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"At the outset it was evident that the staggering casualty list had been no accident. Battle losses were bound to be severe when soldiers advanced shoulder to shoulder, halting at the word of command to trade volleys at distances suited to dueling pistols. Only an iron discipline could nerve men to keep reloading and firing while they stood firm amid the heaped-up bodies of writhing and motionless comrades. Only years of drill could school them to close up their tattered ranks and march forward with the bayonet at the slow and solemn pace of eighty steps a minute."

– Lynn Montross, <u>War Through the Ages</u> (3rd Ed., 1960), p. 336 [1]

Shoulder to Shoulder: Factors of commonly misunderstood 16th-19th Century Linear Warfare:

- ✓ Muskets were heavy, single shot and had about a 20% misfire rate on a *dry day*.
- ✓ Accuracy fell off sharply after 50 yards, thus soldiers lined up shoulder to shoulder.
- ✓ Until the late 19th Century, gunpowder weapons produced a big cloud of thick smoke, thus bright uniforms were necessary to distinguish combatants in a close smoke shrouded battlefield, this also affected command, because once the shooting started, the general on the hill could only occasionally see the unit banners, communication was by messenger or bugle.
  - ▪ In the thick shroud of smoke, when figures emerged close in front of you, you had 5-15 seconds to decide friend or foe. Forget all those movies you've seen, most are filmed with smokeless powder. Thus bright colored uniforms served to distinguish units in the thick smoke; a Canadian unit wearing green uniforms was fired upon in the thick smoke by a British unit in the War of 1812 because they weren't wearing red.
- ✓ Europe was by that time mostly cleared and improved farmland, vineyards and small towns, open fields, roads were common, so linear formations were not problematic in Europe (contrast with the terrain of North America).
- ✓ Musket and bayonet replaced pike and arquebus, lines and squares had been the standard military formations for millennia: linear musketry required men to stand close together and advance slowly, stiffly in line to avoid confusion and friendly fire.
- ✓ "They believed that in order to mash your enemy, you had to mass your men, so he lined up shoulder to shoulder and went forward, and a good deal of dependence on the bayonet frightening the enemy into retreating. There were a few bayonet wounds in that war. And this lining up shoulder to shoulder and advancing was the reason for the huge casualties they suffered." – Shelby Foote undated audio interview, talking about Pickett's Charge.

"Leave it to the infantry to ruin a guy's morning."
– Garibaldi, Babylon 5, "GROPOs" (1995)

GROPOs: Ground Units are regular, equipped and trained armed units that do not normally function as police forces. No Patents or special technology is required to build Ground Units, any position or Minor Race can build Ground Units from the beginning of the game.

Ground Unit size is measured in population and RPs. Ground Units are built (or added to) by activation of the Construction Power for the purpose of Colony Enhancement, using one half population factor for each 1 RP added; Ground Unit size for combat is measured in RPs. All colonies on a Balkanized Colony Planet may have their own Ground Units and may peacefully (or not) co-exist. Population Factors in Ground Units on *any* colony count toward the colony planet's Maximum Habitability, do not produce RPs during Taxation, but will grow normally during Census (eating and breeding!)**[2]** if on a colony of their Native Population Type.

- ✓ Surface colonies on a Balkanized planet may initiate Ground Combat against each other.

- ✓ "By the following summer universal conscription had increased French numbers to nearly three quarters of a million – the greatest horde ever seen in Europe since the barbarian migrations. ... The last traces of the old regime had vanished along with such famous regiments as Picardie; and all units now wore the blue uniform of the National Guard, being designated by numerals instead of names." – Lynn Montross, War Through the Ages (3rd Ed., 1960), p. 455.

    - ▪ This approach can be seen in the movie Paths of Glory (1957) where all of the French officers and soldiers wear their regimental number prominently etched into the collar of their uniforms (in the movie '701' is prominently displayed on most of the uniform collars, except the General-grade officers and staff attachés).

- ✓ *The Alterity Factor*: There are communal eugenic creatures on Earth where every individual is both a natural warrior and a worker, for example, ants and bees. It is possible in GGDM to have technologically advanced alien races along these lines which makes the entire population of the colony a single, probably non-divisible, huge Ground Unit that can also produce in Taxation and grow with the Census, if not involved in a Ground Combat. I designed a game like that when I was about 15.

