steps clockwise, down to an ROF of 1. On the robot's next turn, if it doesn't power up, its laser is limited to 1 shot.*

Note: *The Rail Gun is an electric weapon that has a maximum ROF of one, even if the power core indicates a higher ROF.*

Note: *A robot that is at zero energy and has a disabled drive cannot perform any actions. (This is like trying to start a car with a dead battery).*

Fission Rocket-MHD. The Fission rocket-MHD power core adds one to the robot's maximum speed.

INSERTION REENTRY

Insertion Reentry. This rule can be used for orbital insertion, para-dropping from aircraft, or dropping back into an undersea battlefield. During the first movement of re-entry, the player marks (with a disk) the target hex. During the robot's next movement turn, its figure materializes on the target hex, faced in any direction. (For para-infantry, this occurs during the Infantry Phase). For this turn, it is allowed any legal action *except* movement (silhouette is one).

LUNAR WARFARE

Most of the scenarios can be fought on the moon, with a few minor tweaks to their systems. Conceptually, the pilots and infantry are now suited, and the Helibot and Hoverbot have been refitted with electrothermal rockets. The particle beam accelerator has been reconfigured to shoot neutrons (since charged particles would simply fly apart without an air channel to keep them together). There are some special rules as well:

Electric Drives. Since air-breathing engines don't work, all robots use electric engines instead. If a robot moves, it expends two energy steps if flying (Rocketbot {non-biped}, Helibot, or Hoverbot), and one step if Rocketbot {biped}, Spiderbot, Robotank, or

Robocar. There is no energy cost for maneuvering. (If the gamer is wondering how a robot can power up without an engine to do the powering, it is because each robot is assumed to be powered via a remote laser beam. In the lunar vacuum, such power beams can come from satellites in the Lunar L1 LaGrange point (or from the TV tower). Flying robots are flying using electric rockets.)

Low Gravity. All robots are able to hop over obstacles, and can strafe.

Terrain. Woods and water hexes are actually clear terrain.

Weapons. All laser ranges are tripled (they work well in space). Smokescreens and flames do not work. The "AIR CHANNEL JOLT" function of the Nemo Battery and the "PLASMA CHANNEL TASER" function of the Electrolaser doesn't work (no air to channel).

SUBMARINE WARFARE

Most of the scenarios can be adapted to work undersea. The robots are likely squabbling over an oil field on the continental shelf, such as in the North Sea.

Underwater speed. All maximum speeds are one less underwater.

Underwater weapons. All weapons roll one less attack dice underwater, unless the target is painted (representing sonar). No on-fire markers can be inflicted.

Blowing Tanks. As an attack action, robots are able to release pressurized gas, deflooding tanks and thus rapidly bobbing to the surface, to be repaired at a "pit stop". For the robot's next turn, the pit stop can replace one destroyed item, or remove two damage markers. Reinsertion is via the "Insertion Re-entry" rules.

EXPANSION SCENARIOS

11. Human Wave (1 to 2 players)

Waves of soldiers charge a rogue robotank bent on destroying a city. As fast as the infantry die, they are replaced by more.

Setup. Ten buildings are placed at 4 hexes or less from the central hex (gas station). (In the 2-player game, each player places half the buildings).

Design. Team Green designs a robotank. He sets up on one edge of the map. Team yellow starts with eight non-mechanized infantry, starting on the opposite edge.

Reinforcements. If an infantry is killed, on his next move his replacement can plant a target hex, per the Insertion Reentry rules.

Special. Team Yellow is allowed Bombardment (p. 7). He is allowed to move his infantry in any order (until the pilot, if any, bails out).

Solitaire Rules. If playing solitaire, the infantry move automatically. Infantry will always shoot the robot, if they have a chance to have an effect. They prefer to use their laser designator, unless the target is already painted. If they hit, they choose the lowest-numbered location in the dice pool. If they cannot shoot, they will move to a hex closer to the robot, selecting first any building (first choice), or rough terrain (second choice), or other hex that is not able to be targeted by the robot (third choice). However, once they are in a building, they will stay in that building, unless they can enter another building closer to the robot. Reinforcements will choose the robot location to be their reentry target hex.

Victory. The robot receives a victory point for every building (including the gas station, boat shed, and TV towers), structures (including the dam and bridge), or infantry that is destroyed. The game is a tie if he destroys at least 10, and he wins if he destroys at least 20. If playing solitaire, these victory requirements are doubled. (Note: my personal best playing solitaire is 18.)

12. The Neutron Bomb Cavalry Charge (2 to 6 players)

A squad of six piloted robots storms a metropolis, only to be stopped by a neutron bomb. The nuclear device fries all the enemy pilots instantly, but leaves the robots unharmed. Both the attackers and the defenders send a team of pilots to commandeer the derelict robots.

