

FROZEN THUNDER



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1.0 Introduction

Welcome to Frozen Thunder, a tactical game of futuristic vehicle combat. The primary combat vehicle of the Frozen Thunder universe is the grav tank, a massive floating combat machine that can carry more arms and armor than a main battle tank while outperforming an attack helicopter.

The game can be played as stand-alone game or as a combat engine for a strategic war game or role playing game. In many ways, Frozen Thunder can be thought of as a game design toolkit for a variety of futuristic ground combat games.

The Frozen Thunder system revolves around the design and combat mechanics of the DAT (damage allocation table.) The combat engine is pretty flexible. You can use the DAT to model units such as ground and anti-gravity vehicles, as well as pill boxes, naval vessels, factory complexes, command posts, and other structures.

The Command and Execute system forsakes the traditional 'I Go - You Go' nature of many board and war games and strives for simultaneous action. Players start with writing down secret orders and then they are executed simultaneously where possible.

1.1 Game Components

This game embraces the concepts of desktop printing and virtual table top gaming. To that end, this statement is for all those print shops out there...

Written permission is granted to the bearer of this document (in either electronic or print form) to print any of the rules or support files. This includes source books, scenarios, damage allocation templates, order sheets, maps, unit counters, and paper miniatures for their personal use.

You will also need a pair of ten sided dice, a six sided die, and writing supplies. The more dice you have the better since there are places in the game where you can make multiple rolls at one time.

There are some optional components that can really improve the gaming experience. Most game stores carry large hex grid maps suitable for battles. Placing a large sheet of plexi-glass over the map protects it from accidental spills, lays the map flat, and makes for a great surface for rolling dice, moving miniatures, or using grease pencils or dry erase markers. If your budget allows for it, vehicle miniatures and terrain models are very nice.

You can also use a computer to manage the maps and counters. Vassal, Roll20, and Map Tools come to mind as free tools for multi-player gaming.

1.2 Game Scale

One combat round is 1 minute long and one hex = 1,000 meters wide.

Moving one hex per combat round is equal to 60 kph or 37 mph.

Most ground vehicles are capable of only one or two hexes per round unless traveling on a prepared surface like a road or rail system. Grav tanks are capable of combat speeds reaching 12 hexes, 720 kph, or roughly 450 mph.

1.3 Dice Conventions

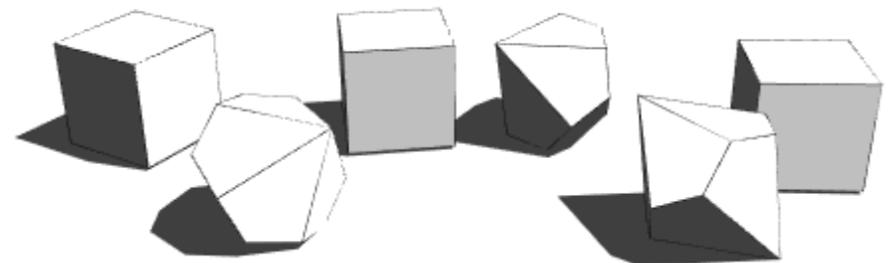
There are four common dice throws in Frozen Thunder: 1d6, 1d10, 2d10, and 1d100. This is a short code that indicates the number of dice and the number of sides on those dice to be rolled.

A 1d6 is your typical board game die with one to six pips. It is handy for randomly determining directions on a hex grid map.

The 1d10 is a ten sided die numbered 0 to 9. Rolling a zero is usually treated as a ten. For example, 2d10 is the code for throwing two ten-sided dice and adding the results together. Rolling a 0 and a 9 would be read as 10+9=19. In FT, this roll is used to determine the point of impact on the DAT. The average value for 2d10 is 11 which is the middle row or column on the template no matter which side you attack from.

The last die roll used is the 1d100 or percentage roll. The simple way to generate this number is to grab two ten-sided dice and call one of them the tens die. Usually, the dice will be different colors making it easy to tell them apart. Some 1d10 are numbered 00 to 90 to make the tens die even more obvious. These rolls are typically used for attack rolls. Zeros are treated a little differently, a roll of 0 and 3 would be 3%, a roll of 3 and 0 would be 30%, and a roll of 0 and 0 would be 100%.

Some die rolls can be modified due to equipment or the difficulty of terrain. Whether you roll one or several dice, modifiers are added or subtracted only to the final value rolled and not to each individual die.



1.4 Game Overview

Select a scenario.

This will determine the victory conditions, the map and terrain, what units and technologies are available, where those units can be placed. As well as any option rules that are in play such as weather. If the Frozen Thunder rules are being used as part of a strategic game, the campaign game itself can act as a scenario generator for FT battles. See the section 7.0 for more information.

Deploy units.

Part of the scenario description details how units can be placed on the map. Sometimes they are placed at fixed locations and at other times their appearance is determined randomly. Specific units might even start in prepared defensive locations or be hidden. The most common scenario is two patrols deciding to engage each other with both sides selecting one or more secret deployment hexes and then rolling for 'scatter'. When a player deploys their units, they have to place all their units on the map unless some of those units are hidden or have been held in reserve (as determined by scenario.) If there are no reserves, the deployment step can be skipped on later rounds.

Play one round of battle using the movement and combat rules.

Frozen Thunder uses the Command and Execute system where each side issues orders and then they are executed simultaneously. Sections 2.0, 3.0, and 4.0 cover writing orders, movement, and combat respectively.

Determine if there is a winner. Otherwise, repeat movement and combat rounds.

Unless specified by scenario, the battle is over when one side has been completely destroyed or has disengaged. Actual victory is determined by the construction point values of the units destroyed or driven off. Bonus points can be earned by achieving mission objectives (as determined by scenario.) While rare, it is possible for a battle to end in a draw.

1.5 Playing the Game

All players should agree as to which scenario they are going to play and any special rules they wish to use. If not playing a pre-generated scenario, all sides (more than two players are possible in a FT game) must agree on the objectives of the current game, its force composition, maps to use, the initial deployment zones, and what are the victory conditions. If the battle is part of a larger setting, it is the campaign manager's job to set up the scenario.

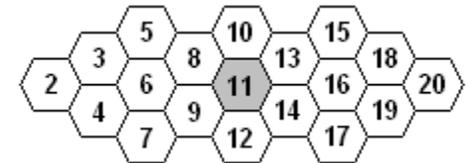
The hexagonal grid that overlays the map helps to regulate movement, determine weapon ranges, set firing arcs, and figure out angles of attack on the DAT. In Frozen Thunder, hex faces are numbered from 1 to 6. The first hex face points toward the top of the map (usually tagged as North.)

During the deployment phase, visible - fixed units are placed first. The locations of hidden units such as mine fields and camouflaged infantry are written down, but not placed on the map. Finally, incoming units are assigned one or more entry points as determined by scenario. Both then roll for possible scatter depending on the unit type. Due to terrain restrictions some units are limited to certain hexes. For example, a train can only appear on tracks or a naval vessel can only appear in the water. If a unit scatters into an invalid hex, the owning player moves it to the nearest valid entry location. Similarly, if a unit scatters into a hex that is off the map, move it to the nearest hex that would put the unit back on the board.

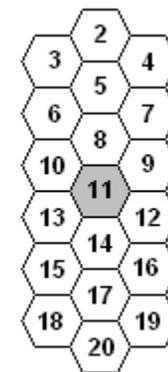
Ground units such as tracked and wheeled vehicles, infantry, or naval vessels are slow enough to not deviate wildly. Roll a 1d10 and a 1d6. If the 1d10 is a five or less, they appear in the indicated starting hex. Otherwise, they appear in the adjacent hex as determined by the 1d6 roll.

Flying units such as grav tanks and fighter aircraft are prone to more variation. Roll 2d10, on a roll of 11, they appear in the hex as written. Otherwise, refer to the following scatter charts:

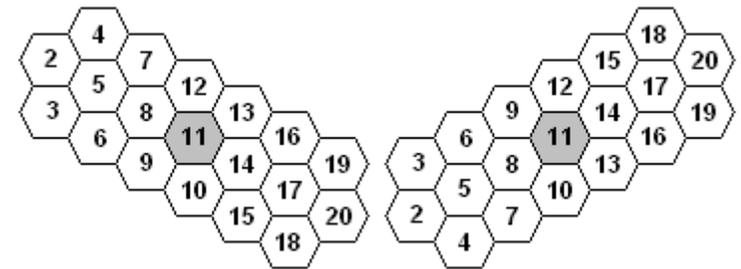
Use this diagram for units entering from the North (top) or South (bottom) of the map.



Units that appear on the sides of the map use the vertical scatter diagram.



If the units are entering from the corners of the map, use the angled scatter diagrams below.



After the deployment phase is finished, orders are written and executed.

2.0 Command and Execute

Frozen Thunder models fast paced future combat where jousting grav tanks try to smash and burn their opponents with heavy weapons. The system does this with a couple of simple rules where players write orders and then execute simultaneous movement while firing at enemy units.

At the start of each combat round, players write down orders for each of their units, even if those orders are to sit still and do nothing. (That's certainly is a viable tactic for an infantry squad waiting in ambush.)

2.1 Turn Sequence

Frozen Thunder is played in a series of one minute turns called rounds. Each round, the following steps are executed in order:

1- **Reinforcements** (beginning of round only)

Any units that are scheduled to appear - do so now. However, they do not move during the movement phase. Reinforcements are placed as specified by the deployment rules for the scenario. Their current speed and facing are also determined by the scenario. Normal scatter rules apply.

2- **Write Orders** (beginning of round only)

The minimum set of orders directs each unit on where to move. Each unit type has specific limits where and how far they can move based on their capabilities. Additionally, units can be given fire orders that determine when they can fire at the enemy. The default fire order is 'fire at will'.

3- **Movement** (check each phase)

The combat round is broken up into twelve phases that are five seconds each. Units moving at a speed of twelve would move one hex per phase while a unit with a speed of two would move one hex every sixth phase. Movement within any phase is treated as simultaneous. At the end of any phase, the players can announce weapons fire at any valid targets.

4- **Combat** (possible each phase)

Combat rolls within any single phase are treated as simultaneous after movement. Damage is applied at the end of the phase.

1. All units select targets and allocate available weapons that can fire.
2. Resolve any point defense against missiles.
3. All surviving weapons fire is resolved.
4. Damage is applied against shields (if any) and then the DAT.
5. Damage is recorded and any destroyed units are removed from play.
6. Ramming attacks are resolved if the rammer is still able.

5- **Resolution** (end of round only)

Victory conditions are checked to see if they have been met. If not, repeat steps one through five until the battle is over.

If the battle is finished and it was part of a campaign game, apply all effects of the battle to the surviving forces.

2.2 Creating Orders

On each map sheet, individual hexes are numbered in order to help with writing of orders for your units. The usual numbering scheme is that the first two digits represent the column and the next to the row or hex in that column.

Each order includes the unit's name or ID number, its current facing (if any), current speed, its new speed when accelerating or decelerating, hexes to travel into, and weapon firing orders (defaults to fire at will.)

Sample Order sheet:

<u>Unit ID</u>	<u>Facing</u>	<u>Spd</u>	<u>New Spd</u>	<u>Move Orders</u>	<u>New Facing</u>	<u>Weapon Orders</u>
Razor 1	1	5	6	1123>1117	1	Fire at will
Razor 2	1	5	6	1323>1317	1	Fire at will
Infantry 1	-	0	0	Hidden 1418	-	Ambush
Infantry 2	-	0	1	1018>1019	-	Fire at Will
Mine 1	-	-	-	Hidden 1320	-	Ambush

Razor 1 is moving North in a straight line (heading up the column.)

Razor 2 is running North and is parallel to Razor 1.

Infantry 1 is hidden and is not been placed on the map board.

Infantry 2 was previously visible (or has just revealed itself) and is moving one hex South. Infantry units do not have a facing and can fire from any direction.

Minefields can't move and usually are hidden. If this is an enemy mine field, when Razor 2 moved to hex 1320 it would have detonated as a surprise attack and revealed its location.

3.0 Movement

In Frozen Thunder, vehicles can fly over the map, drive through cities, and navigate waterways. Regardless of how they move, they all use the Phased Movement table. The phased movement system regulates movement over a one minute combat round. The table allows for roughly simultaneous movement even when those vehicles have different speeds. It is also designed so that all vehicles arrive in their final hex on phase 12.

Phased Movement table:

Phases ->	1	2	3	4	5	6	7	8	9	10	11	12
Speed 1	-	-	-	*	-	-	-	*	-	-	-	⊙
Speed 2	-	-	-	*	-	⊙	-	*	-	-	-	⊙
Speed 3	-	-	-	⊙	-	-	-	⊙	-	-	-	⊙
Speed 4	-	-	⊙	-	-	⊙	-	-	⊙	-	-	⊙
Speed 5	-	-	⊙	-	-	⊙	-	⊙	-	⊙	-	⊙
Speed 6	-	⊙	-	⊙	-	⊙	-	⊙	-	⊙	-	⊙
Speed 7	-	⊙	-	⊙	⊙	-	⊙	⊙	-	⊙	-	⊙
Speed 8	-	⊙	⊙	-	⊙	⊙	-	⊙	⊙	-	⊙	⊙
Speed 9	-	⊙	⊙	⊙	-	⊙	⊙	⊙	-	⊙	⊙	⊙
Speed 10	-	⊙	⊙	⊙	⊙	⊙	-	⊙	⊙	⊙	⊙	⊙
Speed 11	-	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Speed 12	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙

* Slow moving vehicles can do a hex facing change every fourth phase.

This allows them to do a 180 degree turn in one combat round. Vehicles moving at speed 2 can turn on phases 4/8/12, but move on 6 and 12.

On any given phase, units moving at speed 3 or more can also turn by one hex facing unless restricted. A unit can either turn before or after it moves but not both. Turrets can turn independently of the hull. This enables a turret to 'track' a target or location.

If a vehicle is at speed zero and is not disabled or stopped due to terrain, it can turn its hull to face an adjacent hex side on phases 4/8/12. For example, a tank facing north (facing 1) can do a 180 degree turn and end up pointing south (facing 4) on phase twelve. Similarly, that unit could have swept right (facing 2), back to front (facing 1), and then left (facing 6).

3.1 Infantry

Infantry units are the most limited in speed, but their movement rules are the easiest to apply. Standard powered infantry has a speed of one and no facing restrictions. They can move into any adjacent hex with the exception of open water and cliff faces. If they are in a building, they can go up or down one level instead of moving into an adjacent hex.

Marines are specialized infantry units capable of moving through water hexes. This extra capability makes them more expensive than the infantry. But, it also allows them to be deployed from subs and surface navy vessels.

Jump infantry gain extra mobility with their combat suits that allows them to move two hexes per combat round. It may sound slow, but they're covering ground at over 70 mph (120 kph.) When moving at full speed, they can't enter swamp hexes or heavy trees without making a danger roll. They can clear cliffs, jump out of buildings, deploy from slow moving vehicles (speed two or less) without being destroyed. They are also much more expensive.

3.2 Tracked Vehicles

Most tracked vehicles are slow and can only move one hex per turn. They can't enter buildings, swamp, water, heavy woods, or cross cliffs. If the vehicle has turret or hull mounted weapons, the player needs to track the appropriate facings and write orders to change them.

Main battle tanks are a high performance version of the tracked vehicle and can move two hexes per combat round. When traveling at full speed, MBTs are only capable of one 60 degree turn per combat round. When moving only one hex per round, they use the normal turning limits (phases 4/8/12) and can enter any valid adjacent hex. If they travel at full speed into light woods, swamps, or cities they need to make a danger roll.

3.3 Wheeled Vehicles

When referring to wheeled vehicles, we are talking about armored personnel carriers, mobile gun platforms, and missile launchers built on a LAV (light armored vehicle) frame. LAVs can't enter buildings, water, heavy woods, or cross cliffs. They can only move through swamps at one hex per combat round. Most LAVs are capable of moving two hexes per turn and can make two 60 degree turns per round when moving at full speed. If moving at full speed through light woods or cities, they need to make a danger roll.

Civilian vehicles are not normally encountered on the battlefield. They are capable of moving three hexes per combat round and can only travel on roads or desert flats. Moving at three hexes per round in a congested area such as a city requires a danger roll for each hex entered.

3.4 Trains

Trains can travel through any terrain due to the use of rails and bridges. The flip side is that they can only travel on rails. Trains have limited acceleration and braking. So, they can go from zero to one, one to two, and two to three hexes per combat round. For example, a train that is currently travelling three hexes per rounds would take three kilometers to come to a stop. A train at zero speed can accelerate in either direction next round.

Trains can't pass another train unless it is a double set of tracks. If a train that can't stop in time to hit an obstacle such as a parked vehicle, a blown section of track, or another train, it will always crash (see ramming.) There is no need to make a danger roll since the crash is unavoidable.

3.5 Naval Vessels

Wet navy units such as combat hydrofoils, destroyers, and cruisers are limited to water hexes only. They have a top speed of one hex per combat round. These naval units can move in any direction except reverse or they can choose to not move out of the hex and change facing as normal. What they lack in maneuverability they more than make up for in mass.

Super tankers and cargo ships are not combatants, but they may be strategic targets. They have a maximum speed of one hex per round, it takes them three rounds to accelerate or decelerate, and they can only turn by 60 degrees every other round.

3.6 Anti-Gravity Vehicles

The primary combat vehicle of the Frozen Thunder setting is the anti-gravity tank. These units dwarf main battle tanks and buzz around the battlefield like the strike aircraft that they replaced.

Anti-grav (aka contra-grav) vehicles fly very close to surface and can easily traverse any terrain type except heavy woods. However, they have to make danger rolls if they try to fly through cities, swamps, or light woods at any speed greater than one hex per round. They have a max speed of 12 and can hover at speed zero.

