TACTICAL NUCLEAR WEAPONS SIMULATION

With Particular Reference to Firefight and Similar Games

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The following article treats with the nuclear battleground scaled to *FireFight* in particular – but it could be made applicable to any modern tactical game adjusting for the scale change. As the author points out, the nuclear environment really requires more space than the *FireFight* map allows (see, this is really another cheap trick to get you to buy lots of mapsets). In my heart of hearts I do still believe, however, that after the first few "tactical" nuclear weapons are detonated, their use will quickly escalate into the general strategic conflagration, and battleground tactics will be a moot point. *–RAS*

These rules may be used to include nuclear weapons in any tactical scale combat simulation. The charts included with these rules were designed for use with *FireFight*, but they may be used with any game when appropriate adjustments for hex size and time per turn are made. This simulation was prepared using unclassified U.S. Army Training Manuals (FM 101-31-1, FM 101-31-3). Informed sources confirm that the effects resulting from these rules are very close to the actual classified effects. These rules are very brief, since they are to be used for reference when playing already complicated simulations. Further discussion and explanation for the rules is given in the designer's notes, as referenced in these rules.

Nuclear Phase Procedures

The Nuclear Weapons Phase should be the first Player-turn Phase.

1. Check off firing preparation delays for rockets and missiles currently being readied to fire. See Note 1.
2. For each weapon scheduled to impact this Turn:

   a. Place a marker on the hex where the weapon is aimed to impact. This is the hex referred to as "Designated Ground Zero" (DGZ).

   b. Find the range from the firing location to DGZ. This is given in the scenario if the firing location is off the battlefield map board. See Note 2.

   c. Roll a die. Cross-reference the die roll number with the range to find the distance from DGZ to "Actual Ground Zero" (AGZ) using Chart I for the type of weapon firing.

   d. Roll a second die to determine the direction from DGZ to AGZ (in the same manner as for other artillery). Move the marker from DGZ to AGZ in the direction just determined and for the distance found on Chart I. See Note 3.
3. For each unit (both Enemy and Friendly) within the destruction range of AGZ:

   a. Find the distance from AGZ to the unit. This distance is the "range" for use on Chart II.

   b. Roll a die. Find the appropriate graph on Chart II for the weapon being detonated. Cross-reference the number rolled with the range to find the point on the chart that determines the effect of the detonation on the unit. These effects are as follows. See Note 4.

Nuclear Weapon Effects

The effects of the nuclear weapon on a unit depend not only on the distance from AGZ, but also on the type and situation of the unit. For the purpose of determining nuclear effects, units are broadly classified as follows:

Type E: Exposed personnel, dismounted infantry, towed artillery not in revetments (the crews, not the weapons).

Type P: Protected personnel, infantry in foxholes, artillery in revetments.

Type W: Wheeled vehicles, artillery being towed (excluding personnel), any non-armored vehicle.

Type T: Tanks, armored vehicles of all types including APC's.

Type D: Depots, concrete bunkers, reinforced concrete buildings, bridges.

On the graphs on Chart II, there is a line labeled with the letter for each of the five types of target units. If the point found in step 3b, above, lies to the left of the line for the particular type of unit, that unit is destroyed. If the point lies to the right of the line for the type of unit, the unit is not destroyed. But such units may be moderately

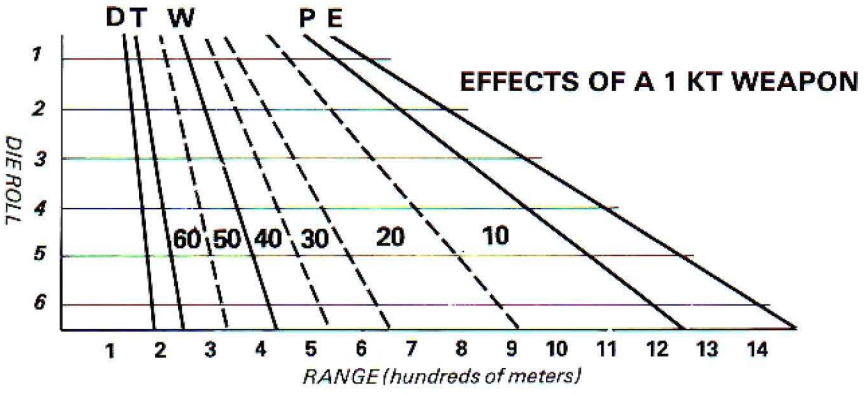
CHART I: Distance of Actual Ground Zero (AGZ) from Desired Ground Zero (DGZ)