- ➢ Ground Units: Ground Units can be distinguished mechanically from Fighter Complements in the following ways: Ground Units are not an Enhancement Technology (there are no Patents required to build Ground Units), and they can exist independently as a unit away from a colony or ship as long as they are supplied by Log Ships. Compare with Fighters, see On The Flight Deck, 1 Carriers & Fighters, p. 1047, *infra*. This makes Ground Units a limited unit in the game, not quite like ships or colonies (see View From a Height, 1 Construction, p. 660, *supra*), but not always and only an enhancement to a ship or colony, as are Fighters.

    - ✓ *Minor Races:* The armaments of Ground Units from Minor Races probably makes them inferior. I once played in a Traveller RPG game where a Tech Level 8 world (1980s technology) was invaded by a Megacorporation (Megacorporations have private armies and navies in Traveller) using Tech Level 12-14 armies and warbots. Most people with even a passing knowledge of history can picture Era differentials in land warfare, because we are land dwellers. But I would not bet too heavily against 300 Spartans vs. 300 18th Century European line infantry (30% hits at 100 yards, 3 volleys per minute); the muskets will do their damage during the charge, but the guys with bayonets will be in big trouble when the Spartans close for *mano-a-mano*.

➢ Sepoys in Space: Since Ground Units may be created from Naturalized Colonies, Native Population Type will be a factor.[3] Ground Units garrisoning colonies that are not of their Native Population Type are possible trouble.[4] The Native Population Type of a Ground Unit is also a factor in the Habitability Class of the planet on which they land (*ut infra*).

➢ Lift & Separate: Ground Units stored in Orbital Cities may not participate in Ground Combat or any other surface activity without being landed. They may be loaded and transported on special transport ships, whose capacity is measured in population of Ground Units that can be transported.[5] Thus, it is possible through technology to increase the RP cost/value of Ground Units per half-population factor. Ground Units may be split between ships for transportation purposes. Ground Units may be left behind while others are lifted or evacuated. A position may build Ground Units for security without the ability to transport or land them.

➢ Troop Transport Technologies: Troop Transport ships do not have an Existential Patent, the technology will need to be invented and will probably be a modification of the Colony Transport Existential Patent (if landing troop transports) or the 1st Era Carrier Existential Patent (if using expendable drop ships). Lifting Ground Units should be similar to transferring Fighters between colonies and ships and not like Loading Population to Colony Ships. A large part of what is called *military efficiency* is the ability to move large numbers of persons and specialized equipment quickly and *in an orderly manner over distances* and *keep them in fighting condition*.[6] Moving military units is not like transporting civilian population; military units are specialized and not self-supporting. And going is not voluntary.

Every rule concerning Ground Units may be altered or enhanced by an appropriate Patent or Doctrine;[7] Colleges may be established for Ground Combat, Enlightenment may be used in Ground Combat. It is possible to build heavy ground units, fortifications (installations), specialized ground units, and ground units consisting of only droids/warbots.

➢ Pac Mecha Fever: GGDM does not comment on or make any assumptions as to whether ground combat units are or are not "mecha" units in the classic science-fiction/anime sense. However, for the purposes of ground combat rules, there would be two general types, which could be classified as ground unit mecha, and space-ground unit mecha (the latter being introduced in Macross as "variable fighters"). The former type, ground unit mecha, would consist of mecha units landed, probably via drop ship or drop pods, from orbit and which have only ground and/or possibly ground-air combat capabilities. The latter type would include mecha which are space capable fighters that can land on the surface on their own power and act as ground or ground-air combat units. Only the latter would require any distinction in the game, being treated as Fighter IPs while in space combat (possibly inferior to 'pure' Fighter Complements) that can be landed and converted to ground units for Ground Combat purposes.

Participants should consider the additional logistical support burden or requirements of Mecha units if they are developed in-game.

   ✓ "As military units and their equipment have grown more complex, the resulting logistical requirements have grown as well. Not only does new equipment require new supplies and new spare parts to keep it operating, but also new specialists to run it, maintain it, and to fix it when it inevitably breaks down." – Col. Trevor N. Dupuy, Curt Johnson, David L. Bongard, and Arnold C. Dupuy, How to Defeat Saddam Hussein (1991), Appendix F, p. 192.