Grav tanks can optionally perform a pop up maneuver to move over heavy and light woods, clear cliffs, or to go over level one and two buildings. The cost of this action has the effect of losing any terrain cover and increases the distances it can be seen and attacked

Anti-gravity technology allows vehicles weighing hundreds of tons to flit about the battlefield like a hockey player looking for a fight, but all that armor and equipment does have a price. The faster a grav tank moves, the wider turns it must take. Grav tanks have a default acceleration and

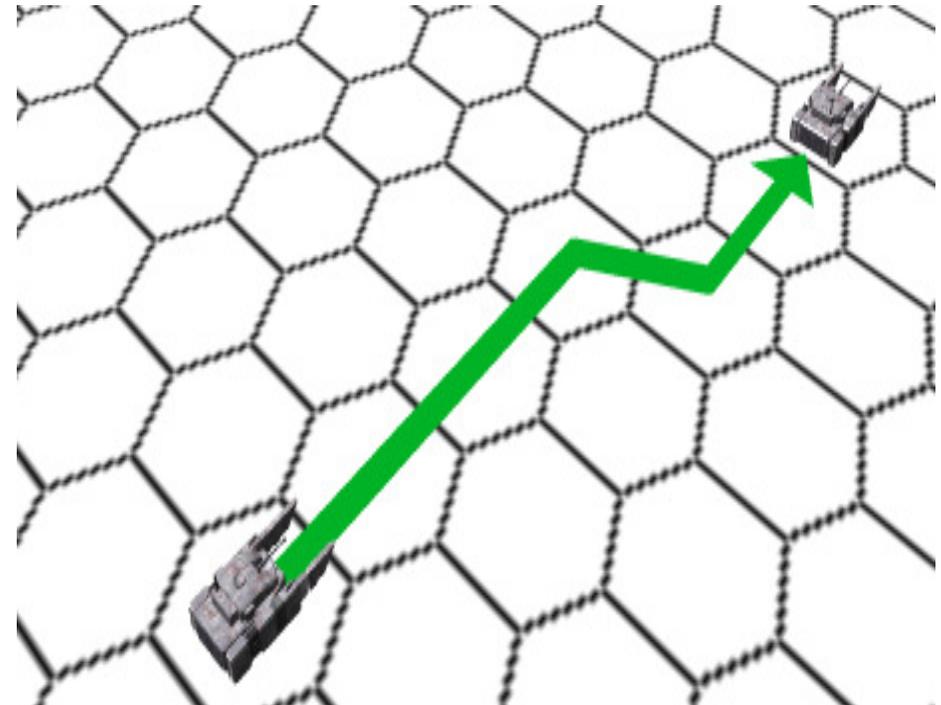
deceleration rating of three. Current speed is set (based on acceleration and deceleration) during the order phase. But, it can change over the course of a combat round due to collision or weapon damage.

The relationship of maneuverability to speed is expressed below:

Speed 0 to 2	Turn at will up to three facing changes (4/8/12).
Speed 3 to 5	Must move one hex forward before turning.
Speed 6 to 8	Must move two hexes forward before turning.
Speed 9 to 11	Must move three hexes forward before turning.
Speed 12+	Must move four hexes forward before turning.

Instead of turning, a grav tank pilot can choose to perform a side-slip maneuver where they maintain facing but shift one hex to the left or right. It's possible to combine an elevation changes with a side-slip or turn action.

While a grav tank will typically fly over water, it is possible for a grav tank to travel underwater. The maximum speed is one hex per round underwater or when transitioning between air and water. Flying into water at speed two or higher is an automatic crash since you're hitting the water at 120 kph.



3.7 Aircraft

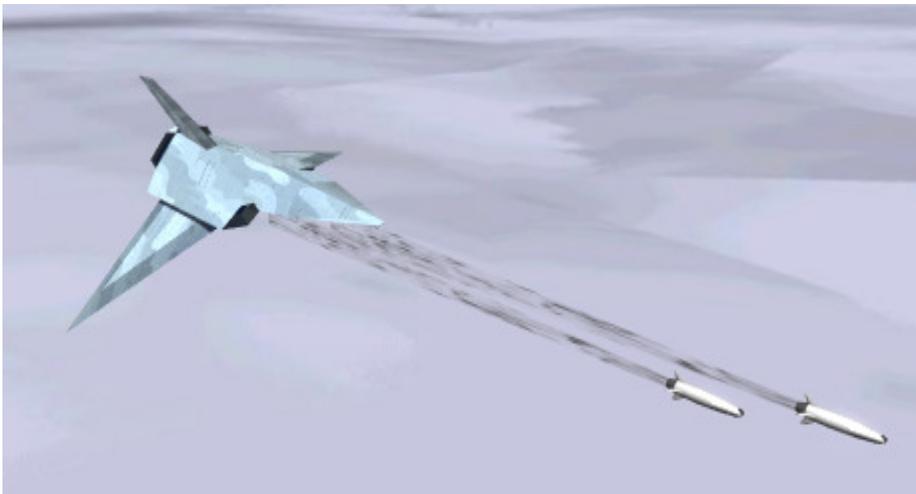
Air superiority died the day that battlefield lasers and energy weapons became practical. Most aircraft strikes actually are the result of weapons that are launched from over the horizon. These attacks are handled in a similar manner to off-board artillery.

When aircraft do appear on the map, they move at two speeds; sub-sonic (speed 12, move one hex per phase) and super-sonic (speed 24, moves two hexes every phase.) Aircraft are capable of two facing changes per combat round. Super-sonic aircraft that side-slip can move one or two hexes to the side (one at sub-sonic speeds and two at supersonic) and then resume forward flight.

The typical attack pattern for strike craft is to line up on a hex row off the board and roll for scatter when they enter the map. They can then do any needed course corrections, perform their recon or attack mission and then try to exit the map as soon as possible. While on the map, they are exposed to anti-aircraft and return fire.

Drones are also considered aircraft although they fit more into the role of mini-helicopter. They are designed to carry a single weapon or sensor package and are piloted remotely by humans or AI systems. They have a top speed of 3 hexes per combat round. They are very agile and can turn to face any direction when they move.

Robotic aircraft, while they may be called drones by some militaries, are treated the same as conventional aircraft even if they have a remote pilot or an AI controlling it.



3.8 Danger Rolls

The danger roll reflects the chance for an accident when moving at high speed. Roll 1d10 when indicated below for each hex entered; if the result is a 1, 2, or 3 then apply the listed effect.

Danger Roll table:

Roll when	Trees	Swamp	City	Effect + modifier
Jump infantry moves at speed 2.	X	X	-	Roll 1d10-2 for effect
Tracked vehicle moves at speed 2.	X	X	X	Roll 1d10-1 for effect
Wheeled vehicle moves at speed 2.	X	X	X	Roll 1d10 for effect (no modifier)
Civilian Vehicle moves at speed 3.	-	-	X	Roll 1d10+1 for effect
Anti-Grav tank moves at a speed of 2 or more.	X	X	X	Roll a single drill attack with damage equal to current speed. Apply to the shield then the front DAT facing or the front side if side slipping.
Drone moves at a speed of 3 or more.	X	X	X	Drones are automatically destroyed when they crash.

Danger Effect table:

Roll + mod	Effect
3 or less	Slowed: The unit stops immediately in that hex and top speed next round is one.
4-6	Stopped: The unit stops immediately in that hex and has to spend the next round at speed zero.
7-8	Accident: The unit takes a wound, stops in the hex, and its top speed next round is one..
9 or more	Crashed: Unit is taken out. The vehicle is broken or wrecked and can't fight or move anymore.

3.9 Ramming

Ramming is a form of vehicular attack that happens during movement. Generally, there's enough space in a one kilometer hex that multiple units can co-exist without smashing into each other.

There are a number of conditions that have to apply in order for a unit to be eligible for a ramming attack.

1. The target and rammer have to be in the same hex at the same level at the end of the same phase. Aircraft can ram other units at any level but aircraft can only be rammed by other aircraft.
2. The rammer has to be capable of moving.
3. The target must be a vehicle (infantry will disperse) or building.
4. The rammer has to survive any weapons fire directed at it on the same phase that it is trying to ram. If the rammer is destroyed or disabled by weapons fire, the ramming attack automatically fails.

Ramming uses a 1d10 check like the danger roll, the odds of success are based on the target speed and vehicle agility. Stationary targets like buildings, bridges, or disabled units are automatically hit on a ram attempt.

Trains can only ram objects that are on the rails. If the target can leave the tracks and does not want to be rammed, it can't be rammed by a train. Similarly, if the target wants to be hit, it can sit on the tracks and not be avoided. This makes trains a binary solution where odds of ramming are either automatic failure or success.

Ramming table:

Vehicle	Ramming Damage	Target Faster	Same Speed	Target Slower	Target Did Not Move
Tracked	3	1	1-7	1-8	Automatic
Wheeled	2	1-2	1-8	1-9	Automatic
Naval	8	1	1-4	1-8	Automatic
Anti-Grav	4 + Spd	1-4	1-6	1-8	1-9
Aircraft	4	1-2	1-4	1-6	1-8
Super Sonic	6	-	1-2	1-3	1-4
Train	6	*	*	Automatic	Automatic
Drone	1	1-5	1-6	1-7	1-8

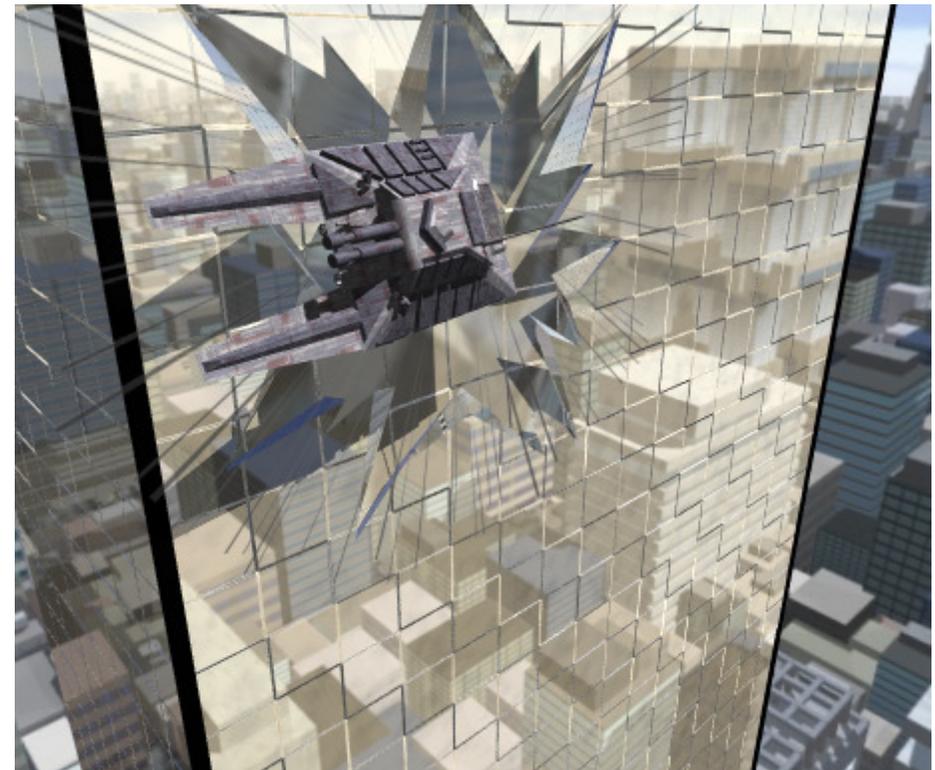
* Head-on collisions are automatic.

A failed ram attack does no damage to either unit with the exception of conventional aircraft and drones ramming ground units and buildings. Such attacks automatically destroy the ramming vehicle.

The damage inflicted by a ram depends on vehicle mass and speed. Anti-grav vehicles are capable of inflicting major damage due to mass and speed. In vehicle versus vehicle impacts, the two units trade damage. So, a tank hitting an APC does three and takes two points of damage. Or, an anti-grav tank moving speed five would inflict nine while taking six points of damage when hitting a train.

Ramming a building or bridge causes a reflection of damage. Thus, a naval ship ramming a bridge would do eight points of damage to the bridge and itself. There is a limit. If the structure has less damage remaining, only the lower amount is applied. For example, a tank ramming a one point guard post would only take one point of damage even though it could inflict three.

Most units when they successfully ram another unit will come to a full stop. Anti-grav vehicles will only stop if they hit a building and fail to destroy it. Otherwise, they plow through and keep going at half speed (round down.)



4.0 Combat

Combat is considered simultaneous in Frozen Thunder on any single phase after movement and before ramming. For example, shots traded on phase five are all resolved before movement and attacks on phase six. It's possible for orders to fail due to combat damage earlier in the round.

1. Each player declares attacks for all of their active combat units. This includes opportunity fire and allocating point defense batteries by either side. Ammunition is expended for missiles and guns.
2. Each attack rolls to hit in the order that they were declared.
3. Each attack that hits applies any damage in the same order.

Simultaneous combat in this context means that even an out-gunned LAV gets a chance to shoot before it is fragged. This also means that a player cannot "plink" a target to death. A player must allocate their firepower during attack declaration and take their chances with overkill.

A player can fire one or more weapons from any unit that is not disabled; they may choose to fire all, some, or none of the available weapons. Each weapon system can select its own valid target. Some weapons, such as mine launchers and drones will deploy to a hex rather than fire at a unit.

Unless specifically stated as part of the weapon write up, no single weapon can fire more than once per combat round. When this happens, that weapon will have a specific ROF (rate of fire) assigned to it. ROFs of 1/2 or 1/3 indicate that a weapon can only fire once every other round or every third round after it has fired the first time. The weapon must then recharge, reload, or cool down as determined by the weapon's description.

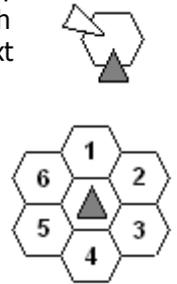
Since a target can sometimes be damaged during the movement phase, its ability to perform actions can be reduced or denied. Players will sometimes need to amend their orders based on the current capabilities of their units.

Firing Arcs

Depending on a weapon's mount, it can have a variety of firing arcs. There are three standard firing arcs in Frozen Thunder. Fixed weapons can only fire into a single hex row. Standard mounts can fire in a 120 degree arc (60 degrees to the left and right of the hex they're facing.) Components with a 360 degree arc are mounted in fast turrets and can always track and stay on target. Components in the turret DAT can only make a facing change every 4th, 8th, or 12th phase when the turret pivots. If a firing arc passes through the middle of a hex, any units in that hex can be targeted.

When determining the angles for a same hex firefight, use the units' current facing to determine the weapon arcs. Next, randomize the relative positions

of the combatants. In a drive-by attack, it's possible to end up in front of, behind, or off to one side of the enemy. Start with the slowest vehicle/target and roll a 1d6 to determine the next unit's position relative to the slower unit that is in that hex. Each unit retains its facing. It's possible that two vehicles will pass by each other before getting into a good firing position.



If one of the combatants is disabled or immobile, the opponent can choose which of the six facings it will attack. You only need to roll for units where facing, firing arcs, and the DAT matter. For example, two infantry units can shoot at each other regardless of their relative position and facing to each other. Units with turrets can rotate them on phases 4, 8, and 12 after the positions are set.

4.1 Point Defense

Each point defense battery gets to fire once per phase in an attempt to destroy a single missile or drone before it attacks. Like weapons fire, you allocate all point defense batteries that you're going to use first and then roll to intercept. Do not allocate one battery and roll, allocate another and roll, etc. Point defense has a range of zero and can be used to protect other friendly units that are in the same hex. Point defense has no effect on plasma weapons, energy beams, cannon shells, or other vehicles.

Roll 1d10 for each point defense battery based on the target type. The intercept percentage represents a mix of armor, speed, and target size.

Point Defense Intercept table:

Target	Intercept	Notes
Anti-tank missile	1-6	Heavier/slower missiles with a larger warhead
Standard Missile	1-5	Baseline point defense target
Drone	1-4	Human or AI controlled weapons platform
Armored Missile	1-4	Hardened kinetic warheads
Smart Missile	1-3	Has evasion routines and ECM

For example, you have a vehicle with three point defense batteries and two incoming anti-tank missiles. The defender can assign one PDB to each missile and hold the third battery in reserve for later in the round. Or, they can assign two batteries to one missile and one battery to the other. That decision is made before the intercept rolls. If they rolled a 1 and 7, they can't go back and assign the third point defense battery that held fire.

4.2 Weapons Fire

Normal weapon systems can only perform one attack per combat round and most weapon systems have a re-load or cool-down delay of four phases. So, a weapon fired on phase 10 could fire again on phase 2 of the next round. A combat unit can fire some, none, or all of its weapons at one or more valid targets. This allows a player to be selective in the deployment of mines and drones, manage weapon recharge/cool-downs times, or conserve ammo. Weapons can fire past other units in order to strike more distant targets.

Any unit destroyed or disabled during movement due to a bad danger roll or mine field damage does not get to fire. A unit must have a functioning weapon system in order to attack. A functional weapon is defined as an undamaged weapon system and for large units that includes an undamaged command component, available power, and any required ammunition.

Most energy weapons and cannons are considered direct-fire weapons. Terrain can limit their line of sight and reduce its accuracy.

Missiles can be used as either direct-fire or indirect fire weapons. Indirect fire is not as accurate, but it benefits from ignoring most terrain and can strike at targets where there is no direct line of sight.

Mines and drones are deployed during the attack declaration. Mines have no movement capability and are simply dropped from a mine layer or are fired at another hex via a mine launcher. They are activated when an enemy unit enters their hex (rather than while they are sitting in the hex or leaving it.) On the combat round that they are deployed, drones are not active. On the next round they can be given orders like most units.

Weapons Range table:

Range	Hex	Notes
Point Blank	0	point defense, infantry weapons, mines, flamethrowers
Close	1	Heavy machine guns, man-pack or drone missiles
Short	3	MBT or LAV cannon, anti-tank missiles
Standard	8	Anti-grav vehicle weapons
Long	24	5" Naval guns, extended range weapons
Extreme	+	Artillery, anti-ship and cruise missiles, battleship guns

When two combatants are in the same hex (range 0), they gain a +20% target bonus with their weapons. This bonus does not apply to weapons that are normally limited to point blank range or long/extreme range.

4.3 Scoring Hits

All attacks that have not been intercepted by point defense are resolved in the order that they are declared. Since damage is not applied until the end of the phase, everyone that fires gets a chance to inflict damage. It is possible for two units to trade shots and take each other out.

Modern fire control systems are very good and unless you have cover, it is very easy to hit your target. The base accuracy for most weapons systems is set at 80%. So, a roll of 01 to 80 lands on target and shots at point blank range rarely miss. Nearly every shot will be at least close to the target and the unit's cross section on the DAT becomes a deciding factor in accuracy.