Setup. The six derelict robots are placed at the center of the map, at least 4 hexes apart from each other. Remove the four pilots and the seven "pylon" system cards from the Team Green design cards, shuffle the remainder, and place at random cards (face-down) to cover all the empty slots on each of the six templates. For the "pylon" slots, shuffle the pylon system cards and place one at random on each. Leave one system slot (the innermost) empty; this represents the cockpit occupied by the dead pilot. Each side takes an equal

number of pilots cards (from 1 to 4), and sets their disks up on opposite sides. Team Green (attackers) starts five hexes away from the nearest robot, and Team Yellow (the defenders) starts ten hexes away.

Special Rules. The pilots for Team Green (the attackers) start as bipeds, while Team Yellow (the defenders) is on horseback.

Barrage. Both sides suffer Bombardment (see p. 7) if painted. (The desperate defenders are shooting anything that might be a threat, whether friend or foe.)

Victory. The team that ends up with the most surviving robots wins.

13. Terrorists (2 to 6 players)

A squad of UN robots invades a compound where six nuclear stockpiles are located. Their mission is to destroy the stockpiles. They are opposed by an equal number of suicidal terrorist robots, plus a hidden bomber.

Setup. The terrorist player places six buildings (representing weapons of mass destruction) on the map at least 6 hexes distant from the map edges. One of these buildings secretly contains an infantryman (note which on a scrap of paper).

Design. The NATO robots cannot be piloted, and the terrorist robots must be piloted. Each side sets up on their side of the map.

Terrorists. Each terrorist pilot and infantry carries a suicide nuke, which has all the attributes of the "Suicide Nuke" system card. If a pilot bails-out, he can carry his bomb on foot, and explode it at the end of his infantry move. All terrorists are not well trained, so all silhouettes are +1 for terrorist attacks. The hidden bomber can reveal himself by shooting, or moving, or moving then detonating on his turn.

Victory. NATO wins if he destroys as least as many stockpiles as the number of robots he started with.

14. Downed Pilot (2 to 6 players)

An Air Force pilot bails-out over enemy territory and aircraft are scrambled to rescue him. The enemy sends vehicles to kill him. Upon touchdown, the pilot activates his decoys, small robots that mimic his transmissions, so as to confuse the enemy as to his position.

Setup. The enemy player sets up first, on his edge of the map. The Air Force player starts with four infantry (the pilot and his three unarmed decoys) in any hex within 6 hexes from the enemy edge. He secretly notes on a piece of paper which name is the real pilot, who is armed with standard infantry weapons.

Design. The Air Force player can only choose from hoverbot, rocketbot, or helibot (1 to 3 robots). All must be piloted. The enemy player chooses an equal number of robots, choosing from spiderbot, robotank, or robocar. Each side sets up on their side of the map.

Decoys. The pilot and the decoys move as infantry. If a decoy takes a hit, it is destroyed (and revealed not to be the real pilot).

Exit. The downed pilot and his decoys cannot exit the map, except if picked up by a friendly robot. (All map edges are ocean except for the enemy edge). Pilots and decoys can board any friendly robot by spending its turn. Thereafter, he is assumed to cohabitate with the rescuer's pilot system. The Air Force robots can only exit the map on their side.

Victory. The Air Force wins if the pilot escapes alive.

15. Musical Chairs (2 to 6 players)

In the distant future, the robot masters of the world have forgotten how to make electricity. So they must rely on unoccupied human dwellings, powered by the last remaining nuclear power plant, to supply their fix. They can sit in the living room, plug themselves in, and run their algorithms for eternity. Unfortunately, there is one less dwelling (and one less wall socket) then there are remaining robots, so at least one robot will lose. There are no teams, its every robot for himself!

Setup. First, each player places a building, at least 8 hexes from any map edge. Then, one of the buildings is randomly selected to be removed.

Design. After design, the robots setup (in movement order) on any map edge hex.

Power Up. A robot can only power up if it is in a building. (In this scenario, all robots can safely enter buildings.) The rectenna cannot be used in this scenario.

Victory. Any robot wins if he ends the game in a building.

16. World Without Oil (2 to 6 players)

The robots have run out of oil. And so two gangs are converging on a Shell station in a remote sector of Arizona to top up.

Refueling. Robots begin out of fuel. Until they refill their tanks, they are not allowed to power up, and must run on electric motors (see the Lunar rules). Any robot performing a maneuver on or adjacent to the gas station can refill its fuel tank.

Victory. The gang occupying the gas station for four turns wins. If the station is destroyed, everybody loses.

SCIENCE BEHIND THE GAME

(Basic and Expansion) by Phil Eklund

Abbreviations:

CPU: central processing unit

ECM: electronic countermeasures

EMP: electromagnetic pulse

GHz: gigahertz (a billion times per second)

HP: horsepower

IR: infrared light

kg: kilograms of mass (a thousand grams)

kW: kilowatts of power (a thousand joules per second)

MeV: mega-electron volts of energy

MHD: magnetohydrodynamics

MJ: megajoules of energy (a million joules)

MW: megawatts of power (a million joules per second)

ROF: rate of fire [Attacks per Attack Action]

UV: ultraviolet light

ACTIVE CAMOUFLAGE

Active camouflage uses high voltages to generate an electrostatic field containing a charged aerosol. Organic light-emitting diodes (LEDs whose emissive electroluminescent layers are composed of organic films) then project an image onto the cloud, making the robot appear to be a variety of natural or man-made objects from all angles. The aerosol can be made into the shape of an auto, billboard, shrub, etc., accurately colored by the LEDs. The aerosol cloud can also defeat tagging lasers and radar, but is not so effective against MAD or infrared sensors.