✓ "Advances in aviation and satellite technology replaced conventional forces and equipment, thereby diminishing the country's ability to have any number of 'boots on the ground' to make a difference in enforcement actions and occupational abilities. Those boots needed to be paid, too. Machines didn't. But what wasn't factored into that equation was the huge sums of money needed to *develop* the technology in the first place by a monopolistic and overpriced tech community, keep it maintained, up-dated, and eventually, replaced. Buy it, use it, scrap it. In the long run, that mindset was ultimately more expensive than keeping the human element – *keeping* being the key word there – especially when it came to loyalty. If you don't believe in the systems you swear allegiance to, then operating their instruments of destruction becomes a moral conundrum." – J.A. Willoughby, "The Promised Land," This Side of Center (2014), p. 157.

By developing Mecha units (or actually anything) in game, participants are also saying that they didn't exist before the game and are thus distinguishable from regular Ground Units.

➢ Beans, Bullets & Bandages: Troop Transports, loaded or not, will have the same OFL and OSL as any other starship of its position. Ground Units not located at a sovereign native colony require *two Supplies* per Regular Turn to avoid Supply Rolls, whether on a ship or the ground. This is a baseline rule, regardless of unit size, environment and combat activities, but can be adjusted, modified, based on judgment and abilities.

✓ "Logistics is the ball and chain of armoured warfare." – Heinz Guderian.

▪ The Battle of Brody, in June 1941, pitted about 3,500 Soviet tanks against 750 German tanks. The battle was a demonstration of all elements, the Soviets had poor logistics, poor mechanical training, poor command & control, and the Lufwaffe savaged the Soviets in all areas, adding to their difficulty. Soviet tanks ran out of fuel, ammo, or had minor mechanical problems and were abandoned, 31 heavy KV Soviet tanks of the 41st division drove into a swamp and were abandoned. Their formations quickly became non-operational and the Soviet command was indecisive.

✓ "The full logistical effect of modern weapons made it impossible for an army to carry with it all the munitions it would need for a campaign; it was essential that it be re-supplied continually. When the burden of fuel, lubricants, and spare parts for motor vehicles are added to the increasing quantities of munitions consumed in modern combat, one begins to form an idea of the dimensions of supply required by a modern field army." – Col. Trevor N. Dupuy, Curt Johnson, David L. Bongard, and Arnold C. Dupuy, How to Defeat Saddam Hussein (1991), Appendix F, pp. 190-191.

▪ And don't forget to bring the Bavarian cream donuts!

Ground Units located at a non-Friendly or Naturalized sovereign colony of their native population type (where they have hot chocolate and fresh donuts) require *one* Supply per Regular Turn to avoid Supply Rolls (see The Cold Equations, 3 Movement, p. 864, *supra*). Ground Units on an empty planet may attack any **alien colony** that is Landed there by a Combat Activation. Ground Units *probably* should never be able to be converted into a colony.

✓ On this latter point however, consider the Roman Danube River colonies of Vindobona (modern Venice) and Carnuntum. They began as legionary camps, which

were then fortified and given permanence (Carnuntum was on the Amber Road running from the Baltic Sea to the Roman Empire). Both of these places did become colony cities and Carnuntum became the capital city of Pannonia Superior, a Roman Emperor lived there for three years, and a historic political conference was held there in 308 A.D. But these all occurred after regular Roman population migrated to the camps (initially, wives, camp followers, attendants and families), including some wealthy individuals, traders, retirees or exiles from Rome, mixed with the local Celtic-Germanic population and retired Roman soldiers living on land grants. The '*probably*' means that the Concierge must exercise judgment on the issue, based on history, milieu and species' involved.

For *game convenience*, Colony Ships' (whether loaded or not) OFL/ OSL is the same as for other ships and the same should be true of Troop Transports whether loaded or not. Log Ships, however, cannot carry enough to Supply Colony Ships (see Empty Cans, 3 Movement, p. 861, *supra*), but can supply Ground Units on the surface or in ships (*ut infra*) **because it is necessary for the game**.

The *per-day* consumption of a modern combat division that is doing nothing is staggering, and there are many military studies and articles available on the internet, for example, Peter Hoy, "The World's Biggest Fuel Consumer," Forbes, June 5, 2008. The issue comes to the fore most often in terms of the cost of keeping U.S. combat units in Iraq and Afghanistan.

- ✓ "Even in reserve and out of combat, an armored division consumed 136 tons and an infantry division consumed 111 tons each day. Consumption rates have risen still higher since then, as those 1953-era units were equipped mostly like their World War II predecessors." – Col. Trevor N. Dupuy, Curt Johnson, David L. Bongard, and Arnold C. Dupuy, <u>How to Defeat Saddam Hussein</u> (1991), Appendix F, p. 192.