The to-hit process is to determine the base accuracy. This starts at 80% while indirect fire has a base accuracy of only 40%, but it ignores terrain except in the target hex. Modify the base accuracy by any positive or negative modifiers for ECM jamming, battle computers, ghost fields, a range zero bonus, terrain effects, etc.

When counting modifiers along evenly split hex sides, the defender chooses which modifier is applied. For example, a shot runs between a woods and a city hex, the defender can choose the -40% modifier for city terrain.

Base Accuracy Modifiers table:

Modifier	Bonus	Notes
Battle Computers	+10% +20%	While everything has a targeting system, some units have better or far superior equipment installed.
ECM	-40%	Electronic Counter Measures can severely degrade missile accuracy and jam GPS and communications.
Defensive Positions	-20%	Ground units, especially infantry, can take advantage of sand bags, trenches, and fox holes.
Cloaking	-30%	Not quite invisibility, ghost fields can distort radar and thermal imaging as well as light.
Fog/Dust	-10%/	An environmental factor that makes any terrain more difficult to fight in. Penalty is applied to each hex.
Trees	-20%/	Each hex of woods and swamp reduces accuracy.
Cities	-40%/	Each city hex provides lots of hard cover for units.
Point Blank	+20%	Close/short/standard weapons used at range zero.
Stationary	+20%	Vehicles that have a movement of zero, bases, buildings, bridges, and rails are easier if not automatically hit.

3. Roll percentile dice (1d100) for each weapon system.

A roll of 01-10 is a Direct Hit, if base accuracy is greater than 10%. When determining the point of impact in step 5 below, re-roll any hex row that would initially miss the target.

If the roll is less than or equal to the adjusted base accuracy, the attack is on target and might damage the target. Roll on the DAT as normal.

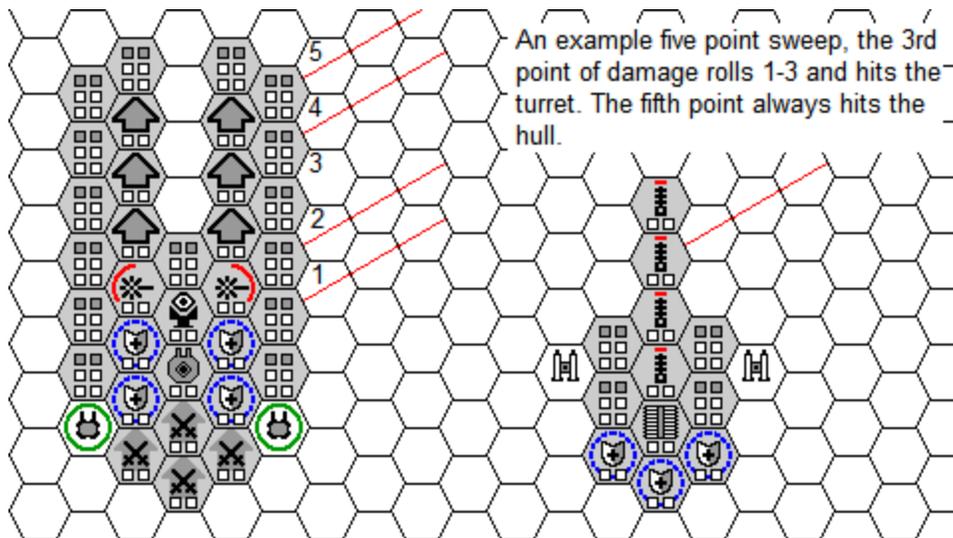
If the roll is greater than the adjusted base accuracy, that's a clean miss.

When an area effect attack such as an artillery or air strike misses, roll 1d6 to determine which adjacent hex it scatters into and attacks.

4. Determine the angle of attack of the shooter to the target. This will determine which side of the DAT to use. Subtract damage from shields and other defenses first. Any excess damage is rolled against the DAT.

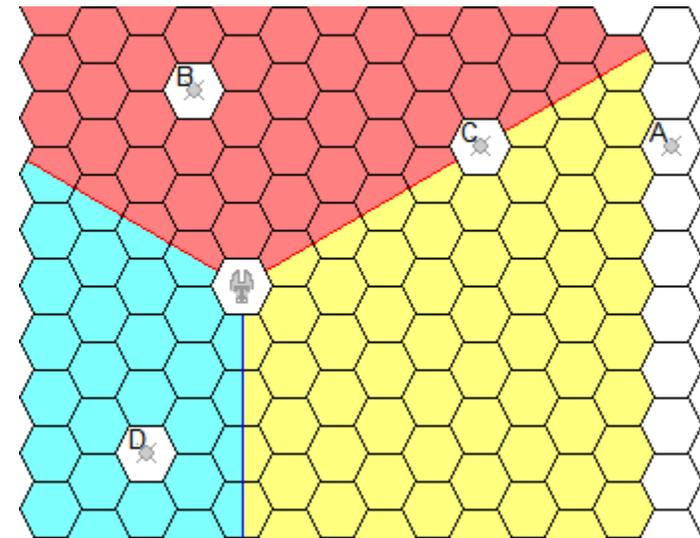
5. Roll 2d10 and check for an impact point based from the direction. If an attack comes in from the corner of a hexagon, the attacker chooses which of the two facings to use. The remaining damage is applied to armor, vehicle components, or individual units in a group based on the weapon profile.

If a given point of impact can strike either the hull or a turret, roll 1d10 and on a 1-3 apply the attack against the turret instead. In the unusual case where the turret can be hit and there is no hull to strike, the attack is applied to the turret directly. You only roll when both are present. When weapons with multiple points of impacts (sweeping or scatter) are used, roll for each hex row where the hull and turret overlap as possible targets.



For example, the Badger has four hull mounted beam weapons and four missile launchers in a turret DAT. The turret (and thus the missiles) is currently facing forward. There are two 2 pt beams with a forward arc, two 1 pt beams in the left and right rear arcs.

Target A is out of range out of weapon range. Target B is in the Badger's forward arc. The 2-pt beams and the four missiles can fire at it. Target C is in the Badger's sweet spot where the forward and right rear arcs overlap. The unit's 2-pt beams, one 1-pt beam, and the four missiles can fire at it. Target D is in the Badger's right rear arc. Only a 1-pt beam can attack it. Of course, if the Badger fires its forward beams at Target B, it could not fire the same weapons at target C this combat round.



We've mentioned terrain and firing arcs, there are also cases where elevation can impact line of sight. Split elevations do not block LOS, but a solid hill between two units will.

4.4 Resolving Damage

Damage is applied based on angle of attack and the point of impact rolled on the DAT. If it is only a single point of damage that gets past the defenses, apply the point of damage to the impacted component as indicated in the section 4.5 Damaging Components. When greater amounts of damage get past the defenses, the characteristics of the weapon profile come into play. Each attack that gets through should be rolled separately. For example, if two 4 point beams hit a target with three points of shields. The first hit is reduced to 1 point of damage and is treated as a one point beam hit. The second hit is treated as a separate 4 point beam hit.

There are four major weapon profiles:

Sweep: Beam weapons and barrage fire are examples of sweeping attacks. Sweeping attacks can cover a large area, but do not dig deep. If the attack does more than one point of damage after defenses, roll a 1d10 to see if the damage either walks up or down the DAT from the point of impact. If the roll is five or less, move each consecutive point of damage down the DAT. On a six or higher, the attack sweeps up from the point of impact.

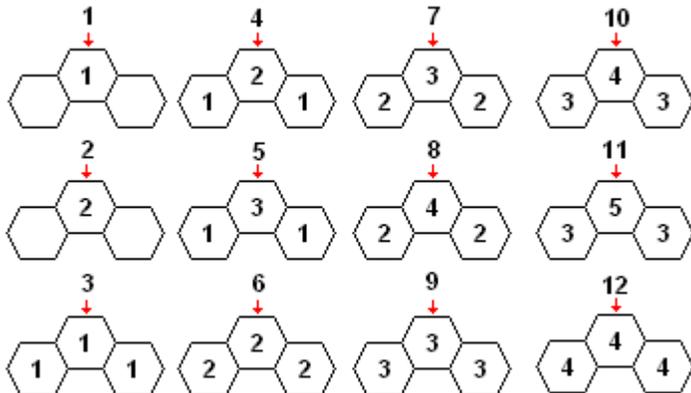
To speed up game play and save a die roll, players can optionally declare 'high' or 'low' for the direction of the sweep before rolling on the DAT.

Drill: Armor piercing weapons, energy lances, or x-ray lasers are considered drilling attacks. Drilling attacks punch straight into the target at the point of impact. These attacks are prone to wasting firepower on small targets by either blowing through the unit or narrowly missing it entirely.

Scatter: Flak shells, cluster munitions, infantry, and rapid fire weapons are examples of scattering attacks. Scattering attacks strike like a hail storm. Every single point of damage gets its own point of impact roll on the DAT. Scattering attacks provide better odds that at least some damage will hit a narrow target or that you'll get multiple hits on a flight of drones.

Explode: Missiles, plasma weapons, and some cannon shells are explosive attacks. Explosive attacks are not as wide as sweeps, but they can possibly reach deeper into the hull. The attack spreads out from the point of impact after striking the hull.

The normal distribution of damage points for an explosion is three hexes wide, but that depends on the amount of damage inflicted. Look up the amount of damage that gets through all defenses and apply that to the left, center, and right columns.



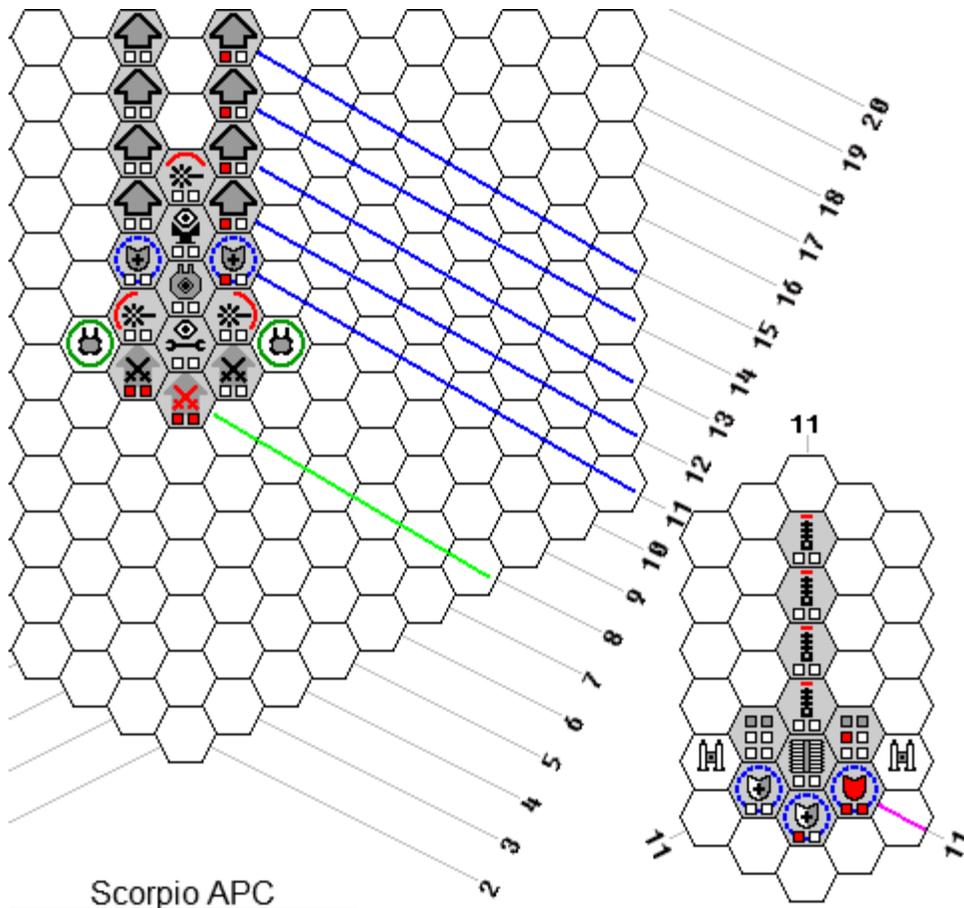
The default amount of damage that a weapon component inflicts is one point for each hex space in size. At design time, two or more weapon components of the same type can be combined to create an integrated weapon group which is treated as a single attack with greater power. Once combined into a weapon group, the weapon components can not be split back into smaller attacks. For example, four gauss cannon components are combined into a four point attack. If one of the components in our 4pt cannon is disabled or damaged, it becomes a 3 pt cannon. Higher tech ammo and equipment in a campaign setting can multiply the damage.

In the following example, the Salem is moving through light woods when it is attacked by a heavy tank destroyer. The attacker has declared that they are opening fire with the grav tank's twin particle beams (two 8 pt beams) and four fire-lance missiles (3 pt missiles that use the drill profile.) The attacker rolls 1d100 for each attack with the light woods reducing the base accuracy from 80% to 60%: rolling 28, 01 (a direct hit), 17, 50, 73, and 98. Bad news for the Salem, both beams and two of the missiles are on target.

First off, weapons are resolved in the order that they are declared. So, the first eight point beam hits the shields and is absorbed, dropping Salem's twelve point shield to four points and burning out four shield generators (they're marked as disabled.) The eight points from the second beam drops the shields and burns out the last two shields generators. All six generators are now burned out (the Salem's shields absorb two points each.)

So, four points of beam damage gets through as well as the two missiles. The attacker rolls 2d10 three times to determine the points of impact on the DAT (15, 10, and 8 are rolled.) The enemy unit was directly in front of the Salem, so the top number scale is used. The point of impact for the beam (15) actually begins with missing the Salem, but since the beam was a direct hit, the attacker re-rolls the point of impact and gets a 12. The attacking player rolls for the direction of sweep (1-5 for lower, 6-10 for higher.) He rolls a 1 and the beam sweeps low to columns 11, 10, and 9. One shield generator takes another point of damage and it is downgraded from disabled to damaged. One point is also taken off of its forward beam array and that component is now offline. The first missile (10) also catches the Salem in the front. Because it is an armor-piercing/drill attack, the damage runs in a straight line, the beam component takes three points of damage and goes from offline, to damaged, and then destroyed. The Salem's forward beam firepower has been cut in half. If that column is hit again, the exposed missile launcher would start taking damage. If the fire lance torpedo had been a standard explosion, the damage would have spread out to the adjacent components and damaging, but not destroying them. The third missile (8) narrowly misses the Salem.

Sweeping (blue) and drilling attacks (green) have simple methods for generating their damage patterns, but explosions (magenta) vary depending on the amount of damage that got through. This example shows a five point beam that sweeps higher (each point rolled 4+ and struck the hull), a five point armor piercing attack, and a five point explosion (which rolled less than 4 and struck the turret.) The sweep does one point to each component and disables them (dropping the grav tank to half speed.) The drill destroys the assault bay and goes on to damage the next one. The explosion destroys the shield generator, disables another, and nicks some armor. If the Scorpio's shields have been up, the five shield generators would have stopped the first 10 points of damage and burned out. The five point hit on the turret would instead have damage one generator, destroyed the next, nicked the armor, and disabled the magazine



4.5 Damaging Components

Most components can take several points of damage before being destroyed. The first point of damage will usually knock that component offline and prevent it from operating until repaired by a damage control system (if present.) Additional points of damage will disable or destroy that specific component. Destroyed components are wrecked and shattered but they are not vaporized. Any attack capable of vaporizing a component would essentially detonate the target rather than damage it.

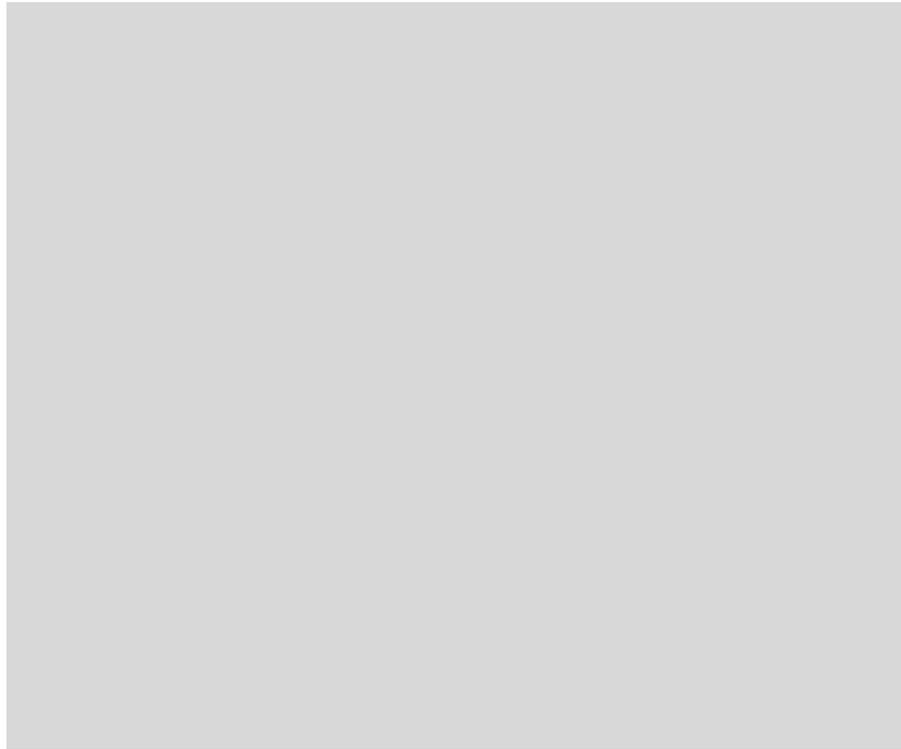
Battle damage may alter a unit's ability to fire its weapons, launch drones, maneuver, or perform other actions. Each internal component normally will only degrade the ship by what it contributes. This means that an eight point beam battery can be reduced to a seven point battery, or when a single missile launcher is taken offline, it does not affect any of the other launchers.

Anti-grav tanks, bases, and naval vessels are knocked off-line when all of their control spaces are disabled. Essentially, they are 'out of control' until a bridge component or other control space is repaired. If all the control spaces are damaged or destroyed, that unit is mission killed. Larger units typically have multiple control spaces. When all of the control spaces are taken out, only then does that unit get disabled.

Solid components like armor plating or rock are treated differently from complicated components like a beam weapon. They do not have offline or damaged conditions. These components simply soak up damage like a sponge until they are destroyed.