Range	Die Roll (Artillery)					
Km	1	2	3	4	5	6
2	–	–	–	–	–	1
3	–	–	–	–	1	1
4	–	–	–	1	1	2
5	–	–	1	1	1	2
6	–	–	1	1	1	2
7	–	–	1	1	2	3
8	–	1	1	1	2	3
9	–	1	1	1	2	3
10	–	1	1	2	3	4
Maximum Range for Short Range Artillery						
11	–	1	1	2	3	4
12	–	1	1	2	3	4
13	–	1	2	2	3	4
14	–	1	2	2	3	5
15	1	1	2	2	3	5
16	1	1	2	3	4	5
17	1	1	2	3	4	5
18	1	1	2	3	4	5
19	1	1	2	3	4	6
20	1	1	2	3	4	6
Maximum Range for Medium Range Artillery						

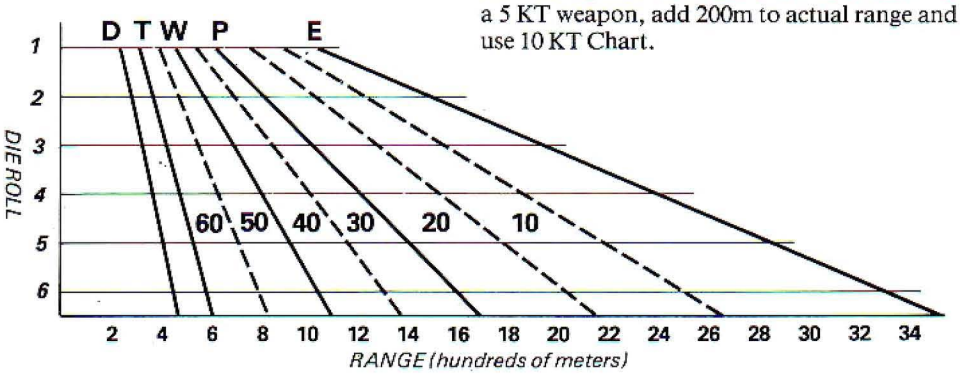
Range	Die Roll (Rockets & Missiles)					
Km	1	2	3	4	5	6
5-6	–	1	1	2	3	4
7-8	–	1	2	3	4	5
9-10	1	1	2	3	4	5
11-12	1	2	3	4	5	6
13-14	1	2	3	4	5	7
15-16	1	2	3	4	6	8
17-18	1	2	3	5	7	9
19-20	1	2	4	6	8	10
21-22	1	3	5	7	9	11
23-24	1	3	5	7	9	12
25-26	1	3	5	7	10	13
27-28	1	3	5	8	11	14
29-30	1	3	6	9	12	15
31-32	1	4	7	10	13	16
33-34	1	4	7	10	13	17
35-36	2	5	8	11	14	18
37-38	2	5	8	11	15	19
39-40	2	5	8	12	16	20

Note: All adjustment distances are given as 50 meter multiples. Thus an adjustment of "5" is 5 × 50 or 250 meters from desired ground zero (DGZ) to actual ground zero (AGZ).

CHART II: Nuclear Weapons Effects



Note: For effect of a 0.5 KT weapon, add 100m to actual range and use 1 KT Chart. For effect of a 2 KT weapon, subtract 100m from actual range and use 1 KT Chart. For effect of a 5 KT weapon, add 200m to actual range and use 10 KT Chart.



damaged so they may not move nor fire for several Turns (minutes). See Note 5. The numbers between the dashed lines give the number of minutes (or *FireFight* Game-Turns) the unit may not move or shoot. The crews and passengers of vehicles suffering moderate damage may be unloaded and move or shoot as if nothing has happened, as the vehicle protected them. (Tank crews may be represented by light fireteams in *FireFight* if they are attacked before repairs are completed to their tanks.)

Designer's Notes

Note 1 (See Nuclear Phase Procedure 1). Rockets and missiles must be fueled, fused, and otherwise readied to fire, long in advance of the time they are intended to impact on the battlefield. If you do not have actual arming times for the rockets and missiles you are simulating, the following generalizations may be used:

Free Flight Rocket (FFR or FROG): 30 minutes after movement is completed, 5 minutes for on-call targets. FFR deliver 5 KT, 10 KT, 50 KT and 100 KT warheads.

Light Guided Missile (LGM): 30 minutes after movement is completed, 10 minutes for on-call targets. LGM deliver 2 KT, 5 KT, 10 KT, and 20 KT warheads. See Note 3 for further LGM guidance.

While larger missiles and warheads are available, it is felt that the destruction of warheads greater than 10 KT is so great as to make them unusable as tactical weapons, at least in simualtions on the scale of *FireFight*.

It is recommended that when nuclear weapons are included in a Scenario, that an "earliest impact time" be given for them. This is because most tactical simulations are for a real time that is much less than the preparation time for FFR and LGM. Also, the location of DGZ must be recorded at least five minutes (8 *FireFight* turns) before impact, to simulate the computation and application of firing data to the FFR or LGM.