  - ▪ ☑ Pogey bait, check. ☑ Doritos, check. ☑ Mt. Dew, check. ☑ Gaming supplies, check. ☒ Girlfriend? ... she left an hour ago.

- ➤ <u>Landing Craft</u>: Landing craft (aka Drop Ships, Flying Saucers, TARDIS) are not existential technologies; positions must develop their own Landing Craft technologies. Landing craft technologies may be different for each Habitability Class. They may also become quite advanced and elaborate; the bottom line measurement of Landing Craft will always be how many RPs of Ground Units can they land? Possibly, Landing Craft, like Colony Ships, will be consumed in the landings.[8] But then how do you evacuate?

  - ✓ One of the best landing combats I have seen on sci-fi television was the Wraith attack on Atlantis (Stargate Atlantis, "The Siege" (2005)) where the Wraith fighters swooped in, but instead of bombing, they beamed groups of Wraith warriors onto or into the target (*à la* Star Trek). The Planetfall Defense Bots used in the Andromeda episode, "The Prince" (2002), were also very sophisticated and interesting units, commanded by the ship's AI avatar.

- ➤ <u>Resist et Mords</u>: Colonies that have Ground Units *might* not surrender after losing a Colony Combat (however, see occupation, *ut infra*). Colony surrender, which is a dramatic issue, is discussed in the next section, 5 Combat. Conquered or Converted Colonies will not automatically revert when no enemy warships are present, if they are occupied by sufficient Ground Units. The Concierge will determine whether or not a colony reverts in these situations,

which implies a revolt and that the extant occupying Ground Units were either destroyed, or marginalized to areas where they cannot control the colony.[9]

- ✓ "No matter our fighting, The numbers will still count, We're outgunned and few in numbers, We're doomed to flag of fail. We were told to hold the border, And that is what we did, Honored were our orders, In despite of our foe." – Sabaton, "Resist and Bite," their 2014 song about an isolated company of the *Chasseurs Ardennais* of the Belgian Army in 1940.

The Chasseurs Ardennais motto is *Resist et Mords*, resist and bite, which appears on their wild boar-head unit logo. Had the Germans won WWII in complete world-conquest fashion, the stand of the Chasseurs Ardennais would not be celebrated in song; it would be necessary for the Reich and its descendants to paint their foes as weak, ineffective, corrupt and the German total victory as brave but inevitable and all things justified.

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*"And the Anzio Bridgehead was held for the price
Of a few hundred ordinary lives."*

– Pink Floyd, "When the Tigers Broke Free" (1982)

Ground Combat: Ground Combat is fought between sovereign standing armies on the surface of a planet. Ground Combat may be initiated by any activation of the Combat Power that initiates combat, as appropriate to the circumstances and if the attacker has Ground Units at the location. During a Colony Combat, the attacker may initiate Ground Combat on the second Combat Round or later as a follow-on Combat requiring no Power Activation to land troops, 1) if the attacker has Ground Units present on ships and 2) they join the Colony Combat on the *previous* Combat Round (planetary approach time).[10] If the ships carrying the Ground Units join the Colony Combat, they may be targeted by the colony defenders (the defenders have many critical tactical decisions to make at this point) and may be Combat Screened while in space.

➢ Chain Guns: It is possible to initiate Ground Combat at the end of a Combat Movement if, upon arrival in the destination system the attackers have Ground Troops on ships, there is an enemy colony, and there are no other warships or colony defenses to impede the landing of Ground Units. Just like any Earth alien invasion movie.

- ✓ It is possible to chain three combats together in a follow through, ships victorious in a Ship Combat may immediately follow through with an attack on a colony (see Panic Bells, It's Red Alert, 2 Combat, p. 960, *supra*, no additional Combat Power Activation necessary), and on the second Combat Round, the attacker may land Ground Units to initiate a follow-through Ground Combat (if they joined in the first round).

- ✓ There are tremendous opportunities for operational luck and timing in these follow up combats, as Combat Rounds run independently of Regular Turns.

➢ Fire at Will:[11] Ground Units may only initiate combat against other Ground Units, Ground Bases or undefended colonies and may fire Close-in Defense against Fighters that attack them during Ground Combat. Ground Units are not (normally) able to attack orbiting warships and Orbital Defense Bases even if they fire at the Ground Units (via Orbital Bombardment). But such an ability could be developed via new technologies... Fighters that are present on a colony with no friendly Ground Units or Ground Bases will be eliminated at the

end of the first Combat Round if enemy Ground Units initiate Ground Combat against the colony, unless they can retreat somewhere else.