Magazines are designed to contain an explosion and channel the blast away from the interior of the hull. When a magazine is disabled or damaged, it can't provide ammo or drones to the component that it is feeding. When it is destroyed, the vehicle is not crippled but the contents are destroyed. Any systems that depend on that magazine (assuming that all previous ammo was not expended) can continue to use their internal magazines if any.

External Ordnance (XO) racks, maglocks, and other 'hull-less' external systems are can only take one point of damage and then they are considered destroyed or otherwise rendered useless. A loaded weapon system like an XO rack with a missile will explode in that hex and do one point of damage to each adjacent component. Unlike incoming fire, a detonated XO rack on the turret will only damage turret components and a hull mounted rack can only damage hull components.



Damage to Drives

Due to special weapons or combat damage, it is possible for a unit to lose its engines. Ground based units simply grind to a halt immediately. Naval vessels will coast one hex (if previously moving) with one last chance to do a facing change. Anti-grav units will unfortunately drop like a rock. If the anti-grav vehicle is moving at speed zero, it will flop down without any significant damage since it is designed to take that kind of impact. If it was in motion, it will take one point of damage for each hex of its current speed. Unlike striking a utility pole, this damage is applied to every hex row on the DAT. Such a collision can easily peel the front armor off of a grav tank.

Normally, as long as there is even one functioning power system, a unit can still fire weapons and use any working systems. Once the last power system is taken offline, the unit is mission killed unless it has some internal repair system. Big power drawing items such as gauss cannons and directed energy weapons may have specific power requirements which limit their operation. These details are covered in the vehicle construction section and are included in the vehicle write up.

4.6 Special Weapon Effects

If the campaign setting allows for them, advanced weapon systems can score additional damage effects or damage a target even when the shields are still up. The standard write-up includes an activation percentage. The default is 5% per point of damage that the weapon battery is capable of prior to armor and shields. When these weapons hit a target, roll for the activation of the effect. A hit is defined as contact with the shields or contact with the hull. If the special effect is triggered, roll 1d100 and consult the appropriate table. Special effect weapons are usually associated with heavy blasts that can overwhelm a shield or focused attacks that can momentarily breach them.

Disabling Charges:

- 01 – 25 Drive controls fail next round, no turning, acceleration, or controlled deceleration. (Grav tanks do not automatically crash, but they can plow into trees, hills, and other terrain next turn.)
- 26 – 50 Power systems fail next round, no energy weapons or gauss weapons. (Point defense batteries, cannons, and launchers work.)
- 51 – 75 Shield generators go offline, shield rating of zero for one round.
- 76 -100 Main computer is offline for next round. This is the same as no drives and no weapon power, but a unit with an aux bridge (CIC, HQ, flag bridge, etc.) will continue to function normally. A second disabling hit on the same round that rolls this result would take out both sets of controls.

Thermal Weapons:

- 01 – 25 Coolant Leak, a random (non-solid) component is filled with toxic gas and the component is taken off-line.
- 26 – 50 Fire: Level 1, one random component takes two hits.
- 51 – 75 Fire: Level 2, one random component takes 2 hits plus an adjacent component takes a single point of damage.
- 76 -100 Fire: Level 3, one random component takes 2 hits plus two adjacent components take a single point of damage each.

Components of a unit operating in a normal atmosphere will continue to burn until the component is destroyed, the vehicle is submerged, or the fire is put out by an fire suppression roll at the end of the round (roll of 1-5 on 1d10, if you have one or more functional engineer controls spaces.) For each combat round that a fire burns unchecked, that component takes one additional point of damage. If the component is destroyed by fire, it has a 5% chance of spreading next round. Roll for each adjacent (but not destroyed) component.

Meson, Tachyon, and Phantom Weapons:

- 01 – 20 One random component takes two points of damage.
- 21 – 40 Random crew station or squad bay takes two hits of damage.
- 41 – 80 Explosion, one random component is destroyed plus one adjacent component takes a point of damage.
- 81 -100 Explosive chain reaction, one random component is destroyed plus four random adjacent components (if present) take one point of damage each.

Gravitic and Vibration effects:

- 01 – 25 A random power system or drive component takes two damage.
- 26 – 50 Hull Fracture, random external component (on the outside edge) takes two hits in addition to any other damage that is done.
- 51 – 75 Structural hit, one random internal component takes two hits of damage in addition to any other damage that is done.
- 76 -100 Structural Collapse/Fracture, one random component takes two hits plus three adjacent components (if present) take one point of damage each.

Due to the many possible configurations of vehicles, bases, and other units, no single method for picking a random component is perfect. You can roll 1d100 and count down each column of components. On a large base that could take a while. Or, you can roll 1d20 on the DAT (this is a flat roll and not a bell curve) and then roll a 1d6 or 1d10 as need to walk down the hex row (re-rolling anything that hits an empty space.) If a random location hits a previously damaged or destroyed component, that does count as a hit.

Frozen Thunder is designed to be a flexible system and this is far from an exhaustive list of special weapon or environmental effects that can be created as part of a campaign game or custom scenario.

4.7 Damage Control

Most components can take three points of damage: The first point disables the component, the second damages it, and the third point destroys it. Crew members or repair drones can attempt to restore disabled components after a battle. Within the scope of tactical combat, they do not have the time to repair damaged components or replace destroyed ones.

Some components are designated as armor. They are ablative in nature and absorb damage before destruction. Armor can't be repaired on the field, since armor is progressively damaged and not disabled. Burned out shield generators, however, are considered disabled and can be repaired if there is no further damage.

The one case where damage control can be done in-game is firefighting. In the case of a fire, the crew can engage the fire suppression system and attempt to put out a fire (50% chance per attempt). Each engineering control space and each active repair drone allows one attempt per turn.

For example, the grav tank is hit with a molecular agitation beam and it suffers a critical hit; a level 2 fire spontaneously starts in a random space and one adjacent component. With no previous damage applied, the starting hex takes two points and is damaged (not repairable in combat) and the adjacent hex takes one point of damage (disabled.) If the player only has one available engineer or drone, they need to decide where to send them. If the team puts out the fire in the first hex, the component is only damaged and not destroyed. The fire won't spread and the component can be repaired after the battle. The down side is that the second hex will continue to burn and become damaged rather than disabled. If the player assigns the team to the second hex, they can put out the fire and the component is only disabled, but the first hex will 'burn to the ground' and risk spreading the fire.

When damage control is not enough, field repair bays allow for repairs after a battle. Given enough time and supplies, they can be used to repair any damaged component. Similarly, a repair depot can replace destroyed components, if the resources are available.



4.8 Minefields and Minesweeping

Minefields are special weapons that players can use to defend locations. While there are dedicated land and sea versions of this weapon system, they more or less function the same way on the table top.

The attributes of the minefield are its visibility, location, trigger, and type.

Visibility plays a key role in the use of mines. If a scenario indicates that there are hidden minefields, it is the owning player's responsibility to write down their location and announce when they are activated. Mines that are revealed or deployed during play are placed directly on the map.

Every mine field has a location indicated by the column and row numbers. Since mines are a range zero attack, they can only attack units that are in the same hex and at the same level that they are. Sea mines can attack surface or submerged vessels in their hex.

Trigger is the next critical element in a mine field and they can be of three types: dumb, smart, or command. Dumb mines attack anything that enters the hex. Smart mines use Identify Friend or Foe (IFF) technology to avoid attacking allies, and command mines only detonate when ordered to by the player.

Type reflects the kind of mine that has been deployed. With the creation of combat suits, anti-personnel mines have faded in usage. Most mines are anti-vehicle in nature. Nuclear mines do exist, but they are normally defined by scenario only.

Mine layers can vary in their deployment capability as well. The standard model dispenses mines in the same hex. Advanced versions have the ability to kick out mines and deploy them in adjacent hexes. Mines typically arm themselves on the combat round after they are deployed. It is also possible to deploy mines from artillery batteries or aircraft munitions.

Mines do have some limitations. Land mines can't be deployed in water hexes and sea mines can't be deployed on land. Additionally, land mines can't be effectively deployed in city hexes due to the asphalt and concrete. It is possible to mine shorelines with either or both types of mines, but only units of the appropriate type are endangered. If a mine field scatters into a city or water hex as part of an artillery barrage or air strike, it fails to arm and is effectively a dud.

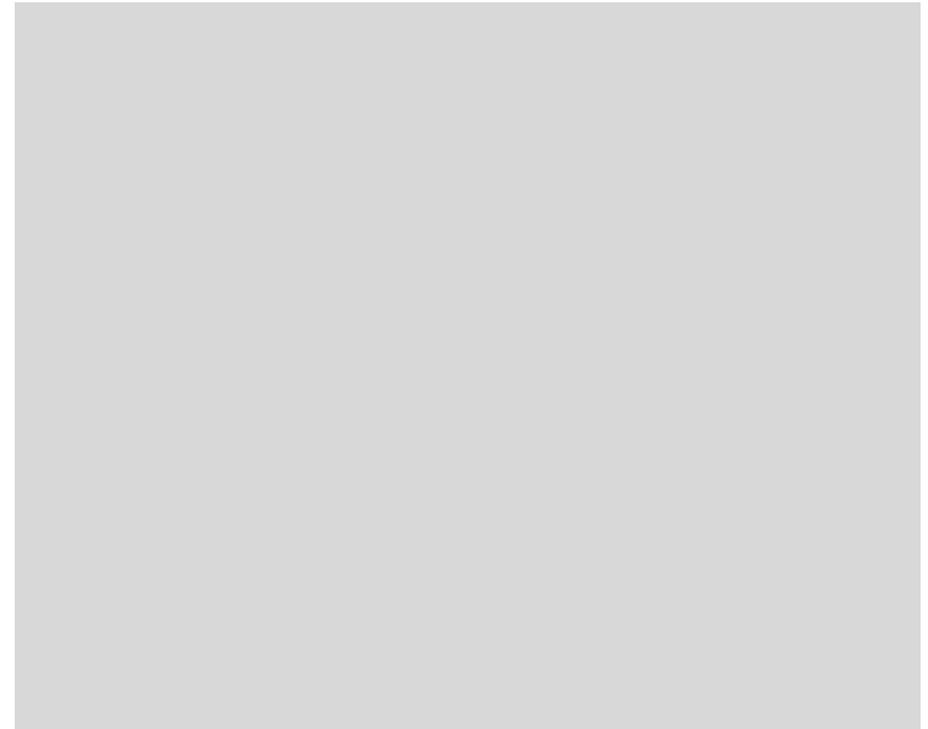
Where there are mines, there are people that think about minesweeping. Specialized mine sweeper equipment exists for land and sea use. Since it can take hours or even days to totally clear a field, the most militarily effective method is to create a path through a minefield.

For sea operations, this is done with a dedicated vessel that is particularly stealthy around mines. The sweeper tows cables to snag or sleds to safely detonate mines before other vessels travel through the hex. This effectively creates a 'road' through the hex that is safe to travel. Anti-grav vehicles travelling at speed one can also tow an anti-mine sled as long as they fly over water. The tow cable can be released if the vehicle moves over land.

For land mines, there are several options available. An artillery barrage or cluster bomb strike can clear a straight path through a minefield. LAVs and tanks can be fitted with plows and flails to tear their way through a mine field. Anti-grav vehicles can fly over sea mines or do a pop up and fly over land mines.

Mines have a base accuracy of 80% with no modifiers for terrain or point blank range. When rolling on the DAT they use 2d6+4 to simulate the fact that they are triggered by close contact with the target. Their damage profile is the same as a 6 point explosion.

Vehicles with mine clearing gear are still at risk to a mine attack, but the base accuracy drops to 40% and the DAT roll returns to a normal 2d10.



4.9 Drone Operations

Drones are small AI or operator controlled flyers. Drones can be equipped with a variety of equipment packages such as point defense, recon/target designation, anti-infantry, or anti-vehicle weapons.

Drones can be mounted as an external device or fired from a launcher. Spinning up and deploying an external drone takes an entire combat round. Using a drone launcher with forced air and a throw arm enables them to be up within seconds. A drone launcher can only hold one drone at a time, but it can be serviced by an adjacent magazine that can hold up to ten drones. Any drone in the magazine can be positioned and loaded in the launcher allowing the operator to select from any of the pre-loaded drone packages.

Drone Equipment table:

Type	Range	Notes
Point Defense	0	Drone acts as a range zero point defense battery.
Recon/Target Designation	2	Drone has no weapons, but can detect mines at range one and can paint targets at two hexes.
Anti-Infantry	0	Drone is equipped with two light machines.
Anti-Vehicle	1	Drone carries two anti-tank missiles with 3pt warheads. It can only fire one missile at a time.
Repair	0	Essentially a flying waldo with AI repair routines. This unit has no combat or recon capabilities.

4.10 Artillery and Strike Missions

Artillery barrages and air strikes allow the player to call in off-board attacks with a variety of munitions and targeting technologies. The ability to use either an artillery or air strike is determined by scenario. For example, the players select a scenario where the defender can call in three missions from direction four and has a choice of smoke, mines, or incendiary munitions. To use those resources, the player would write an order at the beginning of the combat round and the strike would hit on phase 12.

Most barrages and strikes target the hex listed and affect all units (friend or foe) in that hex. However, there are also precision attacks that benefit from target guidance. This can be either GPS (Global Positioning System) guided or laser homing weapons.

Artillery/Strike Accuracy table:

Target	Accuracy	Notes
Moving Vehicle	20%	Normally targeted by precision munitions. GPS guidance is not effective on moving targets. Laser guidance improves accuracy.
Stationary Vehicle	40%	Spotters can provide GPS coordinates for smart weapons.
Building/Bridge	60%	Still a tricky shot from 50 to 100 kilometers away. GPS coordinates are usually available unless the target is a temporary structure.
Full Hex	80%	It's hard to miss a kilometer wide target, but wind and other factors do not make it 100%.
GPS Guidance	+20%	GPS equipped smart weapons can take advantage of battlefield intel.
Laser Designator	+40%	A laser beam from a drone or infantry unit can provide pin point accuracy.

Most terrain modifiers do not apply to over the horizon attacks such as artillery or stand-off air strikes. ECM, cloaking and camouflage may apply depending on the type and target. Artillery or air strikes that miss their target have drifted into an adjacent hex. Roll 1d6 to determine which direction.

In addition to the base accuracy of the target, artillery and aircraft delivered munitions come in a wide variant of strike packages from cluster bombs to kinetic penetrators. Depending on the warhead, the mechanics for applying damage can vary in their effects.

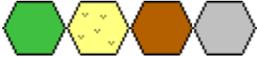
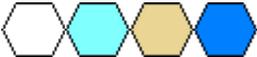
Artillery/Strike Effects table:

Munition	Targets	Notes
Cluster Bombs	Area	Cluster bombs and shells drop a bunch of sub-munitions into a single hex and attack all targets in that hex with a swath of one point attacks. Active shields act like they were struck with a 19 point beam attack. Alternately, they can cut a path through a mine field.
Incendiary	Area	Incendiary ordinance will automatically set woods on fire and create smoke in a swamp.
Smoke	Area	Lays down smoke in hex which can drift.
Land Mines	Area	Creates a known (not hidden) mine field in any non-city hex. Used as an area denial tactic.
Precision	Vehicle/ Buiding	A smaller round/bomb designed to strike a specific target and reduce collateral damage. The actual attack is either drill, explode, or scatter depending on if the shell is a kinetic penetrator, high explosive, or flechette.
Tandem Charge	Vehicle/ Buiding	A heavy warhead that is part penetrator (drill attack) and part explosive warhead. Designed to explode inside armor or under rock.
Nuclear	Area	These are tactical low yield atomic weapons rather than city busters. They will destroy terrain leaving either a crater or lake after detonation. They also generate radiation, smoke, and thermal effects in a ring around the hex they explode in. Most military units are hardened against EMP.

5.0 Terrain

Terrain represents a regulated set of locations on the battlefield. Terrain generally falls into two categories; terrain types and features. Terrain types are the dominate terrain that fills that a hex and provide modifiers for base accuracy and potentially impacts the movement of various units. Features are terrain elements that modify how a hex works or offer targets as part of a scenario. For example, a snowy field is a base terrain that fills the full hex while the road or river that runs through it is a feature.

Terrain Effects table:

Terrain	Notes
Clear	Grass covered lawns, farms, barren earth, and pavement all fall into the clear terrain definition. As the default terrain type, they offer no modifier to base accuracy or movement for most units. 
Light Woods	Sparse woods with loosely scattered trees. Each hex of trees that you have to shoot into or through reduces accuracy by 20. 
Heavy Woods	Dense woods/heavy scrub which seriously impedes the mobility of ground units. The trees also reduce accuracy by 20 per hex. 
Swamp/ Marsh	Difficult/wet terrain with trees that stops some units. A marsh would have the same effect, but without the trees to reduce accuracy. 
Snow/ Ice/ Sand/ Water	Clear terrain types that do restrict the movement of various units. Ice allows some units to cross water. 
City	Cities, as a terrain type, offer a lot of hard cover for combatants. 
River	Rivers act like roads for naval vessels and barriers to ground vehicles, if a bridge is not present. Rivers can be combined with other terrain. 
Road/ Rails	Roads and rails enable ground units to avoid the movement effects of various terrain types. 
Building/ Bridges	Buildings & bridges are stand-alone structures that can be targeted. They have a set point value for damage. For example, a 50 point bridge can take that much damage before being destroyed or impassible. 
Slope/ Cliff/ Waterfall	While not a terrain type until itself, slopes represent major changes in elevation and have the potential to block the line of sight between two units. Slopes are relatively gentle and easy to traverse. Cliffs represent a sharp impassible barrier for ground units. By combining features, you can create hex types such as a waterfall. 

5.1 Fire and Smoke

The most common things to catch on fire during a battle are trees. Incendiary weapons (artillery, air strikes, plasma, and flamethrowers) can easily ignite a woods hex. City hexes are harder to catch on fire, but they can be defined as one fire as part of a scenario.

All burning hexes also generate smoke that rises in a column. If the scenario indicates that there is wind present, smoke hexes will drift in that direction for up to three hexes. Smoke works exactly like fog for accuracy penalties.

If there is wind, a fire has a 10% chance per round of spreading to an adjacent downwind woods hex.