Note 2 (See Nuclear Phase Procedure 2b). Most tactical Scenarios will be of a scale such that the nuclear delivery systems are "off map," not actually located on the battlefield map board. The minimum and maximum ranges for short and medium range cannon and FFR are shown on Chart I. Most delivery systems will be fired at a range about midway between the maximum and minimum. When off-board nuclear delivery systems are included in a tactical Scenario, the following ranges to the near edge of the map board are recommended:

Short Range Cannon (Max range less than 10 Km): 5 Km. (fires 0.5 to 1 KT warheads)

Medium Range Cannon (Max range over 10 Km, less than 20 Km): 10 Km. (fires 1.5 to 2 KT warheads)

FFR: 10 Km *LGM:* 15 Km

Note that the actual range used for Chart I will be the above range plus the distance from the edge of the map board (nearest to the firing weapon off board) to DGZ.

Note 3 (See Nuclear Phase Procedure 2d). All artillery cannon and rocket or missile-delivered warheads are affected by winds, small unpreventable aiming errors, and enemy counter-actions. These cause the actual impact site to be different from the site toward which the weapon was aimed, sometimes. This is why artillery dispersion rules are included in simulations on the scale of *FireFight*. It can be seen that the farther the target is from the firing location the greater the error usually is. This is true for cannon and FFR, but not true for guided missiles. LGM accuracy is classified, but it may be approximated by using the 8 Km line on the Artillery side of Chart I, for all ranges.

The marker for AGZ may be left on the map to determine radiation effects on troops that pass through the impact area, optionally. These radiation effects are negligibly felt by troops during a few-hour tactical Scenario. But up to two weeks later, they may die from radiation poisoning. If the Scenario gives points for the number of units destroyed, then units receiving a lethal dose of radiation should be counted as destroyed, even though they go on fighting during this battle as if nothing has happened. A lethal dose is received under the following conditions:

Types E, P, and W: Divide the KT of the weapon by 4. Any type E unit passing within this distance of AGZ has received a lethal dose. Thus if a 2KT weapon were fired, any type E unit passing within 500 meters of AGZ is dosed.

Type P and W: Same as type E.

Type T: Divide the KT by 20. Thus a 2 KT weapon lethally doses type T units if they pass within 100 meters of AGZ.

Type D: No radiation effects unless personnel leave the bunkers. If personnel leave the bunkers, they become type E units for radiation.

An additional use of the AGZ marker that may be optionally used is to compute "tree blow-down" effects. Any wooded hexes and any town hexes within the distance found by dividing the KT by 4, become impassable to vehicles. This includes town hexes with roads through them when the road is blocked by fallen trees and other debris. These hexes may be cleared by engineers in the same way they remove other road blocks and obstructions (if such rules are in your game).

Note 4 (See Nuclear Phase Procedure 3). Only two graphs of nuclear weapons effects are given, one for 1 KT weapons and the other for 10 KT weapons. These two charts may be used for 0.5 KT, 2 KT, and 5 KT weapons by adjusting the range from AGZ as described on the chart. Purists will note that the effect curves on both of these charts are straight lines, while nuclear effect attenua-

tion follows a logarithmic curve. Straight lines were used because the data used to compute the curves was only within 10% of actual, just as the straight lines are within 10% of a log curve. Straight lines were found easier to see and use when the system was tested.

The unit types for calculating nuclear blast effects are straight from the current doctrine. This is why effect curves were available for them. It should be noted that personnel are not dispersed, pinned, or suppressed by the effects of a nuclear blast. They are either casualties or physically able to fight. In reality, certain blast effects will cause a "pinning" of a few personnel at the "safe" ranges given on Chart II. Night blindness (due to the atomic flash), ringing ears, slight blast shock (shell shock), cuts and bruises, may be experienced by some personnel. But it will be so few to the right of the E-E line that it will not affect small unit performance. To the left of the E-E line, some may have these light effects, but so many will have greater injuries that a fireteam will be ineffective for at least the rest of the day. It will be evacuating its wounded, fixing its weapons, waiting for sight or hearing to return, and such things as to render the team unfit for combat.

Note 5 (See Nuclear Weapons Effects). Moderate damage to vehicles is defined as damage that can be fixed by the crew, but such damage as to make the vehicle completely unfit for combat. This is beyond the definition of vehicle suppression used in *FireFight*. Nuclear blast will clog radiators and grills, clog exhausts, clog weapon barrels, crack view port prisms, fill view ports with earth, fill engines with debris without harming them, burst tires, break treads, remove ATGM rails, remove external machineguns, and similar damage that the crew can fix, but which prevents the vehicle from performing its normal mission.

It may be more realistic to treat the last ten minutes of nuclear moderate damage delay as being normal vehicular suppression. But the vehicle remains in the suppressed or Kms state until it does not move for ten minutes (15 *FireFight* Game-Turns). While this may be realistic, it involved so much bookkeeping when tested that it was not included in the regular rules due to playing delays it caused.