DUAL-MODE SEEKER

A guided missile's nose contains a seeker, for obtaining target information. A **dual-mode seeker** has both an active millimeter wave radar, and a passive Anti-Radiation Homing (such as found on the High-Speed Anti-Radiation Mission "HARM"). "Active" means that the seeker is generating signals, and listening for their return to find out where the target is. "Passive" means that the seeker is listening for radar or other emissions being generated by the target itself, so it can home in on, for instance, enemy radar. The latest Anti-Radiation Missiles (such as AARGM) use a weapon impact assessment system, which transmits lethality data about the target just prior to impact.

ECM

Electronic countermeasures (ECM) are electrical or electronic devices designed to deceive detection systems like Radar, IR, and Laser. ECM techniques

such as Blip Enhancement may make a bogus target appear bigger to your enemy, or make the real target appear to disappear or move about randomly. It is used effectively to protect moving vehicles from guided missiles.

ELECTRO-REACTIVE ARMOR

Reactive armor reacts to the impact of an armor-piercing projectile to reduce the damage done. Some types of reactive armor explode on contact. This disrupts the armor-piercing metal jet of a shaped charge or long rod penetrator, and shades the target from laser beams. A more sophisticated type, still top-secret, is **electro-reactive armor**, made up of two electrically charged plates separated by an insulator. This arrangement makes the skin into a giant capacitor. When an incoming projectile or shaped-charge jet penetrates the two plates and closes the circuit, a several thousand amp current vaporizes it, largely negating its effect.

ELECTROTHERMAL CHEMICAL AMMUNITION

An **Electrothermal Chemical (ETC)** gun uses a plasma cartridge to ignite and control the ammunition's propellant, using electricity to catalyze the process. ETC increases the performance of conventional solid propellants, reduces the effect of temperature on propellant expansion and allows for more advanced, higher density propellants to be used. It will also reduce pressure placed on the barrel in comparison to alternative technologies that offer the same muzzle energy given the fact that it helps spread the propellant's gas much more smoothly during ignition. Illustrated on the card is a prototype 40mm ETC gun, with a muzzle energy of 17 MJ. This small gun has demonstrated the capacity to defeat the armor of the latest heavy battle tanks, but recoil is a bear.

EMP BLASTER (CROWD CONTROL)

The **EMP** crowd control feature is based on Raytheon's Silent Guardian™, which uses 95 GHz microwaves to disperse crowds without causing permanent injury. The microwaves heat skin moisture, producing an incapacitating burning sensation at up to 250 meters (5 hexes).

EMP BLASTER (ELECTROMAGNETIC PULSE)

As electronics become miniaturized, they become more vulnerable to surges like **electromagnetic pulses (EMP)**. Older electrical components, such as motors, switches, or transformers, are the most robust. They may absorb one MJ of EMP without damage, whereas a vacuum tube may absorb only a millionth of that (1 joule) without damage. But a transistor will be zapped with as little as a millijoule,

and an IC with just a microjoule. EMP can be formed from explosive capacitors, high altitude nuclear bursts, or lightning. It is as harmless to humans as it is devastating to microgeometry electronics. Target systems are susceptible to EMP only at certain frequencies, often between 1 and 3 GHz (i.e., microwaves). When produced by high-powered microwaves, EMP enters military systems through unconventional and/or inadvertent pathways (e.g., a hydraulic control cable). If you know the resonance frequency of a target, you can shoot it with a narrow-band modulated burst tuned to this waveform. If you don't know it, you should instead fire a wide-beam impulsive pulse that covers many frequencies and hope some gets through. Our microwave EMP gun uses a 1 GHz Multiwave Cerenkov Generator (MWCG) with a power of 30 kW (avg) and 2 MW (max), a source efficiency of 70%,⁵ a duty cycle of 0.0002, and an on-target power density of a watt per square centimeter at a range of one kilometer. Microwave weapons with a 10 kJ pulse are under development today.