➢ Underlined: Unenlightened Activity: During a Ground Combat, the status of the Epistemological Con-structural Element of the defending colony is used to determine whether or not the colony's Defense Bases, Ground Units and Fighter Complement can benefit from the application of Enlightenment (see Skool Tyme, 2 Constructural Elements, p. 190, *supra*) or NSF acting as Faculties (see The First is Last, 3 Colleges, p. 493, *supra*) during the combat. If the Colony Combat lasts to the next Regular Turn, the owner of the Colony may attempt to reactivate an inactive Epistemological Constructural Element at the colony by Cohering (see 5 Culture, p. 421, *supra*).

   ✓ The attacker's Ground Units will use the Constructural Elements status of either their Transport Ship (as of the beginning of the combat) or the colony on the same planet from which they launched their attack, for the purposes of Enlightenment.

➢ Dropping In: Attacking Ground Units landing to initiate Ground Combat may not fire at the Defenders during the first Combat Round – the landing is their only action for that Round. Enemy Ground Units landing on a Colony may be attacked once during the landing round by any Ground Bases (as if acting as Ground Units, *ut infra*) or Fighters based on the Colony. Landing Ground Units *may not fire* Close-in Defense at defending Fighters during landing, but any escorting fighters from ships in orbit may engage the Colony's Fighters in a Dogfight Combat. The only way to prevent an enemy Ground Unit from landing is to destroy it; all surviving Ground Units (or parts of) will land on the colony planet. Warships may not Com-bat Screen Ground Units during landing operations; only Fighters can escort them to the sur-face. See 3 Carriers & Fighters, p. 1067, *infra*, regarding Combat Screening.

   ✓ "Fighting soldiers from the sky, Fearless men who jump and die, Men who mean just what they say, The brave men of the Green Beret... Back at home a young wife waits, Her Green Beret has met his fate, He has died for those oppressed. Leaving her his last request, Put silver wings on my son's chest..." – SSgt. Barry Sadler, "Ballad of the Green Berets" (1966).

   ✓ In 1945, 2,500 Army paratroopers of the 503rd dropped on tiny Corregidor Island from 500 feet without reserve parachutes – they wouldn't have time to use them if the main chute failed. Dazed, surprised defenders killed some dropping troopers.

These rules also apply to all subsequent landings. The combination of population, and at-tacking and defending Ground Units may temporarily exceed the Maximum Habitability of the colony planet until one side prevails – not to mention the damage they will do to the planet during the combat which may reduce Habitability Class.

   ✓ If the landing is being conducted against a Minor Race, the Concierge will need to de-cide whether the Minor Race has any ability to resist the landing on the first Combat Round. For example, the natives of the moon Pandora (movie Avatar) or planet Na-boo (Star Wars) were unable to resist the initial landings, but fought later. In May 1513 A.D., the Calusa tribe in Florida met Ponce de León's ships in costal sea canoes full of warriors armed with long bows, and drove them off. It is clear from several accounts of expeditions that the natives of Florida already knew about the Spanish and were hostile. The Spanish had depopulated several Bahama Islands with slaving

raids and Ponce de León was not the first Spaniard in Florida; others had come raiding for slaves to sell in Spanish territories.

✓ Having the ability to 'drop' units on a hostile enemy colony planet via control of orbital space following Colony Combat – does not automatically allow the attacker to learn the size of the Ground Unit on the colony. There is, therefore, always a risk involved in invading an **alien colony**. Surveillance and Information Operations (Special Operations spying) may be used to learn generally the size of the opposing Ground Unit; Probing actions probably will not be effective for this task. See Taking It All Down and Information Operations, 2 Information, pp. 1343, 1349, *infra*.

✓ Though the Ground Combat landing rules are phrased in terms of a single attacker landing, Ground Combats on surfaces can be fluid and protracted situations where both sides land forces. A historical example is the Battle of Guadalcanal, from August 1942 to January 1943, where both Allied and Japanese forces landed on the island many times, while the sea and air battles raged over and around the islands, with neither side able to establish permanent control of the approaches. Guadalcanal was the most evenly matched and fought Air-Land-Sea (ALS) campaign between the war machines in the Pacific during WWII, the result of which (in combination with the Japanese carrier losses at Midway) gave the Allies the permanent strategic initiative. The Japanese were able to evacuate their troops by forming a naval corridor.