No unit is designed to survive in burning terrain, if they stay or they can't leave after one round, they are destroyed. Travelling through a burning hex requires a danger roll at double the normal odds (for example, a danger roll of a 1-3 would activate on a 1-6 instead.)

5.2 Environmental Factors

Related to terrain are environmental effects that tend to affect the whole board. Fog, rain, dust, and snow fall all have the effect of reducing base accuracy. Snow has the addition effect of reducing all ground units to a speed of one when it is a terrain type.

Heavy storms, dense fog, sandstorms, or blizzards reduce visibility and attack ranges to one hex. Attacks at range zero are at -20% and attacks at range one are -40%. In extremely cold weather, rivers and water hexes are useable by ground units and naval units are forbidden from moving.

More extreme weather conditions might be found on other worlds:

Vacuum prohibits the use of aircraft and drones. Vehicles with internal combustion engines will not operate and missiles designed for atmosphere do not function properly.

Low gravity allows ground units to move one hex faster. But, it does not change the speed limits at which danger rolls are made. Low gravity also cuts the damage from anti-grav vehicle crashes (but not ramming) in half. Round down any fractions.

Toxic atmosphere, vacuum, and chemical weapons also create a hazard for anti-grav and naval units. If a component next to a crew space is destroyed, there is a hull breach and the crew has to stop and fix the leak or put on environmental suits. This effectively disables the vehicle for one round and it can't fire its weapons unless they are under AI control.

5.3 Radiation

Radiation is another environmental hazard that might exist as part of a scenario or as the result of a large nuclear strike. Map-wide zones of radiation are typically the fallout of a nuclear battle field or the alien surface of some hostile world. People as well as electronics can be seriously affected by a radiation zone. These zones are ranked by level:

Level 1 Radiation subtracts 10 from base accuracy. GPS targeting is lost.

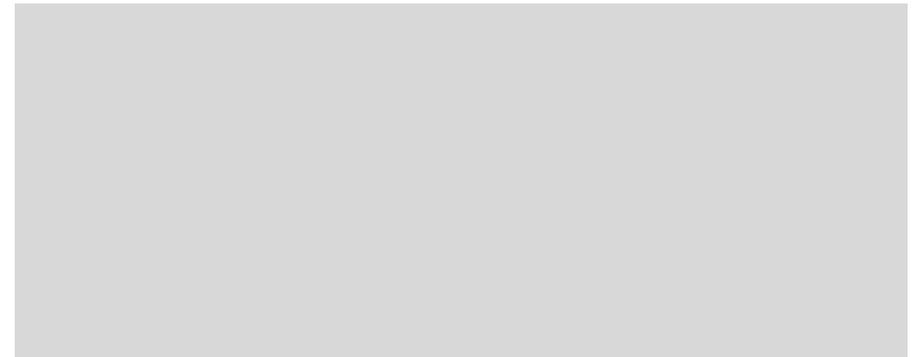
Level 2 Radiation will kill or incapacitate even armored infantry. Subtract 20 from the base accuracy. GPS targeting is lost.

Level 3 Radiation will kill or incapacitate any infantry or ground vehicle that can't be sealed. Subtract 40 from the accuracy all units like ECM.

Level 4 Radiation blinds unit sensors, and kills or incapacitates any crew member not in a radiation shelter or shielded vehicle. All electro-magnetic communication is jammed.

Only command and control spaces, nuclear power components, medical centers, and communication centers have heavy radiation shielding by default. A functional 360 degree shield can protect an anti-grav vehicle, but that protection is lost when the shield goes off line due to damage. Partial shields provide directional defense against weapons and are not designed to stop environmental radiation.

Nuclear mines and warheads are rated by level. So, a level one nuke will fry the hex that it is detonated in, but it has a small foot print. As each level of nuke goes up in level, its blast extends outward in a ring. So, a level three bomb would have one hex of level three radiation, a ring of level two radiation, and a larger ring of level one radiation. Any level of radiation will set trees in that hex on fire as part of the thermal pulse. This also generates smoke. Nukes are very messy things.



6.0 Victory Conditions

The short and sweet of it is that the side left standing holds the territory and is considered the winner. In some scenarios, the battle occurs over no-man's land and territory is not an objective. In such a case, the side that destroys the most construction points is the victor. CPs are the lifeblood of an nation and losing significant amounts of units and supplies in battle is to lose in the war of attrition.

Scenarios can present additional victory conditions. A unit may have a higher CP value to reflect its strategic importance. This can be in the form of valuable cargo, new technology, critical data, or a VIP like a scientist or political target. So, a scenario author can assign a CP value that the attacker gains for capturing or killing the target while the defender may gain a CP reward for protecting that person.

Escaping from a battle depends on a number of factors. Can the enemy chase you? What is the surrounding terrain like? Is there a superior force you can retreat to for protection? Most of these options will be covered by the campaign and the scenario itself. When a unit escapes off the map, it is not allowed to re-enter with a few exceptions (such as aircraft making multiple passes on the battlefield.)

6.1 Campaigns

While Frozen Thunder can be played as is on a scenario by scenario basis, it can also be used as part of a much larger campaign. The game can be adapted for large scale battles in sci-fi role playing games or a strategic board game. Cluster War is a campaign system designed for Tactical Command which can also be used as a scenario generator for Frozen Thunder. Campaign systems provide a rich back drop for scenarios, economics, geography, technology, research, and exploration.

Research and development can have significant impact on unit construction as part of a campaign. As R&D projects succeed, new systems and components will become available. These items add to that nation's manufacturing capability and allow for new designs to be built. Cluster War uses an open ended technology tree. This gives the players lots of options to explore, including those that I haven't thought of yet. When new systems and technologies become available, it is the job of the GM to determine the costs, how they can be implemented during ship design, and if any new house rules for that campaign need to be applied.

7.0 Scenarios

If the DAT is the heart of Frozen Thunder, scenarios are the brains. Scenarios allow FT to stand on its own for pick up battles, tournaments or as a set of events for a mini-campaign.

Scenarios follow the format of introduction, setup, house rules (if any), victory conditions, plus any included maps, units, and DATs. As a general rule, each side starts out with an equivalent amount of construction points in which to design or buy a force. In a campaign game, these forces are determined by the GM as a result of strategic movement, patrols, and the orders that they were given. Often times, these forces will be unbalanced and the weaker player has to decide between inflicting damage on the enemy, surrender, or running to fight another day.

7.1 Sample Scenario: The Last Stand

Introduction:

Diplomatic action has failed and it has come down to war. Both nations have reasoned that a first strike against the enemy is required. Ironically, both forces meet on the battle field with the same idea.

Setup:

Each side gets 1,000 construction points (SP) of grav tanks, vehicle, and infantry. Higher or lower CP amounts can be used as agreed upon by the players depending on how big of a game they want. The number of infantry units can't exceed the carrying capacity of the vehicles.

Using two standard hex maps placed side to side, one player sets up on the North or top edge of the map and the other player on the South edge. Neither side has surprise, artillery, or ground bases.

House rules:

Units are not allowed to start out cloaked or hidden. Similarly, any stealth ships start out as being detected.

The map is fixed. Any unit that moves off the sides of the map must immediately rejoin the battle. Northern units exiting the North edge have escaped and can not rejoin the battle. The damage inflicted on them still counts for victory points. The same applies for Southern units exiting the South edge of the map. Units that move off the top or bottom into enemy territory are considered destroyed.

Victory conditions:

The game ends when one side has no units on the map (due to escape or destruction.) The side with the most victory points is the winner.

Victory point calculation:

Enemy unit destroyed, full CP cost

Enemy unit escapes, half CP cost

The CP cost refers to the base cost of the unit and not its munitions.

7.2 Random Scenario Generator**Introduction:**

When two forces meet, chaos reigns as each strives to achieve its goals.

Setup:

Construction Points: (roll 1d6 or pick)

1. Each side gets 250 CP of units.
2. Each side gets 500 CP of units.
3. Each side gets 750 CP of units.
4. Each side gets 1,000 CP of units.
5. Each side gets 1,500 CP of units.
6. Each side gets 2,000 CP of units.

CP can be used to purchase infantry, LAVs, Tanks, Grav-Tanks, Naval vessels, and their required ammo or drones at the listed values.

Faction: (roll 1d6 or pick)

1. UNEF VII (United Nations Emergency Force)
2. SAND (Southern Alliance National Defense)
3. The Unity
4. Mechnation
5. Kinsect
6. Raiders, any captured/stolen unit, nothing heavier than a hull 35 unit.

Deployment: (roll 1d6 or pick)

1. Head on combat, the first player sets up on the south central edge of two side by side maps. The second player sets up on the north central edge.
2. Across the grain, the first player sets up in the east central edge of two maps placed side by side. The second player sets up in the west side.
3. The running battle, two maps are placed end to end creating a long map. The first player sets up in the center of the two maps. The second player sets up on the south central edge of the bottom map.

4. Out flanked, the first player sets up in the middle of two maps placed side by side. The second player has to split their forces and start half of them in the northeast corner and the remainder in the southwest corner.

5. The bear trap, the players set up their vehicles like in Across the Grain, but any infantry units can be hidden and pre-deployed on the enemy's side of the map outside of the enemy's deployment zone.

6. The crossroads, the forces are split like in Out Flanked for both sides. The first player sets up half their forces in the northwest corner and the rest in the southeast corner. The second player similarly has to split their forces and start half of them in the northeast corner and the remainder in the southwest corner.

Missions: (each player, roll 1d10 or pick)

By default, the map is fixed. Any unit that is moved off the map must immediately try to rejoin the battle unless they are achieving a mission goal.

Each player secretly rolls and records their mission objectives. Some missions are not as secretive as others are.

1. Search and Destroy: +20 VPs for each grav vehicle or naval unit destroyed.
2. Escort Freighters: Three medium freighters (1 bridge, 3 crew quarters, 3 drives, 2 point defense batteries, and 21 cargo bays) each with 1G of thrust start with your fleet. Earn 3 VPs for each cargo space that makes it off the map. The freighters have to leave via the enemy's deployment zone. If the exit zone is in the middle of the map (deployment option #3 or #4), the freighters just have to survive the battle.
3. Retreat: Earn +10 VP for each vehicle that makes it off the board under its own power. Cripples drifting off the map do not count. The exit zone is opposite of your deployment zone. Units carrying infantry score double.
4. Destroy the Flagship: +50 VPs for destroying the enemy's largest vessel (use CP cost to break ties in size.)
5. Deep Raid: Exit via the enemy's deployment zone(s). Earn +10 VP for each vehicle that makes it off the board under its own power. Cripples drifting off the map do not count. If the enemy starts in the middle of the map, the exit zone is opposite of your deployment zone. Grav tanks with functional weapons score double victory points.
6. Recover Artifact: Secure an object resting in the middle of the map via maglocks, docking arm, or tractor beam. Earn +50 VPs for taking it off the map via the player's deployment zone. If the player's fleet has no maglocks or tractor beams, it takes 4 rounds to load it into a cargo bay or assault bay.

If the player's force has none of those, the only way to secure the artifact is to remove all enemy units from the map. The artifact is very dense and well shielded, destroying it to deny the enemy is not an option.

7. Recover Data: There is a spy on a random enemy vehicle. You must close to range three or less so the spy can transmit the data. The player unit that carries the spy data off the map (player's startup position) earns 25 VPs.

8. Defend Base: There is a 100 point facility at the center of the map. The player receives one VP for each point of the facility that survives to the end of the game.

9. Destroy Base: There is a 100 point facility at the center of the map. The player receives 100 VPs for destroying the colony.

There can be only one base at the center of the map. If both sides have a base mission, the facility is neutral. Players with a destroy mission earn 1 VP for every point of damage they inflict. Players with a defend mission can only earn points if they destroy or drive off the enemy task force.

10. Head Hunter: The enemy player has a 50 point command and control bunker set up in their deployment zone. The enemy player can order an air or artillery strike at the beginning of every fifth combat round. The player earns 50 VP for taking out the enemy bunker. If the bunker is destroyed, the enemy player loses the ability to call in strikes. Any previously ordered strike is still executed.

Environmental Factors: (roll 1d6 or pick)

While fair weather is every general's friend, sometimes you don't get to choose your weather conditions.

1. Fair skies, no penalty of any kind.
2. Night fight, reduce base accuracy to 40%.
3. Bad weather; dust, fog, light rain, or snow is present.
4. Terrible weather; heavy storms, dense fog, sandstorms, or blizzards. Roll a second die to determine the wind direction.
5. Hostile environment;
6. Deadly battlefield;

Victory conditions:

The game ends when one side has no units on the map due to escape, destruction, crippling, or surrender of all the units. The side with the most victory points is the winner.

Victory point calculation is determined by adding up the CP cost of destroyed, surrendered, and crippled enemy units, half the CP cost for enemy units that escape, plus any mission bonus.

Vehicles, infantry, and bases are all considered units. Mines and drones are treated as expendable. The CP cost refers to the base cost of the unit and not any ammunition, mines, or drones.

8.0 The Design Process

While Frozen Thunder can be played and enjoyed as a set of scenarios, one of the neat things available is the ability to either customize existing units or create units from scratch. Each of the major nation states has their own unique design templates and component lists.

To determine the cost of a unit is a simple process. Total the costs of all the components as you add them to the DAT. Add ammunition, drones, and troops. The DAT Builder program makes this even easier by doing most of the math for you.

This can be achieved because the special costs of most components are factored directly into their cost. For example, a meson beam projector could be added as a new component without having to worry about the base cost plus multipliers for arc and special capabilities. The total unit costs should be rounded to the nearest whole construction point.

At the campaign level, unit construction must take place in an appropriate construction facility such as a shipyard, factory, or growth vat (for biological constructs.) There are a few exceptions; mobile repair vehicles and tenders can perform some field repairs and upgrades. This allows for various ammunition, drone, external pod configurations, as well as armor patches and component repair in between linked scenarios.

Player unit and bases designs are only limited by the templates they have researched and the components they have access to. It is possible for a player to have artifact or alien components that they can use, but they can not build. Normally, these limits are established during player setup or as defined by the scenario.

While the players can create a nearly unlimited number of configurations, the combat system does influence which ones are more efficient. Combat vessels tend to be narrow and maneuvering to get a side attack on the enemy is important. Units that are easily out flanked will usually have a more oval or round shape and a wider range of weapon arcs. Defensive systems like ECM, point defense, armor, and shielding become important for bulkier and easier to hit designs.

8.1 Unit Requirements and Equipment

When designing an anti-grav unit, naval vessel, or ground base from scratch, there are several factors that need to be taken into account. Each of these units needs control spaces and power in order to operate. Typically, the drive system is also the power source. If the unit is to be operated or manned continuously, optional crew quarters are also needed for personnel.

The smallest possible vehicle is a control space and a drive component. It's unarmored and relies totally on external components for function.

Total Hull	Control	Drive	Crew	Notes
2 - 5	1	1	1	Flitter, GEV (fighter = 2)
6 - 10	1	1	1	Skimmer, Patrol Boat
11 - 15	2	2	2	Gunship, Landing craft
16 - 20	2	2	2	Attack Sub (heavy bomber = 16)
21 - 25	3	3	3	Cutter
26 - 30	3	3	3	Destroyer
31 - 35	4	4	4	Destroyer Leader
36 - 40	4	4	4	Freighter
41 - 50	5	5	5	
51 - 60	6	6	6	Cruiser
61 - 70	7	7	7	Battlecruiser
71 - 80	8	8	8	Carrier, Juggernaut
81 - 90	9	9	9	
91 - 100	10	10	10	Super Freighter
101 - 110	11	11	11	Titan
111 - 120	12	12	12	
111 - 130	13	13	13	
111 - 140	14	14	14	
111 - 150	15	15	15	
111 - 160	16	16	16	
161	17	17	17	That's not a moon...

Total Hull represents all components for a given size range with the exception of external racks that are hung off the hull. Control mandates the number of control spaces required to operate the unit effectively. Most control components can be used interchangeably but some of them also have strategic functions as well.

Drive represents the minimum number of drive or power plant components needed for proper operation of a combat unit. Additional drive or power spaces enable a unit to function without penalty even when damaged.

Crew indicates the minimum number of crew quarters needed to staff the vessel for continuous operation. Crew quarter components also provide long term life support capabilities.

Units without crew quarters are only capable of short missions before having to return to base. Ground bases without crew quarters are not capable of withstanding a long siege or providing rest for the crews of other units.

Redundant components are a good insurance policy for larger units. If a unit falls below the minimum value, its effectiveness is reduced.

There are a few exceptions to determining the control requirements, you don't need crew or control spaces for armor or rock. And, you don't count armor or rock for bases when determining power (you do for vehicles since you have to push all that armor around.)

If a vehicle lose all of its control spaces it is mission killed unless repaired. For each control space below the minimum, the vehicle loses functionality. This is normally in the form of available weapons and devices that it can control each turn. Systems include weapons, launchers, point defense, drone control, piloting, and other devices that require active control.

Control Space Loss table:

Minimum Spaces	Loss per Space	System Notes
1	100%	Vehicle is disabled if it loses its control spaces.
2	50%	When the unit is down to one control space, only half of the systems are available each turn.
3	33%	At two control spaces, 2/3 rd of the systems are available. And at one space, only 1/3 rd of the systems can be used.
4	25%	The breakdown is 75%/50%/25% for remaining spaces.
5	20%	The breakdown is 80%/60%/40%/20% for the remaining spaces.

For example, the light cruiser Travis Brown has three control spaces and 45 system components: If the 'Trav' takes some internal damage and has a control space disabled/damaged/destroyed, it loses the ability to control 15 systems (33% rounded down.) The controlling player gets to decide which systems that they'll continue to use each combat round.