ENERGY

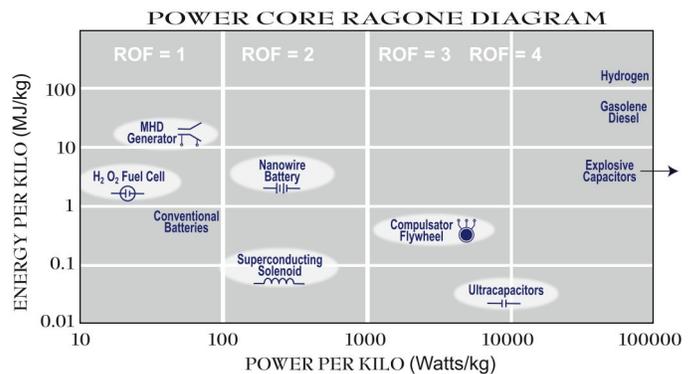
The international unit of **energy** is the Joule. A megajoule (abbreviated MJ) is a million joules, which is about the amount of energy stored in a Sears Lifetime car battery! A kilo of TNT releases 4 MJ, and a lightning bolt releases about 10 MJ. A one MJ pulse of laser energy is a significant threat, as first demonstrated by Soviet big lasers from the cold war era. One MJ of laser output requires 10 MJ of electrical input, and each step of energy in the power cores is scaled to 10 MJ. So each energy step expends as much energy as in a lightning bolt! One Joule delivered each second is better known as a Watt, the international unit of power.

ENERGY AND POWER DENSITY

Generators are rated according to their **Energy per Kilo** (vertical axis on the Ragone Diagram below) and their **Power per Kilo** (horizontal axis). The Energy per Kilo measures the number of MJ of energy stored. For instance, a fuel cell with a 500 kg mass (half a ton) has enough energy to fire 100 bolts of energy, where each bolt requires 10 MJ (at least half of which becomes waste heat, and the other half is delivered to the target.) Vastly more energy per kilo is contained in nuclear or chemical fuel, but that needs considerable equipment to convert it into high voltage electricity. Generally, generators with a high energy per kilo (such as fuel cells) have a low power per kilo (and vice versa). (Power is the rate at which energy is

⁵ This means that 70% of the input electrical power goes into the emitted EM beam, and 30% becomes waste heat.

produced or used). The best generators for power density are ultracapacitors, which store very little energy, but release what they store in a flash. This corresponds to the highest rate of fire (ROF). Generally, capacitors are the most expensive, bulkiest, and heaviest way to store energy, but the only one that delivers energy fast enough for pulsed beams and bolts.



EXO-DISPOSABLE ARMOR

Exo-disposable armor (aka "ablative" armor) is a hypothetical technology in which the skin undergoes a state change on weapon impact. This state change would carry energy away from the armored vehicle and into the shed skin. The ballooning cloud of ablated vapor would also deflect the plasma jets and hot gases of chemical warheads, block laser and particle beams, and extinguish flames. Meanwhile, beneath the protective carapace, nano-glue fluids are being discharged which detect and restore damaged components.

EXPLOSIVE MHD CAPACITORS

Explosive magnetohydrodynamic (MHD) capacitors convert explosive energy directly into electrical energy in a burst mode. These are single-shot expendable capacitors: Bang!, and they're gone. Because the energy density of these devices ranges from 4.5 to 6 MJ per kilo for common explosives, they can provide useful energy per pulse even at low-energy efficiency. A device small enough to carry in the hand can produce 10,000 MW of power (for a fraction of an instant). Detonating a device a meter in diameter is capable of a hundred MJ, enough to completely re-energize a Kriegbot power core, or forming a potent EMP, laser, or particle beam pulse.

FARADAY CAGE

External electric fields, lightning, and EMP can be completely stopped by a **Faraday cage**, a grounded mesh of conductive material, with openings less than the wavelengths to be shielded against. When hit by a

field, the electrical charges in the bars of the cage rearrange themselves as to cancel the field's effects inside the cage.

FREE ELECTRON LASER

A laser emits coherent light, meaning the electromagnetic (EM) waves interfere constructively. The waves are monochromatic, that is, all the same color and wavelength. In a **free electron laser**, the light is made coherent and monochromatic by passing it through a periodic "wiggler" field. The output is tunable over a broad EM spectrum, from lased microwaves to UV. Pulses are in the nanosecond range. As a laser beam punches through the air, it knocks the electrons off the air molecules, creating a plasma channel. Lasers lose lots of energy creating the plasma channel, and these losses (called blooming losses) are vastly increased if there is smoke, dust, water, or fog in the air. The distortions caused by blooming can be reduced by a phase-conjugate system, which analyses the reflected laser light from the target and corrects for it. A free electron laser is quite efficient for a laser, but even so at least half the energy will be wasted. Its 5 MJ pulse is not enough to make much of an impact against armor. However the laser's plasma channel is conductive and can serve as a conduit for a particle beam accelerator or electroshock weapon ("electrolaser").

FUEL-AIR BOMB

A **Fuel-Air Bomb** uses oxygen in the air as its oxidizer. The fuel (a metal powder or reactive organic) is first dispersed in the air as a cloud. Many substances become explosive when finely-powdered to maximize the exposed surfaces to atmospheric oxygen. When the cloud is ignited by a high explosive, the smaller particles burn first, providing heat to ignite the larger particles. The resulting blast, more powerful than conventional explosives, creates a severe superheated pressure wave, which quickly forms a vacuum as the reaction sucks all the oxygen out of the atmosphere.

GATLING GUN

Sometimes obsolete inventions experience a renaissance. Dr. **Gatling's** multi-barreled design, patented during the Civil War, has resurged because multiple barrels can handle a rate of fire that would overheat a single-barrel gun. The limiting factor on rate of fire is the speed at which loading and extraction can occur. In a multi-barrel design, these can happen simultaneously, whereas in a single barrel these tasks must alternate.