Commentary on the Nuclear Battlefield

When playing *FireFight*, one rather quickly falls into a pattern of placing smoke on Enemy positions and overrunning them just before the smoke clears. Such close-in massed combat creates large Enemy casualties with the fewest Friendly casualties when well executed. But then the Enemy masses his forces in a fortified position and usually prevents the attempted overrun. Both sides then tend to mass or bunch-up their units to gain maximum local fire-power.

But nuclear weapons change this tendency. As soon as an attacker bunches his forces, they are nuked into dust. When a defender builds a too-strong hardspot, it too gets nuked into vapor.

The attacker then disperses his forces across a wide front for the approach march toward an Enemy hard spot, smoking the objective as usual, but not actually massing his units until they arive on the Enemy hardspot. And the normal bloodshed occurs, with the attackers massed too close to the defender for a defensive tactical nuke to do any good, until too late.

Consolidation of the objective, which classically meant the reorganization of the trench lines so they face their former owners, rather than their former enemy, now has a new meaning. It means quickly dispersing away from the just captured hardspot, to avoid any follow-up nuke its former owners may have called in just before their demise.

For the defender, the nuclear battlefield also means dispersion. His hardspots must be small enough not to tempt the enemy to nuke them, but big enough to withstand an attack like the one just described. The dilemma is apparently unsolvable, because the Enemy will nuke anything too big to easily overrun. So the defender uses a liquid mobile defense, few if any hardspots, and lots of electronic sensors and patrols.

When the direction and apparent intent of Enemy movement is detected, several defending platoons and companies are set in motion from their widely and deeply dispersed positions. Their movements are timed so their arrival at the ambush position coincides with the arrival of the Enemy at the selected site. This again makes too intimate a contact for either side to use nukes. If the attacking force is too big for the counterattacking or ambushing force, the counterattack withdraws leaving blockades to hold the Enemy position until a nuke can impact on them. The counterattacking force then destroys any survivors and again disperses.

The Warsaw Pact echeloned attack formation may make this mop-up and disperse tactic difficult. The second echelon becomes an ambushing force for the opposing ambushing force. This could result in a series of entrapments and counter-entrapments, with the wiliest commander being among the few survivors. World War Two battlefields had nothing even remotely resembling this. The closest example might be the desert warfare in North Africa, where battles consisted of several days of maneuver to entrap the opponent for a few hours of actual combat. But even then, the battlefields were described in tens of kilometers and forces in brigades and battalions, where the nuclear battlefield will be described in hundreds of kilometers, and forces in platoons and companies. And there will be no front lines, only local perimeters of platoons and companies, all mixed together like lettuce and vegetables in tossed salad. They will be constantly tossed, trying to trap without being trapped, observe and nuke without being observed and nuked, and find somebody's resupply trains to use to keep going.

The depth and width of the *FireFight* battlefield should be doubled to allow proper dispersion for any given Scenario with nuclear weapons included. The number of nuclear weapons included should also be limited, just as the supplies of warheads is limited in reality. A 0.5 KT or 1 KT weapon with one warhead per company, and a 2 KT or 5 KT weapon with one warhead per battalion is about right for addition of nuclear weapons to *FireFight* Scenarios.

While some may insist that lighting the corner of the battlefield map with a match is the best nuclear simulation, you will find the dispersion of reality a challenge worth simulating.

You Too Can Be an Air War Ace *[continued from page 5]*

Again, like heat-seeking missiles, radar-homing missiles have aerodynamic launch envelopes, so the ability to launch any type of missile is limited by preceding maneuvers or the attitude of the launching aircraft. Radar-homing missiles are perhaps the most difficult weapons to use as they have a great deal of pre-launch requirements to accomplish (or avoid) before they may be fired.

When selecting weapons loads for particular scenarios, it is strongly advised to be quite discriminating. Cannon weapons are in order (unless the addition of a pod would cause the carrying aircraft to be in a loaded configuration). The selection of missiles is also to be based on the previous idea, that of loaded configuration. The player must also take into account the combat environment and the expected target aircraft, altitude considerations, the ECM environment, the time of day the combat is supposedly about to encompass, and the effectiveness of the carrying aircraft in firing that weapon, e.g., the ability to search and lock on with its onboard radar.

concepts of aerial combat have been treated in a game-objective manner. There remains an extensive quanitity of optional rules in *Air War*, such as visual and radar search, air-to-ground and ground-to-air combat, and pilot capability, which make the game truly the gem that it is. These optional rules are of such magnitude and complexity that they are best treated in a separate premise, rather than in this introduction to *Air War*.

Without a doubt, *Air War* is a complex game. But is by far the best and most accurate, yet most playable, game of aerial combat available today. It is certainly worth adding to any collection of great wargames.