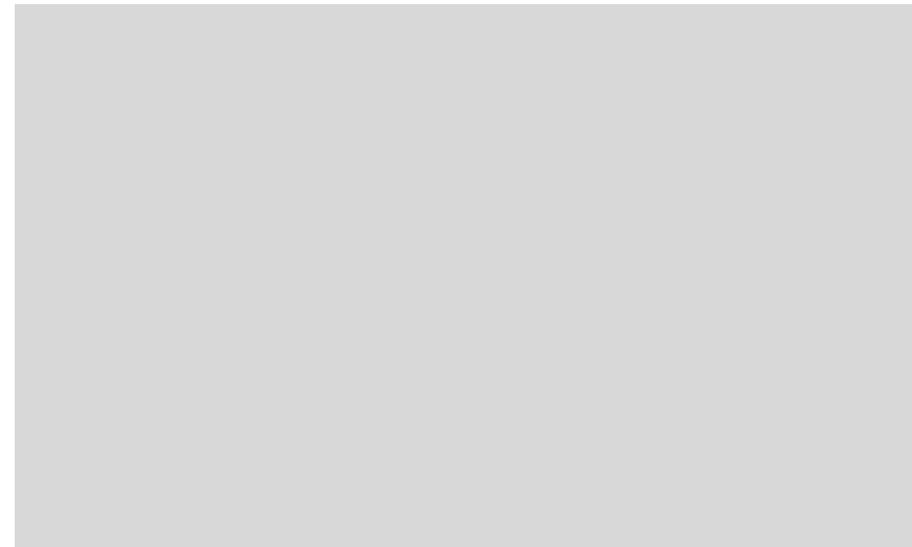
Losing drive components reduces the maximum speed or mobility of units. Additionally, reducing drives and power plants can also impact the usage of high energy devices such as particle beams.

Drive Component Loss table:

Minimum Spaces	Speed Notes
1	Vehicle is disabled if it loses its only drive component.
2	Top speed halved when one is lost.
3	Top speed halved when two are lost.
4	Top speed halved when two are lost.
5	Top speed halved when three are lost.
6	Top speed halved when three are lost.
7	Top speed halved when four are lost.
8	Top speed halved when four are lost.
9	Top speed halved when five are lost.
10	Top speed halved when five are lost.
11	Top speed halved when six are lost.
12	Top speed halved when six are lost.

At half speed only one high energy device can be powered per combat round. Beam weapons, gauss cannons, plasma torps, and shield generators are all examples of high energy systems.

Losing crew quarters during combat does not have a direct impact on a unit's functionality, but it does create problems for its long term and strategic operation. Without sufficient crew quarters, the combat effectiveness of a unit degrades, it is unable to perform long range patrols, and bases become difficult to keep fully staffed.



Defense Components	CP	Icon	Description
Armor (ablative)	1		Ablative armor is designed to absorb enemy weapons fire. Zero gen armor stops two points of damage before it is destroyed. While ablative armor can be more effective than shielding, it's limited in its surface coverage.
Armor (ablative)	2		Ablative armor is designed to absorb enemy weapons fire. First gen armor stops four points of damage before it is destroyed.
Armor (ablative)	3		Ablative armor is designed to absorb enemy weapons fire. Second gen armor stops six points of damage before it is destroyed.
Armor, Resistant	10		Super dense armor that can't be destroyed by conventional weapons. Explosive and drill attacks have some ability to penetrate due to shock and heat transfer. Resistant armor ignores the first point of damage per attack, so it is effectively immune to beam weapons.
ECM Pod	2		ECM pods employ active jamming, chaff, and flares in order to spoof enemy missiles by reducing their base accuracy by 20. This makes them a cost effective but not perfect defense. In general, slow moving or stationary targets like naval ships and bases can't benefit from these pods since they can't get out of the way of incoming missiles. Multiple pods do not stack for defense purposes.
Point Defense Battery	2		Point defense batteries are a cluster of small weapon turrets firing lasers, particle beams, or light gauss cannons. These automated weapon systems attempt to intercept incoming missiles and drones. Their limited firepower makes them ineffective versus vehicles and powered armor infantry.
Point Defense Pod	4		External point defense pods are similar to XO racks, but they employ a small turret and a low power weapon system. Their small size and independent systems makes them more expensive than integrated point defense weapons.
Rock	0		Technically free armor, but limited in availability and usage. The ablative capability of rock armor varies from one point of dirt to several meters of reinforced nickel/iron. This component is usually limited to base construction.
Shield Generator	2		Shield generators are field generators that are designed to absorb and deflect incoming attacks. The basic shield generator can absorb two points of damage and then burns out (it takes a point of damage and is disabled.) Full 360 degree shields ground out and can only be used by anti-gravity vehicles.
Shield Generator	3		Improved shield generator that can absorb three points of damage before burning out.
Shield Generator	4		Improved shield generator that can absorb four points of damage before burning out.
Shield Generator, Advanced	6		Advanced shield generators cover a wide range of specialty devices that are tuned to be resistant versus a specific attack such as additional heat or radiation resistance.
Shield Generator, Flicker	6		Flicker shields are an alternate branch of shield technology where individual shield generators can create impervious shields. Each shield generator has a 5% chance of stopping an attack. Multiple generators can be stacked together to yield better results, but the maximum percentage is 60%. That limit can be increased through research and development.
Shield Generator, Deflector	1		The basic deflector is a directional shield that provides two points of protection. Since the directional shield is not grounded, it can be deployed on bases and naval vessels as well as anti-grav units. The facing of the directional deflector can be changed during the order phase, if they are not burned out. Deflectors lack the ability to provide environmental protection from things such as radiation.

Shield Generator, Deflector	1.5		A three point version of the directional shield generator.
Shield Generator, Deflector	2		A four point deflector, while more cost effective than a full shield, they only protect in a 60 degree (one hex facing) arc set during the order creation phase.
Shield Generator, Regenerating	6		Four point shield generators that can repair themselves (if not damaged) after a battle. The default time to recover from a burnout is one week. Only really significant for campaign games where damaged vehicles carry over to the next battle.
Weapon Components	CP	Icon	Description
Beam Weapons (turret)	6		Standard directed energy beam weapon with a 360 firing arc.
Beam Weapons	3		This version of the standard beam weapon has a 120 degree arc of fire and can be oriented in one of six directions at design time.
Beam Weapons (fixed)	2		Usually reserved for agile units, the fixed beam weapon can only fire down a single hex row determined at design time.
Beam Weapons (spinal mount)	6		Specialized artillery version of the standard beam. Due to the additional power requirements and focusing gear, this component can fire out to the horizon.
Beam Weapons, EMP	6		This advanced beam weapon is enhanced with a powerful electro-magnetic pulse designed to knock out electronics and/or the neurons of biological targets. Every point of damage inflicted converts into a 5% chance of causing a roll on the Disable critical hit chart. The purple arc indicates that this is a special effects weapon and can cause critical hits.
Beam Weapons, Radiation	6		This advanced beam weapon is highly radioactive and charged with penetrating particles. Every point of damage inflicted converts into a 5% chance of causing a roll on the Meson critical hit chart.
Plasma Torpedo (turret)	6		Energy torpedoes are a cross between beams and missiles. They fire like beams and can't be intercepted by normal point defense. Plasma damages targets in an explosive pattern like missiles.
Plasma Torpedo	3		The standard energy torpedo has a 120 degree firing arc.
Plasma Torpedo (fixed)	2		The fixed energy torpedo is more economical, but its limited firing arc is a tactical problem for larger vessels.
Enveloping Torpedo	6		Plasma energy torpedoes are similar to normal torps but they do not use the explosive damage pattern. Instead, roll for the point of impact like a beam weapon. The plasma damage then flows along the exterior of the hull inflicting one point of damage to each component touched.
Gravitic Torpedo	6		The gravitic shockwave torpedo does normal torp/explosive damage. In addition, every point that is inflicted creates a cumulative 5% chance for a Gravitic weapons critical hit. The purple arc indicates that this is a special effects weapon.

Hellfire Torpedo	6	HX 	The thermal effects of the hellfire torpedo can cause spontaneous fires and explosion to break out when this weapon strikes. In addition to normal damage, every point that is inflicted creates a cumulative 5% chance for a Heat critical hit.
Gauss Cannon (turret)	4	GC 	Gauss cannons are an alternative to missile launchers. They have firing arc limitations like beams and require ammunition like missiles. Their shells are armored to withstand point defense weapons. All gauss cannons carry 10 rounds/salvos internally and can feed from adjacent magazines. Their default damage pattern is drill.
Gauss Cannon	2	GC 	Standard gauss cannons can operate in a 120 degree arc.
Gauss Cannon (fixed)	1.5	GC 	Relatively cheap as weapon systems go, they are difficult to use due to their limited firing arc.
Gauss Cannon (spinal mount)	4	GC 	Standard weapons have a range of eight hexes while spinal mounts can fire over the horizon.
Gauss Cannon, Multi-Mode	4	GX 	The multi-mode gauss cannon (also known as the flak cannon) is capable of firing bursts of shells in explosive or scatter patterns. The damage pattern to use must be determined before the roll on the DAT is made.
Hand to Hand, Energy	3	HE 	Hand to hand energy weapons are range zero attacks such as a plasma torch. They are usually mounted on mecha (robot-like mechanical forms) and some constructs. They are designed for close quarters combat with a 360 degree attack radius. They use the sweep damage profile.
Hand to Hand, Melee	2	HH 	Hand to hand weapons, claws, and long spines that are made of metal, crystal, or bone are melee weapons. They are breakable and only effective at range zero. They have a 360 degree attack radius. Damage is applied to a specific spot and uses the drill damage profile.
Hand to Hand, Teeth	1	HT 	Hand to hand teeth covers close quarters melee weapons that have a limited arc such as teeth, tusks, ramming spikes, etc. This icon also covers rear mounted weapons such as tails and tail mounted spikes. In the notes, just write down the specific arc for a rear attack.
Magazine	1	MZ 	Each magazine can hold 100 salvos or 50 mine clusters in relative safety. One salvo can range from a single missile to thousands of flechettes. Each salvo is considered a single shot for combat purposes. Multiple missile launchers, gauss cannons, drone hangers, or mine launchers, can access the same magazine if they are adjacent to it on the DAT.
Mine Launcher	4	MN 	Mine launchers are capable of deploying mines in a 120 degree rear arc. They also have mine recovery equipment, but this is not a combat capability. Enemy mines can't be recovered unless the Identify Friend or Foe (IFF) codes are known. The launcher has built in storage capacity for 5 mine clusters.
Mine Layer	2	MI 	Mine layers are passive ordinance launching systems. A mine layer dispenses a mine cluster in the same hex as the vehicle. The mine cluster does not activate until the vehicle leaves the hex. Mine layers have the same storage capacity as a mine launcher.
Missile Launcher	3	ML 	Missile launchers come in a variety of shapes and capabilities. The standard launcher is either a breech loading tube design or uses a rotary drum design. Each can hold 10 salvos in their internal magazines. Missile launchers can tap into adjacent magazines for more rounds of continuous fire.
Missile Launcher, Advanced	15	MX 	The advanced launcher is capable of firing in barrage mode. This allows it to fire off up to ten missiles/salvos at the same time. The additional firepower comes at a price. The additional launch rails/tubes means that there is no auto-loader and it can only be reloaded in between battles.
XO Rack	2	XO 	External ordinance racks are weapon racks and specialized systems that are bolted on to the outside of a vehicle. Normally, a single salvo of missiles or one anti-ship torpedo is placed in these racks. If the technology is available, more advanced multi-mission pods can be bought and installed.

Control Spaces	CP	Icon	Description
Artificial Intelligence	1		Artificial Intelligence modules are computer control systems or organic brains used as a drone controller or for robotic units. Besides the control systems, they contain all the sensors and fire control systems that any normal control component would have.
Bridge	1		Bridges are an essential part of any naval unit. They provide basic sensors, navigation, communication, and fire control capabilities. A bridge is a control space, if a ship loses all of its control spaces, it is crippled.
Cockpit	1		Cockpits are specialized control spaces for combat units. They provide basic sensors, navigation, fire control, communications, and life support. Cockpits are the standard control space for aircraft and anti-grav vehicles.
Combat Information Center (CIC)	3		Combat information centers are command and control systems for task force commanders. A CIC is required if a graded officer wants to apply his or her command skill. A CIC can be used as a control space.
Command Post	1		Command posts provide sensors, communication, and fire control for ground bases. While they do not have any navigation capability, they do provide additional communication channels to local ground forces, remote sensors, and command detonated mines.
Engineering	1		Engineering is a specialized section of a unit tasked with monitoring internal systems and repairs. It has a set of redundant control systems and sensors that enable it to be used as a control space in case the bridge or cockpit has been destroyed. If you have a functioning Engineering space and there is an onboard fire, you have a 50% chance of putting that fire out at the end of the round.
Flag Bridge	3		Flag bridges are command and control centers for graded officers that need to control fleet activity. Its advanced communication features allow the commander to coordinate the deployment of multiple task forces and keep abreast of the battle as it progresses. They are counted as a control space.
Headquarters	3		Headquarters are the ground base equivalents of a flag bridge. They have all the functions of a command post and can serve as a control space. HQs also provide administrative capabilities for strategic functions such as troop and officer training.
Other Components	CP	Icon	Description
Assault Bays	1		Assault bays are quick deployment spaces for ground troops and marines.
Barracks	3		Barracks combine the troop deployment capabilities of an assault bay with the function of crew quarters. If the combat team has heavy equipment requirements (marines or jump infantry) a cargo bay is also required.
Cargo Bay	1		Cargo bays are more than an empty space in the belly of a ship or base. They offer storage in a climate-controlled environment, loading/ unloading facilities. External cargo pods can be carried or towed by units with the right equipment.
Comm. Center	3		Communication centers are an essential part of a nation's infrastructure. They allow the relay of messages between colonies, message couriers, and shipping. Communication centers are also part of a trade network. Depending on the campaign, they allow for advanced communication technology. Normally, these facilities are part of a ground base of dedicated naval vessel.
Crew Quarters	1		Crew quarters encompass bunks, dining, life support, and recreational facilities for the crew of a ship, base, or bunker. Crew quarters are required equipment for long haul missions. They can also be used for hauling passengers on civilian vessels.
Docking Arm	1		An external docking arm that allows for a unit to easily haul smaller vehicles or cargo pods. For a dock to be successful, both units need to be stationary in the same hex for two combat rounds. Dropping a vehicle or pod is a free action, but doing so at anything greater than speed one will wreck the vehicle or pod.

Drill	2	 DR	Burrowing units can hide in dirt and sand and every so slowly dig tunnels. Only ground unit carry drill components. A unit needs one drill component for every forward facing hex row. So, a unit five columns wide would need five drills to be effective.
Drive, Conventional	.5	 CD	Conventional drives represent air breathing engines used to power wet navy vessels. Conventional drives require additional fuel tanks for extended operation.
Drive, Gravity	2	 GD	Gravity drives provide motive power for grav tanks. Depending on the hull size of the vessel, it will need progressively more gravity drive components. Gravity drives also contain power generation systems.
Drive, Power	1	 PD	Power drives are used by naval units that need nuclear power capabilities. They provide motive power as well as the ability to operate all onboard systems such as energy weapons and sensors. This would be the typical power system for a nuclear submarine.
Fire Control Computer	10	 FC	Advanced targeting systems that are spread throughout the unit. Each battle computer can improve up to 10 spaces of weapons. These weapons are assigned at design time and each system gains a +10 bonus to accuracy. Integrated weapon systems must be completely allocated in order to get the bonus. This bonus can only be stacked once for a +20 bonus.
Fuel Tank	.5	 FL	Fuel tanks are required for the operation of conventional drives. This represents 200 hours of continuous operation.
Ghost Field	5	 GF	Ghost tech is as close to true cloaking and invisibility that an object can get. One ghost field generator will cover 10 spaces (external components are not counted.) So, a size 35 unit would need four ghost field generators.
Hanger	3	 HG	Hangers are specialized launch and maintenance facilities for drones. Hangers have an internal capacity for five drones. Missile armed drones can be serviced by adjacent magazines. Only one drone can be launched or recovered per combat round from a single hanger component.
Long Range Scanners	3	 LR	Long-range sensors enhance the basic sensor package that comes with a bridge, cockpit, or command post component. They have a chance of sniffing out hidden units and minefield before stumbling over them.
Maglock	1.5	 MG	A maglock is an electro-magnetic grapnel designed to pick up small units, tow vehicles, or haul cargo pods. Both units still need to be in the same hex and it only takes one round to pick up a vehicle or pod. Like the docking arm, any grappled object can be immediately dropped, but unless it is done at speed zero or one, the dropped object will be wrecked.
Maneuvering Thrusters	5	 MT	External thrusters that give more agility to flying units. One thruster pod is needed for every 10 hull spaces or fraction of in order to get a -10 to enemy accuracy. This bonus is not cumulative.
Medical Center	3	 MC	Medical centers are advanced sick bay and surgical facilities. Medical centers are normally part of ground bases or hospital ships.
Mine Sweeper	3	 MW	Mine sweepers use a variety of systems to detect and safely detonate enemy mines or harvest friendly mine fields. This can only be done at range zero and at speed zero.
Power System	.75	 PS	Power systems provide self contained energy for ground bases and buildings. Exotic facilities such as sky cities or floating bases in a gas giant's atmosphere would require a gravity drive.
Repair Bay	3	 RB	Repair bays are designed for field repairs to damaged units. They are normally used for shield generator repairs and damage control duty after a battle.

Science Station	3		Science stations are self-contained laboratories designed for research and development as well as processing data from long range sensors and survey crews. Normally, they are part of a ground base, but they might appear on a specialized science vessel.
Stealth Coating	1		Stealth coating enables a vehicle to be stealthy which has strategic implications. For a unit to be considered a stealth unit, it must be completely surrounded by a stealth coating. So, while a single space of radar absorbent material is not too expensive, the actual cost increases as the size of the vehicle does. Bases gain no benefit from stealth coatings.
Towing Link	.5		Towing links are the cheapest form of towing technology available. They are mainly used by freighters, tugs, and some mobile artillery. They are not useable by flying units such as anti-grav vehicles. It takes two combat rounds before a towing link can be completed. During that time, both units must be stationary.
Tractor Beam	2		Tractor beams are an advanced form of maglock that uses gravity rather than magnetic force. A tractor beam can pick up a vehicle or cargo pod while moving up speed three (zero to 180 kph in five seconds.) They have the same dropping limitations as a docking arm or maglock.
Turret Mount	1		The turret mount is designed to rotate massive main battery turrets. If the turret mount is disabled or damaged, the turret is locked into its current relative facing for the remainder of the battle.