HALOGEN FIRE EXTINGUISHER

Flooding the interior of a robot with a **halogen gas** like chlorine steals oxygen instantly from the fire. Not healthy for humans, nor the ozone layer. Good for robots, though.

JOSEPHSON JUNCTION TARGETING CPU

Certain exotic integrated circuits, called **Josephson Junctions**, use quantum tunneling to attain speeds of one billionth of a second per operation, ten times faster than today's machines. The machine cycles so fast, that its size cannot be any larger than a softball - any larger and the speed of light limitation would not allow all parts of the machine to communicate with each other before the next cycle begins. About 100 chips are packed in the softball, which is immersed in liquid helium.

LIQUID METAL HEATSINKS

Robotic systems generate waste heat, which will need liquid cooling to avoid meltdown. (It's a law of thermodynamics that each MJ of electricity does useful work, while each MJ of heat is a useless and dangerous annoyance.) Beam weapons typically lose 90% of their energy as waste heat, and internal combustion engines lose 60% as heat, which is why a car needs a water-filled radiator to keep it cool. (Most of the heat energy in a car radiator is transferred to the atmosphere via convection, not radiation. It would better be called a "convector".) Liquid-cooled systems such as these are large and vulnerable. A more rugged solution is an array of **liquid metal** (sodium or potassium) **heatsinks**, which can absorb dozens of MJs of heat as the liquid changes phase from a solid to a liquid.

MAD SENSOR

A **Magnetic Anomaly Detector (MAD) sensor** is an instrument used to detect minute variations in the Earth's magnetic field caused by metal objects, such as submarine hulls deep underwater. It can also detect the magnetic flux caused by current flowing through a coil, such as the ignition coil of a truck motor. The huge fluxes generated in free electron lasers, rail guns, and other electric weapons are easily detectable. A MAD sensor is placed as far as possible from the robot's own electronic devices which can cause interference. That is why the "MAD boom" of the P-3C Orion aircraft gives it its distinctive "tail stinger" appearance.

MHD GENERATOR

A **magnetohydrodynamic (MHD) generator** converts the energy of moving plasma into electricity. Although we are accustomed to thinking of rockets as vehicular power, rocket exhaust is a convenient source of

moving plasma, and a couple of shielded superconducting loops in the exhaust can generate electricity at high efficiency in the megawatt (MW) range, at short notice. Perhaps 4 MJ per liter of conductive plasma can be extracted. What plasma emerges from the long MHD nozzle is still energetic enough to give the robot an extra impulse of speed.

NANO-DEFORMABLE MIRROR

Laser beams begin to cause plasma breakdown in the air (called "blooming") at energy densities of 1 MJ per cubic centimeter. This drastically reduces the laser's range. The beam can be distributed over a large mirror that focuses the power on the target, to keep energy density in the air too low for blooming to happen. This requires a large (about 1.5 meters in diameter), precise mirror, with slewing machinery to aim the laser. There are actually two mirrors. The emitted beam first hits the small deformable primary mirror, and is reflected back to the large concave collimating mirror, which focuses the beam on the target. Any mirror-like ("specular") points on the target reflect light back to the collimating mirror, and from here back to the primary mirror. Here, sensors on the mirror's adaptive optics use the information to distort the mirror slightly to sharpen the focus, and to adjust for atmospheric turbulence and smoke in a positive-feedback loop. In urban legend, mirrors can be used to reflect beams away, but the problems with this are formidable. No mirror reflects perfectly, and lose their reflectiveness as they distort from over-heating. An incoming megajoule pulse hitting a small portion of a mirror warps that spot, and catastrophically blasts through the finest mirrors in a fraction of a second. Only a stoutly-cooled mirror evenly illuminated over its entire surface has a prayer of surviving a beam of weaponized power.

NANO GLUE

Nano glue is a nanotechnology designed to respond to a diagnostic program and restore function to damaged systems. The affected area is bathed in a fluid milky with billions of assembler nanobots. A central seed unit produces instructions encoded onto bumpy polymer molecules. These instructions are picked up by assemblers that replicate and pass them on. A reader on the assembler translates the bumps into patterns of nanobot arm motion. Such systems are patterned after extremophilic bacteria (e.g. *Deinococcus radiodurans*) that can repair cellular radiation damage rapidly. In theory, nanodamage (such as that inflicted by BOLT weapons) could be fixed in the amount of time to replicate a bacterium, about 15 minutes.

NANOWIRE BATTERY

Lithium-ion batteries employ solid-state technology based on ion conductivity in polymers. A **nanowire battery** is a lithium-ion battery invented by Dr. Yi Cui in 2007. Holding 10 times the charge of ordinary lithium-ion batteries, it has excellent energy and power densities (see the Ragone Diagram), which may revolutionize mobile electronics and electric vehicles. For pulsed operations relevant to beam weaponization, the critical capabilities for this technology are an energy density of a MJ/kg, a power density of 4 kW/kg, and a life cycle of 2,000 cycles.