Ammunition	CP	Notes
Ammunition I	.1	Basic missile or shell, inflicts 1 point of damage
Ammunition II	.2	Advanced missile or shell, inflicts 2 points
Ammunition III	.3	High-Tech missile or shell, inflicts 3 points
Anti-ship Missile I	.2	Heavy missile, inflicts 2 points of damage, but takes up twice as much space in the magazine
Anti-ship Missile II	.4	Advanced heavy missile, inflicts 4 points, but takes up twice as much space in the magazine
Anti-ship Missile III	.6	High-Tech heavy missile, inflicts 6 points, but takes up twice as much space in the magazine
Cargo	-	A single cargo bay can hold 20 CPs of stuff
Fuel	-	A single fuel tank can hold 20 points of fuel

Fuel and cargo have minimal impact in-game, but they can play a role in scenario design and victory conditions.

Drones	CP	Notes
Point Defense	6	Attack 0, Move 3, missile defense only at range 0
Recon	6	Attack 0, Move 3, paint rng 2, detect mines rng 1
Anti-Infantry	9	Attack 1, Move 3, unlimited ammo, range 0
Anti-Vehicle	9	Attack 3, Move 3, explosive ammo (2 rnds), rng 3
Repair	6	Attack 0, Move 3, after battle repair and fight fires

Ground Units	CP	Notes
Infantry	6	Attack 1, Range 0, Move 1
Marines	8	Attack 1, Range 0, Move 1, move through water
Jump Infantry	10	Attack 1, Range 0, Move 2
Heavy Weapon	12	Attack 2, Range 1, Move 1, heavy MG crew
LAV	16	Attack 2, Range 1, Move 2, heavy MG, APC
Gun LAV	24	Attack 3 (drill), Range 3, Move 2
Missile LAV	20	Attack 3 (explode), Range 3, Move 2, ammo 4
Mobile Gun, Artillery	48	Attack 6 (drill or explode), Range 24, Move 1, tracked, indirect fire only
Missile Tank, Artillery	40	Attack 6 (explode), Range 24, Move 1, tracked, indirect fire only, ammo 6
Ammo Crawler	16	Attack 2, Range 1, Move 1, heavy MG, tracked, ammo 6 for Missile tank if in same hex
Main Battle Tank	28	Attack 4 (drill), Range 3, Move 2, tracked, armored (takes four points to destroy)
Civilian Vehicle	-	Attack 0, Range 0, Move 3, included by scenario

8.2 Damage Allocation Template (DAT)

While a game of Frozen Thunder could be played just with ground units, what makes it stand out are the units built on the DAT; anti-grav tanks, naval vessels, and large ground bases. The DAT gives these collections of components a personality and drives interesting tactical decisions. All units have some basic requirements: a control space, some form of drive or power system, and a suite of weapons and defenses to use on the battle field.

A control space is required, even AI or robotic units need a place to store their control systems. The control space covers all computer systems, communications, and sensors needed for normal operations. Some control components have extra functionality such as command and control gear, flight operations, etc. Only small units and inert buildings do not need one.

In the FT universe, anti-gravity drives exist. But, they are big and bulky. They also require a lot of power to operate. However, they have some distinct advantages. Their movement is on par with aircraft and they can use a lot of heavy equipment such as shield generators that no conventional aircraft could hope to carry. These brute force tyrants of the battlefield are the battleships and cruisers of their day.

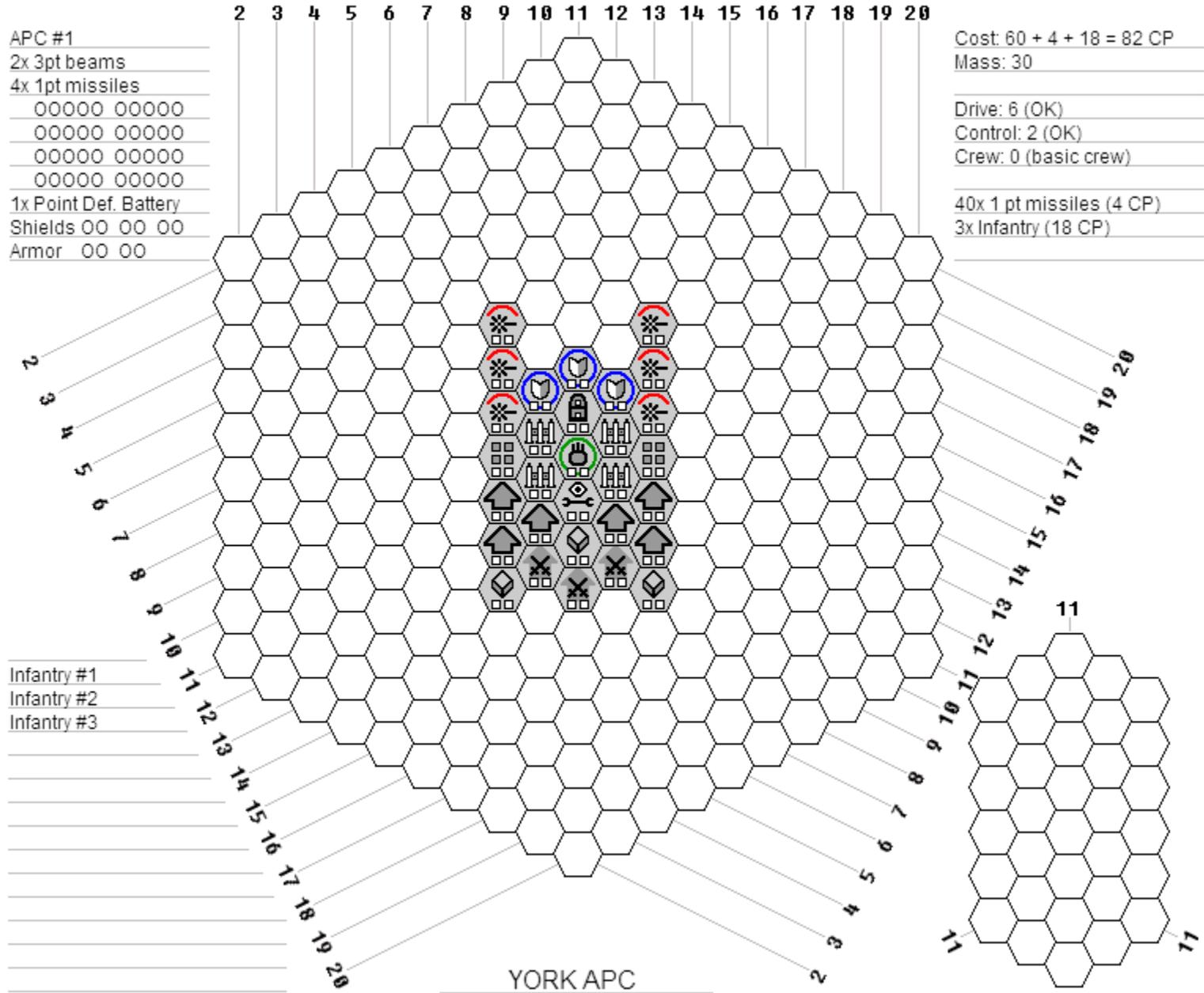
Anti-gravity flight is based on a set of thresholds in field strength. A unit that meets these limits is capable of full flight at 720 kph or 12 hexes per combat round. If a unit is damaged (or designed to operate at lower power level), its maximum speed is reduced to 360 kph or 6 hexes per round.

To construct an anti-grav tank, a player must first choose a hull size and possibly a blank hull template. Hull size determines the number of required components while templates are 'fill in the blank' designs with the minimum required components included and a grey hull outline. Most national forces have a preferred set of templates that they use which reflects design traits and manufacturing preferences. Once the ship hull size or template has been chosen, the player can fill that hull with equipment.

On the following page is a sample unit. The design template also doubles as a damage allocation template during combat.

The center of the DAT is dominated by a hexagonal grid. This is where you can place components and record battle damage. The three number scales (based on a 2d10 dice throw) are used to determine the placement of shots based on any of the six directions that an attack can come from. In general, the center of mass for your ship should be near the center of the hex grid.

You can find a blank DAT and list of standard codes and icons for parts in the appendix. The DAT Builder web app is available at Tangent-Zero.com.



The York Class armor personnel carrier has a Hull of 30. At a minimum, it needs two control spaces (a cockpit and an engineering space in this example) and six anti-grav drives in order to operate. That leaves 22 hull spaces available for armor, weapons, shield generators, and additional gear. External components do not add to this total hull size, but they do increase the cost of the unit.

The York is a turret-less design with additional storage space for troopers, equipment, and perhaps supplies for non-combat missions. It has three assault bays and three cargo bays to the equipment list. That brings the total space up to 11 used and 19 remaining. We'll round out the weapons suite with six beams, four missile launchers, and a shared missile magazine.

2 Control Spaces	x1 = 2 CP
6 Gravity Drives	x2 = 12 CP
3 Assault Bays	x1 = 3 CP
3 Cargo Bays	x1 = 3 CP
6 Beam Weapons	x3 = 18 CP
4 Missile Launchers	x3 = 12 CP
1 Point Def. battery	x1 = 2 CP
2 Armor	x2 = 2 CP
3 Shield Generators	x3 = 6 CP

Unit costs are figured by adding together all of the DAT components. That's it. The base cost for a York class is 60 CP.

The 60 CP that it takes to build this unit represents its 'dry weight'. Because it fires missiles, you also have to purchase ammunition for it. Each launcher has an internal magazine with a 10 shot capacity. If there was a shared magazine (where the point defense battery is), it would be an additional 100 salvos that can be shared with adjacent launchers. The maximum load out for the York is thus 40 missile salvos (a salvo being one or more missiles or shells that equate to one attack roll.) The starting missile cost is .1 CP for missiles with a one point warhead. This works out to 4 CP (40 x .1 = 14), thus the York costs 64 CP to build and arm. Troops are also bought separately for each assault bay component. Regular infantry, which are useful for holding objectives, cost 6 CP each which would bring the total cost to 82 CP.

8.4 Base Design

Bases and buildings are constructed at the same scale as other units on the DAT, but they do not require specialized factories or shipyards. They are considered standalone installations and, once built, may not be moved unless dismantled, transported, and then reassembled. The primary distinction between buildings and bases is that buildings are passive structures while bases require control spaces like other combat units. A building is usually a target or obstruction. But, a ground base is an active combatant albeit an immobile one.

The primary control space for a base is called a command post and it is interchangeable with a ship's bridge (or an anti-grav's cockpit component.) The flag bridge and headquarters components perform a similar function to each other. At the campaign level, there are some differences. The bridge component has navigation functions and the command post has additional communication channels for controlling ground units.

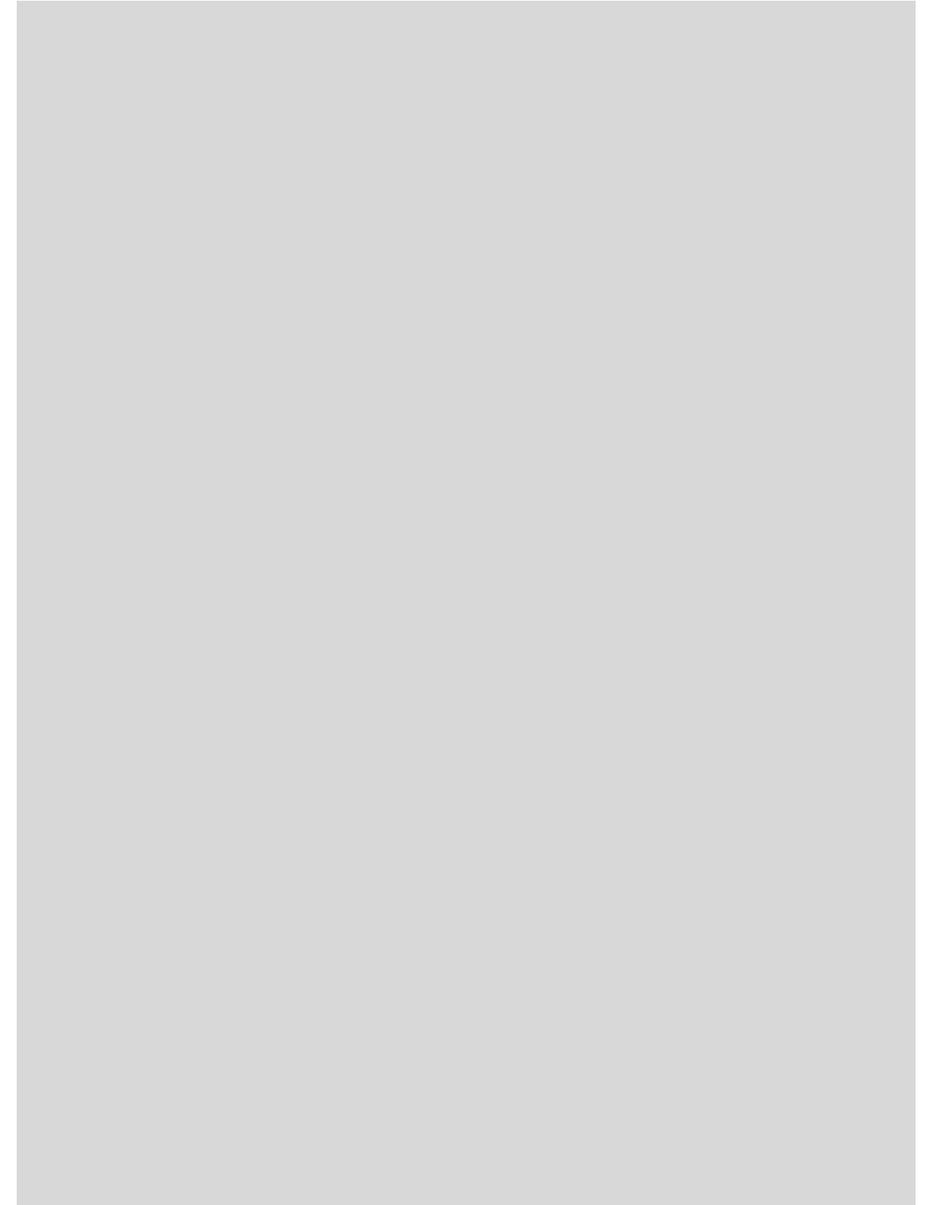
Bases are either stand-alone structures or strong points built into a hillside. Strong points benefit from free armor in the form of natural and reinforced rock. The major disadvantage is that they have large blind spots created by their protective terrain. Bases made from structures are easier to build where desired, but there's no discount to the armor costs.

Ground bases also benefit in construction costs since they only need power systems to generate power for weapon and internal systems. Buildings, such as civilian facilities like a factory, can even draw power from the local power grid if there are cities nearby. Floating bases are possible in an aquatic environment. They are still considered immobile structures for game play purposes.

When using native rock as part of the base design, it has two costs: free or the same price as armor. If the rock blocks your line of sight and you can't fire through it, the rock is free. If the rock acts like armor and you can shoot through it like armor on a anti-grav unit or naval vessel, you have to pay for it like armor. Basic rock armor stops two points of damage and costs 1 CP per hull space. Native rock can be reinforced to absorb three and four points respectively. The cost to do so is 1.5 or 2 CPs, the same as armor. More advanced forms of rock/armor are possible once they are researched.

Building a base requires construction points and manpower. So, most bases are limited to populated worlds where there is infrastructure to support it. Anywhere else and a base needs to house troops using barracks, cargo bays, hangers, and crew quarters.

When determining the power requirements for a ground base, only count the hull spaces that have equipment. Rock does not require electrical power in order to function.



Our example ground base is of the Defiance class. These bases are usually built adjacent to a civilian operation such as a mining colony, a scout base, or a star port. They are built without crew quarters but have barracks to house security forces.

The total cost of the facility is 241 CP. To totally fill it with cheap missiles for the missile launchers and fighters would cost an extra 56 CP for 560 missiles (six launchers and five magazines.)

The price does not include drones or ground troops. Costs for digging and tunneling are factored into the cost of the rock armor.

The damage allocation template represents a unit's design and how it takes damage.

Qty	Equipment	Cost	Total
18	Beam Weapons	3	64
12	Shield Generators	3	36
6	Missile Launchers	3	18
5	Magazines	1	5
2	Point Defense Batteries	3	6
6	Barracks	3	18
1	Command Post	1	1
1	Headquarters	3	3
8	Cargo Bays	1	8
9	Hangers	3	27
1	Long Range Sensor	3	3
1	Medical Center	3	3
1	Science Station	3	3
1	LR Communications	10	10
8	Power Systems (power for a hull of 80)	.5	4
33	Rock armor (2 pts each)	1	33

			241 CP

The second base design example is a small outpost built on the surface of a moon or planetoid. Since all the components are built on top of a rocky base, the player can not shoot the foundations.

The base is designed for harsh environments. So, crew quarters are needed for the personnel. The beam cannon and the reinforced armor located in a roof top turret. There are three hangers capable of housing drones. Normal combat doctrine for these drones is to launch missiles and run back to the hangers for reloads. The price does not include marines or ammunition.

Qty	Equipment	Cost	Total		
8	Beam Weapons	3	24		
2	Reinforced Armor (3 pt)	2.5	5		
12	Standard Armor	1	12		
3	Missile Launchers	3	9		
1	Magazines	1	1		
3	Point Defense Battery	3	9		
1	Command Post	1	1		
1	Turret Controller	1	1		
1	Long Range Sensor	3	3		
4	Crew Quarters	1	5		
3	Hangers	3	9	4	Power
Generators		.75	3		

			95 CP		

The three hangers and missile launchers share a central magazine (with 130 missile salvos.)

Appendix A: Quick Reference Guide/Tables

Game scale:

One combat round = 1 minute, One hex = 1 kilometer

Turn Sequence:

- 1 - Reinforcements (beginning of round)
- 2 - Write Orders (beginning of round)
- 3 - Movement (check each phase)
- 4 - Combat (possible each phase)

Combat rolls within any phase are treated as simultaneous after movement. Damage is applied at the end of the phase.

1. All units select targets and allocate available weapons that can fire.
2. Resolve any point defense against missiles.
3. All surviving weapons fire is resolved.
4. Damage is applied against shields (if any) and then the DAT.
5. Damage is recorded and any destroyed units are removed.