NEMO BATTERY

High energy lasers create a plasma channel through the air, a conductive path that connects the laser source with its target. A **Nemo battery** exploits this to defend itself. An instant after an attacking laser beam forms a conductive plasma channel through the air, the Nemo ultracapacitors discharge a billion volt jolt of electric current which follows the channel to the source. The effect is that of a long range Taser or EMP shock. This principle is also used by the **Electrolaser** (found in the expansion).

PARTICLE BEAM ACCELERATOR

Charged particles have more punch than laser photons. Our **particle beam accelerator** ejects electrons using a traveling wave tube (TWT), basically a huge vacuum tube amplifier. A TWT microwave beam provides the waveguide to keep the electrons bunched and an auxiliary laser provides a conductive plasma channel for their passage to the target

PHASED-ARRAY ANTENNA

A **phased-array antenna** is a group of antennas acting in mathematical synchrony so as to reinforce the signals coming from a desired direction and suppress those originating from other directions. They are used to steer an electromagnetic (EM) beam rapidly to first acquire the target and then remain on target. It provides trajectory analysis, so that the path of an incoming round may be used to determine the launch location. Thermal imaging is used to identify heat sources. Our design operates at 100 MW peak effective radiated power (100 kW average power).

PHOENIX-BOT

A Phoenix is a mythical bird that resurrects itself from its own ashes. So our **Phoenix-Bot** is a self-propelled *recoilless rifle* (a light-weight gun firing shaped-charge shells) that can detach itself and act autonomously should the primary system become derelict. If the robot is piloted, the cockpit detaches along with the recoilless rifle. You should consider this maneuver only under the most desperate circumstances.

POWER CORE

Electricity is marvelously versatile, able to power a thousand synapses, transistors, valves. But electrical energy can only be stored at a tiny fraction of the energy density of diesel, or uranium, or many other useful chemical or nuclear fuels. Gasoline packs 200 times more energy per kilo than a good battery, and can convert that energy into useful work 900 times faster. So Kriegbot robots, like hybrid cars, use chemical (or nuclear) energy to move around, and electricity for their sensors, ECM, manipulators, and electric weapons (beam and bolt). Each **power core** card lists both components: the engine that provides the motive power, and the generator powered by the engine that provides the electricity.

RADAR

Radar is a system that locates targets via reflected electromagnetic waves. Searching for someone with radar is akin to searching for someone at night with a flashlight. Everyone in the vicinity knows where you are long before you locate your quarry. This is the reason that using radar paints yourself.

RAILGUN

A **railgun** is an electric gun that accelerates a conductive projectile along a pair of metal rails to a speed many times the velocity possible by conventional propulsion. A light gas gun injects the rounds into the barrel at initial speeds of a half a kilometer a second. Distributed-energy systems inject current into the railgun along its length in synchrony with the rapidly-accelerating round, which exits the barrel screaming at Mach 7. The U.S. Army's 9 MJ railgun was designed to launch 2 kg solid tungsten rounds at velocities of 4 kilometers per second. Coupled with a 230 MJ compulsator flywheel, it had 6 kV and 3 MA peak output ratings, and could fire 9 shots before the flywheel would have to be powered-up. This project (now canceled) would have formed the main armament of the 2015 electric battle tank, and would have been similar to our Kriegbot version.

RECTENNA

A **rectenna** is a special type of antenna that converts microwaves directly into DC electricity. Microwaves beamed from a friendly hilltop power station can be intercepted by a robot's rectenna, and used to recharge its power core. Rectennas can also be used for ELINT (Electronic Signals Intelligence), where it can use the electronic emissions of motors and servos to pinpoint an enemy robot.

ROBOCAR

Wheels are the most efficient and fastest means of propelling a vehicle known. This is why the **Robocar**

is so fast. Counter-intuitively, a car is faster than an airplane or helicopter with the same powerplant. What's that again? Everyone knows that planes and helicopters are faster than cars! But everyone is wrong. A car on the salt flats, racing against an level-flying aircraft with the same engine, should cross the finish line at twice the speed of its competitor. This is regardless of power-plant: electric, gas, turbine, whatever. This is regardless of aircraft: fixed wing, rotary wing, whatever. This surprise is a consequence of two laws of physics: conservation of energy and conservation of momentum. A flying or swimming machine must push about as much air or water backwards as the vehicular mass to be moved forward. In other words, about half the engine power is used to advance your aircraft, and the other half is wasted pushing the air backwards with your rotor, propeller, or jet. What about the car? When a car races forward, it attempts to turn the entire world the opposite direction. But, due to the conservation of momentum, the massive Earth barely budes! The difference of mass between car and the Earth means that almost 100% of the car's engine power drives the car forward, compared to 50% for an aircraft. However, as the speed of sound is approached, tires suffer from heating and intermittent road interface. And jet engines are not well suited for coupling with drive shafts. The world's fastest cars are just barely supersonic.