- 5 - Resolution (end of round)

Phased Movement table:

Phases ->	1	2	3	4	5	6	7	8	9	10	11	12
Speed 1	-	-	-	*	-	-	-	*	-	-	-	○
Speed 2	-	-	-	*	-	○	-	*	-	-	-	○
Speed 3	-	-	-	○	-	-	-	○	-	-	-	○
Speed 4	-	-	○	-	-	○	-	-	○	-	-	○
Speed 5	-	-	○	-	-	○	-	○	-	○	-	○
Speed 6	-	○	-	○	-	○	-	○	-	○	-	○
Speed 7	-	○	-	○	○	-	○	○	-	○	-	○
Speed 8	-	○	○	-	○	○	-	○	○	-	○	○
Speed 9	-	○	○	○	-	○	○	○	-	○	○	○
Speed 10	-	○	○	○	○	○	-	○	○	○	○	○
Speed 11	-	○	○	○	○	○	○	○	○	○	○	○
Speed 12	○	○	○	○	○	○	○	○	○	○	○	○

* Turn only phase

Weapons Range table:

Range	Hex	Notes
Point Blank	0	point defense, infantry weapons, mines, flamethrowers
Close	1	Heavy machine guns, man-pack or drone missiles
Short	3	MBT or LAV cannon, anti-tank missiles
Standard	8	Anti-grav vehicle weapons
Long	24	5" Naval guns, extended range weapons
Extreme	+	Artillery, anti-ship and cruise missiles, battleship guns

Base Accuracy Modifiers table:

Modifier	Bonus	Notes
Battle Computers	+10% +20%	While everything has a targeting system, some units have better or even superior computers installed.
ECM	-40%	Electronic Counter Measures can severely degrade missile accuracy and jam GPS and communications.
Defensive Positions	-20%	Ground units, especially infantry, can take advantage of sand bags, trenches, and fox holes.
Cloaking	-30%	Not quite invisibility, ghost fields can distort radar and thermal imaging as well as light.
Fog/Dust	-10%/	An environmental factor that makes any terrain more difficult to fight in. Penalty is applied to each hex.
Trees	-20%/	Each hex of woods and swamp reduces accuracy.
Cities	-40%/	Each city hex provides lots of hard cover for units.
Point Blank	+20%	Close/short/standard weapons used at range zero.
Painted	+10%	Target is painted by a friendly drone or infantry unit.
Stationary	+20%	Vehicles that have a movement of zero, bases, buildings, bridges, and rails are easier to hit.

Point Defense Intercept table:

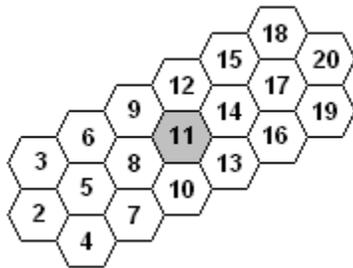
Target	Intercept	Notes
Anti-tank missile	1-6	Heavier/slower missiles with a larger warhead
Standard Missile	1-5	Baseline point defense target
Drone	1-4	Human or AI controlled weapons platform
Armored Missile	1-4	Hardened kinetic warheads
Smart Missile	1-3	Has evasion routines and ECM

Drone Equipment table:

Type	Range	Notes
Point Defense	0	Drone acts as a range zero point defense battery.
Recon/Target Designation	2	Drone has no weapons, but can detect mines at range one and can paint targets at two hexes.
Anti-Infantry	0	Drone is equipped with two light machines.
Anti-Vehicle	1	Drone carries two anti-tank missiles with 3pt warheads. It can only fire one missile at a time.

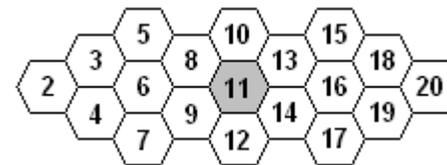
Artillery/Strike Accuracy table:

Target	Accuracy	Notes
Moving Vehicle	20%	Normally targeted by precision munitions. GPS guidance can't be used on moving objects. Laser guidance improves accuracy.
Stationary Vehicle	40%	Spotters can provide GPS coordinates for smart weapons.
Building/Bridge	60%	Still a tricky shot from 50 to 100 kilometers away. GPS coordinates are usually available unless the target is a temporary structure.
Full Hex	80%	It's hard to miss a kilometer wide target, but wind and other factors do not make it 100%.
GPS Guidance	+20%	GPS equipped smart weapons can take advantage of battlefield intel.
Laser Designator	+40%	A laser beam from a drone or infantry unit can provide pin point accuracy.



Artillery/Strike Effects table:

Munition	Targets	Notes
Cluster Bombs	Area	Cluster bombs and shells drop hundreds of sub-munitions into a single hex and attack all targets in that hex with a swath of one point attacks. Active shields act like they were struck with a 19 point beam attack. Alternately, they can cut a path through a mine field.
Incendiary	Area	Incendiary ordinance will automatically set woods on fire and create smoke in a swamp.
Smoke	Area	Lays down smoke in hex which can drift.
Land Mines	Area	Creates a known (not hidden) mine field in any non-city hex. Used as an area denial tactic.
Precision	Vehicle/Buiding	A smaller round/bomb designed to strike a specific target and reduce collateral damage. The actual attack is either drill, explode, or scatter depending on if the shell is a kinetic penetrator, high explosive, or flechette.
Tandem Charge	Vehicle/Buiding	A heavy warhead that is part penetrator (drill attack) and part explosive warhead. Designed to explode inside armor or under rock.
Nuclear	Area	These are tactical low yield atomic weapons rather than city busters. They will destroy terrain leaving either a crater or lake after detonation. They also generate radiation, smoke, and thermal effects in a ring around the hex they explode in. Most military units are hardened against EMP.



Disabling Charges:

- 01 – 25 Drive controls fail next round, no turning, acceleration, or controlled deceleration. (Grav tanks do not automatically crash, but they can plow into trees, hills, and other terrain next turn.)
- 26 – 50 Power systems fail next round, no energy weapons or gauss weapons. (Point defense batteries, cannons, and launchers work.)
- 51 – 75 Shield generators go offline, shield rating of zero for one round.
- 76 -100 Main computer is offline for next round. This is the same as no drives and no weapon power, but a unit with an aux bridge (CIC, HQ, flag bridge, etc.) will continue to function normally. A second DIS hit on the same round that rolls this result would take out both sets of controls.

Thermal Weapons:

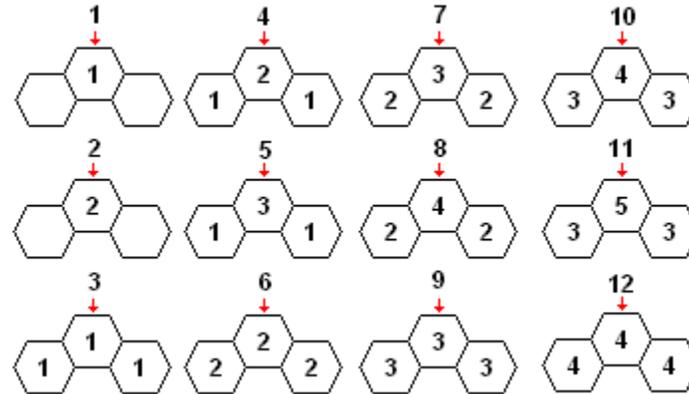
- 01 – 25 Coolant Leak, a random (non solid) component is filled with toxic gas and the component is taken off-line.
- 26 – 50 Fire: Level 1, one random component takes two hits.
- 51 – 75 Fire: Level 2, one random component takes 2 hits plus an adjacent component takes a single point of damage.
- 76 -100 Fire: Level 3, one random component takes 2 hits plus two adjacent components take a single point of damage each.

Meson, Tachyon, and Phantom Weapons:

- 01 – 20 One random component takes two points of damage.
- 21 – 40 Random crew station or squad bay takes two hits of damage.
- 41 – 80 Explosion, one random component is destroyed plus one adjacent component takes a point of damage.
- 81 -100 Explosive chain reaction, one random component is destroyed plus four random adjacent components (if present) take one point of damage each.

Gravitic and Vibration effects:

- 01 – 25 A random power system or drive component takes two damage.
- 26 – 50 Hull Fracture, random external component (on the outside edge) takes two hits in addition to any other damage that is done.
- 51 – 75 Superstructure hit, one random internal component takes two hits of damage in addition to any other damage that is done.
- 76 -100 Structural Collapse/Fracture, one random component takes two hits plus three adjacent components (if present) take one point of damage each.



Control Space Loss table:

Minimum Spaces	Loss per Space	System Notes
1	100%	Vehicle is disabled if it loses its control space.
2	50%	When the unit is down to one control space, only half of the systems are available.
3	33%	At two control spaces, 2/3 rd of the systems are available. And at one space, only 1/3 rd of the systems can be used.
4	25%	The breakdown is 75%/50%/25% for remaining spaces.
5	20%	The breakdown is 80%/60%/40%/20% for the remaining spaces.

Drive Component Loss table:

Minimum Spaces	Speed Notes
1	Vehicle is disabled if it loses its last drive unit.
2	Top speed halved when one is lost.
3	Top speed halved when two are lost.
4	Top speed halved when two are lost.
5	Top speed halved when three are lost.
6	Top speed halved when three are lost.
7	Top speed halved when four are lost.
8	Top speed halved when four are lost.
9	Top speed halved when five are lost.
10	Top speed halved when five are lost.
11	Top speed halved when six are lost.
12	Top speed halved when six are lost.

Appendix B: Glossary

Aircraft is a generic term for conventional aircraft that were popular around the turn of the millennium. They are generally light-weight aluminum and titanium frames that are extremely fragile in comparison to anti-grav tanks. Aircraft fall into two general categories; sub-sonic or super-sonic. For ease of game play, super-sonic aircraft move two hexes per phase when they are on the map. Sub-sonic aircraft move from 0 to 12 hexes per round depending on their construction. Attack helicopters can move 0 to 7 hexes per combat round. Low speed combat aircraft have a minimum speed of 5 hexes per round and a top speed of 12 hexes per round.

Anti-gravity vehicles are an interesting hybrid of tank, plane, and naval vessel. They're huge, powerful, and hang in the air the way bricks don't. The development of anti-gravity technology opened a lot of design possibilities for military and civilian applications. Their speed, durability, and firepower have created new tactical options for planetary combat.

Assault shuttles are battlefield taxis used to deploy marines and power armor. They tend to be small anti-grav units with minimal weapons. Some of these vehicles also operate in other support roles such as mine sweepers or drone carriers.

Barracks combine the long term housing capability of crew quarters with the rapid deployment of an assault bay. To meet that purpose, barracks should be located near the surface of a base or the exterior of a vehicle.

Cloaking renders the unit electronically or mentally invisible depending on the race that uses it. Actual usage of cloaks is covered under the combat and movement sections of the rules. Strategic use of cloaking technology can significantly alter the starting conditions of a battle.

Command and Execute is the primary game mechanic of the Frozen Thunder system. Each player gives orders to each unit on their side and those orders are executed simultaneously in a set number of phases designed to distribute movement over the whole duration of the turn.

CP or construction points are the coin of the realm. They represent work, wealth, and resources in an abstract manner. They are also used to represent the general value of combat units.

DAT is short for damage allocation template, the hexagon grid that sits right in the middle of the record sheet. The DAT is the core of the system. You use it to design units, create formations, and determine the point of impact for weapon damage.

Desktop publishing enables me as the author to bring this game to you without the added expense of manufacturing, shipping, and warehousing. DTP reduces the costs to everyone since the player is in complete control of how much they want to bring to the game table. Some players are happy with just a few sheets, counters, and maps. Others want a hard copy of the rules with full 3D terrain with infantry and grav tank models all over the place.

ECM/jammers disrupt the ability of the enemy to lock on or scan your ship. The down side is that ECM/jammers broadcast your general location to the enemy and prevent any chance of ambushing or surprising the enemy.

Game design kit is a concept where a game can be played as is, but it can also be easily tweaked to be used with a variety of established or custom designed settings. One of the goals of the Frozen Thunder system is to allow players to create unique settings based on their own campaigns.

Gauss Cannons are electromagnetic cannons that fire shells at high velocity. Solid slugs use the drill profile. Fragmentation or explosive shells use the explosion profile.

Magazines are specialized storage facilities for missiles, cannon shells, and mines. A single magazine can feed multiple adjacent weapons systems. They are also capable of holding a variety of ammunition types and supplying them on demand. For example, a gauss cannon might have an external magazine with explosive, armor piercing, and flechette rounds. The magazine system is sophisticated enough that it can deliver any of the above shells as needed. Magazines can also service hanger bays in order to re-load drones. Magazines have a generic capacity rated at 100 shots. A 'shot' represents everything from a single missile to a single burst from a cannon.

Mecha is a generic term that is most commonly associated with giant robots and the like. They are not a normal part of a Frozen Thunder game, but the system is flexible enough to include them. The best way to simulate mecha features such as hand held weapons is to give them an appropriate number of XO racks. The player or GM can design a number of rifles, rockets, swords, shields, and other devices as pods that the racks can use. On the DAT, the upper is represented by the main turret. The hull represents the lower half of the mech. Due to the proportions, the roll between hitting the upper body on an attack is 1-5 on a 1d10.

Powered Armor can vary in complexity from the simple exo-skeletal frames used by light infantry, to the sealed marine suit, and jet-pack equipped jump infantry. In the Frozen Thunder setting, infantry with bulky equipment like squad assault guns and rocket launchers are just as mobile as standard infantry due to this technology.

Shield technology can vary from one sci-fi campaign setting to the next. In the Frozen Thunder universe, shield generators are bulky devices that 'ground out' if they make contact with the ground. As such, only anti-grav vehicles can make effective use of them. The shields do not appear on the DAT, only the generators for them. Due to their large radius, they're automatically hit before damage enters the damage template. Shields usually do not impede outgoing attacks. Hitting the 'back' of a partial shield does not degrade it. Deflectors are another branch of shield technology that operates in a narrow arc. They are still bulky, but they have the advantage of working on ground bases and surface naval units.

Stealth technology decreases the effective detection radius of enemy sensors. Stealth primarily benefits strategic movement and has some limited effect on combat. However, if used properly, it can have a major impact on establishing the conditions of a scenario (levels of surprise, enemy unit

deployments, availability of reserves and reinforcements, etc.)

Tracked vehicles cover a wide range of units in various mission roles. In FT, they can be broken down into two groups; fast and slow. Slow tracked vehicles tend to be support units like engineering vehicles, ammo crawlers, rocket launchers, and construction equipment. Fast tracks are usually main battle tanks which have since been eclipsed by anti-grav tanks. They still do have some functionality in a defensive role.

Wheeled vehicles can range from the family mini-van on up to armored personnel carriers and light armored vehicles. Fast civilian vehicles are only capable of operating on city streets and roads. While they would never appear as a fighting unit in Frozen Thunder, they could make their way on to the map as a target to protect or destroy. Slower all-terrain vehicles like APCs and LAVs are more likely to make in into battle and have weapons systems to fight back with.

Appendix D: Designer Notes

Frozen Thunder is an extension of Tactical Command combined with inspiration from Mode 7 Games' Frozen Synapse, FASA's Renegade Legion: Centurion, and Steve Jackson Games' Ogre. I'd like to time to address some of those points and explain the game decisions behind them.

Is Frozen Thunder intended to be a simulation? FT strives to be an interesting game first. While there are some systems that hopefully give the players a sense of realism, other parts have been deliberately engineered to generate a game-like feel. The goal is to give the players a variety of interesting decisions to make and have the game play out in a reasonable amount of time with some of the thrill that random dice rolls can bring.

How massive are anti-grav tanks? Well, we are talking about flying battleships that can swoop down and snatch up a main battle tank. Some folks like to reverse engineer a game design down to the final kilogram of mass and the final bit of horsepower. It's their way validating a set of game mechanics or science fiction background. That's okay for a simulation that nails everything done to four decimal places. Frozen Thunder is not that kind of game. Due to the coarse resolution and nature of the DAT, there is some fudging on the mass and volume of in-game components.

Where are the nuclear weapons in the price tables? Nukes are messy and generally they are looked down as a means of resolving disputes. The long term social and environmental impact of using them has curtailed their use in the game fiction. Given that, they can be modeled in the game.

Rules-wise, I think a lot of this can be handled by the radiation zone rules. If nukes were given a rad-zone/damage rating, the existing rules would help to model their usage. I figure nukes would be set to either area effect or close contact. Area effect nukes explode before getting into point defense range and fill the local hex with radiation based on the warhead size. The surrounding hexes would get lesser amounts of radiation. These effects would last for one round after detonation. Close contact attacks have to survive point defense. If the point defense fails, the target is inside the nuclear fireball and the ship's components take damage. No need to roll on the DAT for location. It's a nuclear weapon and there is plenty of heat, shock, EMP, and radiation to spare.

In close contact, a level 1 nuke would do one point to each component that faced the blast, level 2 would do 2 points, etc. For shielded units, each level of nuclear warhead strength would inflict 20 points per level (roughly the width of the DAT or the shield bubble.)

Level one nukes are essential nuclear firecrackers that generate a lot of noise. In close contact mode, they could wipe out conventional forces or peel off a layer from unshielded units and disabling a lot of systems on the hull and the turret.

Level 2 and Level 3 nukes start doing serious damage even to the big units either damaging or destroying the exposed sides of units. They are also town killers since most small cities are not rad-shielded.

Level 4 nukes will penetrate the first layer of components and start knocking out internal systems. They also have an impressive footprint since there would be a hex of level 4 radiation, a hex ring of level 3, a twelve ring of level 2, and a final eighteen hex ring of level 1 radiation. That's a footprint that is seven kilometers across.

Costs won't be cheap due to game balance if nothing else. Their default size is the same as a conventional anti-ship missile (double the size of a normal missile.)

Level 1, 20 point warhead + rad 1 = 5 (20 x .1 x 2.5)

Level 2, 40 point warhead + rad 2 = 20 (40 x .1 x 5)

Level 3, 60 point warhead + rad 3 = 45 (60 x .1 x 7.5)

Level 4, 80 point warhead + rad 4 = 80 (80 x .1 x 10)

A couple of ideas to keep nuclear weapons in balance in a campaign game: Allow research on enhanced point defense systems that can counter missiles at longer ranges. This technology could form the basis of an Aegis carrier design. Another more sci-fi like options would be research and development into field effect defenses such as nuclear dampeners, stasis snap shields, specialized thermal armor, and adaptive systems.

Art Credits

Most of the computer graphics were created by me with DōGA CGA L3. You can find the DōGA web site at <http://www.doga.co.jp/english/> or the unofficial discussion group that I moderate at <http://groups.yahoo.com/group/dogacga/>.

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