ROBOTANK

The Kriegbot **Robotank** is a hybrid vehicle, one that uses a high energy density fuel for its drive, and a versatile electrical storage device for its weapons and electronic warfare systems. Diesel packs 200 times more energy per kilo than a good battery, and can convert that energy into useful work 900 times faster. So a proposal for the future main battle tank is a hybrid that uses a diesel turbine engine for its treads, and a whirling compulsator flywheel to store electricity for its railgun. The compulsator generates electricity at a high enough rate to power the tank's targeting laser, railgun, and electronic warfare systems. Each Railgun shot may need a 10 MJ pulse of electricity, delivered at a rate of 6 Megawatts. A good 3 ton compulsator, spinning like mad, can deliver at this rate. After the shot, the diesel engine can begin respinning the compulsator up to its full rating. (A 1340 HP engine generates 1 MW of non-electrical motive power.). However, if the tank is using its engine to drive around, there may not be much extra power to do any recharging.

ROCKETBOT

"Rocketeer-style" rocket packs suffer from short flight durations. True rockets (non-air-breathing) have flight durations up to 30 seconds with a few hundred

pounds of hydrogen-peroxide fuel. So instead, the Kriegbot rockets use superheated water coolant from an on-board nuclear power plant. Compared to a chemical rocket, a nuclear-heated rocket has improved specific impulse (higher exhaust velocity) allowing better fuel economy, and you can refill your propellant at any waterhole.

SCALE

Each hex is 50 meters across. Each turn is about 30 seconds. Each hex/turn is about 5 mph. The maximum ranges of attacks in the game correspond to the published weapon medium ranges. Each damage is about 2 megajoules (MJ) of energy. In the expansion, I used the following power scaling for the rates of fire: ROF of 1 = 10 kilowatts (kW); ROF of 2 = 80 kW, ROF of 3 = 630 kW, and ROF of 4 = 5000 kW. Each power core energy step is 10 MJ of electrical energy output. I assumed that the power core generator weighs 500 kg (half a ton). Each recharge is 330 kW (or 443 HP) of engine power.

SMOOTHBORE MAIN GUN

The **smoothbore main gun** is modeled after the Rheinmetall L55, a 120 mm caliber cannon used by EU and US tanks. The complete gun system weighs 4.2 tons. It uses armor-piercing Sabot ammunition, which launches a dart of depleted uranium at an energy of 5.7 MJ. This 120 mm round, the most extensively used tank round fired during Desert Storm, is nicknamed "The Silver Bullet" due to its effectiveness against Iraqi tanks. The next generation 120 mm Sabot ammunition upgrades to an energy of 12 MJ. The 120 mm L55 can also fire canister, a shell filled with tungsten shot that acts like a giant shotgun shell for use against buildings, dug-in infantry positions, and unarmored vehicles.

SUPERCONDUCTORS

High temperature **superconducting** materials conduct electricity without losses. ("High temperature" in a relative sense, we are talking about temperatures just above liquid nitrogen at 77 degrees Kelvin.) Superconducting magnetic coils form the barrels for MHD generators, rail guns, advanced TWTs, and RF injectors for free electron lasers. Superconduction can levitate the flywheel in a compulsator for frictionless operation. Superconducting solenoids and thin film resonators can store energy magnetically at high densities.

SUPER-STEEL and CHOBHAM ARMOR

Tank armor nowadays has two components: a "strike face" to deflect high-speed kinetic shots, and a "reactive" component to deflect chemical warheads such as shaped-charges, which use a high velocity

focused jet of metal to punch a small hole through the strike face. Our **"super-steel" armor** is a strike-face composed of a layering of nano-structured steel and tungsten. Underneath the steel, **Chobham armor** (a secret alloy of ceramic laminate) is used, which mushrooms when struck to defeat the jets of shaped-charge rounds. This can be used to protect a robot's power core or cockpit.

TARGETING LASER (RANGE-FINDER)

A **targeting laser** is a low-energy beam used to indicate a target for a precision-guided weapon, which homes in on the reflected laser light. The beam of your targeting laser is set to a certain pulse rate so your guided missile follows it and not some other laser in the area. Targeting lasers are usually infrared, so your enemy cannot easily detect the guiding laser light. The time it takes for laser light to be reflected back from the target can be clocked, and from the calculated range, the gun can compensate for the pull of gravity. Doppler effects can compute target speed and direction. By employing a suite of laser frequencies, each with a different reflectivity at the target, a three dimensional interior model of the target can be constructed.

TESLA GUN

The mad scientist Nikola **Tesla** worked on several "death ray" projects during his career. Our science-fiction version is a particle beam weapon which discharges 30 MeV electric bolts at a few hundred pulses per second. The current would be more than 5 kA, the peak power over 50 GW, and the average power at over 5 MW. Precision magnets are needed to focus and steer such a beam.

THERMAL LANCE

A **Thermal Lance** is a hollow bar filled with iron wires, pumped with high purity oxygen. The oxidation of iron generates temperatures high enough (4000 °C) to cut through anything, including rock. It is often depicted in the movies employed by safe-crackers.

TOW MISSILE

The **TOW** (Tube-launched, Optically tracked, Wire command-link) is the primary anti-armor missile worldwide since 1972. It uses a shaped-charge warhead. The operator uses a telescopic sight to view a point on the target, launches the TOW, and continues to view and track the target through his sight. Guidance signals are transmitted along two slender wires, each 3 km long, which spool from the back of the missile to the control system on the launcher. Advanced "Fire and Forget" features, such as found on the new NLOS (Non-Line-Of-Sight) missile (which I currently have the privilege to work on

at the Raytheon facility in Tucson), use advanced seekers which do not need the operator to track the missile into the target.

UAV

An **Unmanned Aerial Vehicle (UAV)** is drone acting as a communication relay and sensor platform. The system illustrated is Raytheon's Killer Bee, with a payload of 14 kg, a speed of 70 mph, and an endurance of 15 hours.

VIRAL BAYONET

A **Viral Bayonet** can infect your target with a computer virus that causes it to change to your side! How would such a system work? The bayonet, containing a CPU and lithium polymer batteries, is blown into the target with a superconducting slingshot, and remains embedded like the sting of a honeybee. To establish an electric connection, nano-glue is released, containing assembler nanobots. These seek out communications buses, trailing fine gold lines. If a connection is made, the hacking program kicks in, trying to locate and corrupt your enemy's IFF (identification: friend or foe) routine. This is a cryptographic interrogation system that allows a robot to distinguish targets from friendlies. The victim now has a reversed sense of who is friend and foe. Once successful, the hacked system transmits an encrypted "success" message.

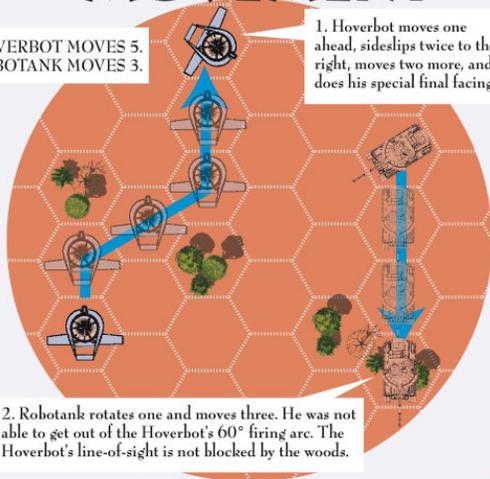
Hard Vacuum. If you enjoyed KRIEGBOT, you will also like HARD VACUUM. The year is 1942, and through a scientific breakthrough the Axis and Allies have developed orbital spacecraft! An alternate reality game with rockets armed with 20mm cannon and .50 machine guns. See www.sierramadregames.com.

MOVEMENT

HOVERBOT MOVES 5.
ROBOTANK MOVES 3.

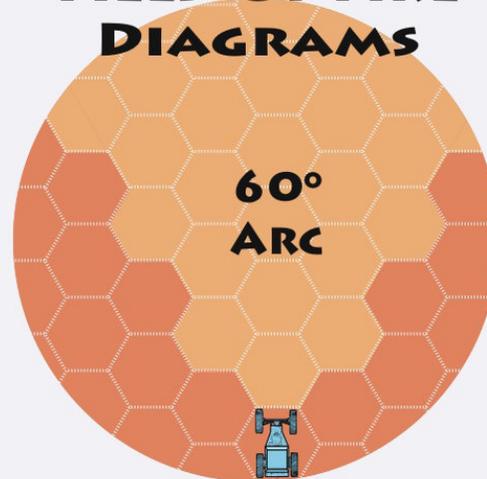
1. Hoverbot moves one ahead, sideslips twice to the right, moves two more, and does his special final facing.

2. Robotank rotates one and moves three. He was not able to get out of the Hoverbot's 60° firing arc. The Hoverbot's line-of-sight is not blocked by the woods.



FIELD OF FIRE DIAGRAMS

60°
ARC



LINE-OF-SIGHT MATRIX



ATTACKER OR TARGET IS IN THE HEX

Not blocked.	Advanced Game: Targets in hex use Silhouette 4.	Not blocked.
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TARGET IS BEHIND THE HEX

Always blocked.	Always blocked.	Blocked unless Target or Attacker is on a Hill.
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TARGET IS PAINTED & BEHIND THE HEX

Not blocked.	Blocked unless attacked by MISSILE or Howitzer.	As above, but not blocked if attacked by MISSILE or Howitzer.
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MOVEMENT RESTRICTIONS

Robocar & Hoverbot can't enter.	Hoverbot can't enter.	No restrictions.	Robotank, Spiderbot, & Robocar stop upon entering.
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Note: A robot that ends its movement phase on a water hex instantly removes any paint and on-fire status markers!

120°
ARC



LINE-OF-SIGHT EXAMPLE



Helibot has line-of-sight on Hoverbot and Robocar, but is blocked by the woods on Spiderbot (unless Spiderbot is painted).

1° ARC (STRAFE)

360°
ARC