▪ *Thoughts of an intergalactic mercenary after a hot combat landing*: "Clean job my ass. A sixty-two percent loss is thirty-seven, hell-trained men. Men who will never get to spend the money they died for. Thirty-seven men and not one a friend. You don't make friends in this business 'cause it is too painful to see a friend's burnt guts sprayed across the dirt by a rygon beam." – B.K. Taylor (story) and James Fox (art), "Retrospect," Epic Illustrated, Vol. 1, No. 4, Winter 1980.

➤ Soft Landing: Ground Units unloaded on their owner's colony do not automatically initiate, and may not, during transfer, initiate combat against other positions' Ground Units on a Balkanized Planet. It is possible to unload Ground Units on your own colony, then later initiate Ground Combat against another colony. However, if the owner of the Ground Units is currently involved in a Colony Combat against any other colony on the planet, the transports must join the Colony Combat even to land troops on their own colony – as it is most certain that the defenders will see the approach of troop transports as an intent to land Ground Units on their colony. However, as no Ground Combat is being initiated by the landing, the defenders cannot fire at the Ground Units during landing on their own colony.

➤ Razor Rain: Generally speaking, the Orbital Bombardment discussed In This Dust That Was a City, 2 Combat, p. 961, *supra*, is a mostly indiscriminate bombardment of urban areas, installations and government facilities with the intent of maximum destruction of population and causing the collapse of civilization, with little regard to damage to the planet. It can be described as being like a full thermonuclear war in 1983, either with nukes, beam weapons, or rocks thrown down from orbit.[12]

As such, it is not suited generally to strategic or tactical support of Ground Units engaged in combats. If the intent was to Orbital Bombard the planet in this way, why were Ground Units inserted on the surface?[13] However:

✓ Should the situation arise where an Orbital Bombardment of a planet is ordered where there are Ground Units, either friendly or enemy, all units will suffer damage proportional to the loss of population. It is of course, possible to just Orbital Bombard a colony that has defending Ground Units without initiating a Ground Combat or before initiating a Ground Combat (see Something Here from..., 2 Combat, p. 960, *supra*).

✓ It is possible for positions to develop technologies (Patents) and doctrines that will allow for 'close' Orbital Bombardment by orbiting warships and Orbital Defense Bases that tactically and strategically supports Ground Units in combat on the surface, which may or may not mean orbital launched MIRVs with tactical nukes (perhaps similar to 155mm nuclear artillery shells[14]) or conventional explosives, or damage to the planet.

➢ <u>Ground Combat Resolution</u>: Drumroll please? Each Combat Round, each Ground Unit on both sides must be designated to either attack or defend. This is independent of their side's overall status as the strategic attacker or defender in the Ground Combat.

✓ Ground Units initiating Ground Combat by landing on the planet may fire in the second Combat Round. Attackers already based on the planet may fire in the first round.

✓ Ground Units either attack or defend in a Combat Round as their action.

✓ Attacking Ground Units must be given a single enemy Ground Unit as the target; Ground Units designated to defend in the Combat Round do not have targets assigned and do not attack. A side may designate all of its Ground Units to defend in a round.

✓ Ground Units may be Combat Screened by other Ground Units, Combat Screened Units and those providing the Combat Screen may not be designated to attack in the Combat Round. Ground Units may not be Combat Screened by Fighters against other Ground Units, but can be Combat Screened against enemy Fighters.

✓ Ground Units may be attacked by more than one enemy Ground Unit each round.

✓ Each attack is resolved *individually*, one attacker vs. one target unit. One ten sided die is rolled for each 10 RPs of the attacking Ground Unit's size and the results are added. If the die roll result or total falls within the *absolute value* range of the attacker's total RPs minus the defender's RP size, the attack has been successful.

▪ For example, a 10 RP Ground Unit attacks a 3 RP Ground Unit (the target), the difference is 7, any result less than or equal to 7 on a ten sided die will mean the attack was a success. One die is rolled, the attack roll result was 5.[15]

• Flip the script. The 3 RP unit attacks the 10 RP unit. Because absolute value is used here, 3 minus 10 is negative 7, but the die roll result for a successful attack is still less than or equal to 7.

✓ A successful attack is not like a hit in Ship or Colony Combat; the defending unit is not instantly destroyed. Instead, Ground Units are reduced by RPs damage. For each RP lost, the *one half population factor* is also lost (*ut supra*).

✓ If the attack was a success, take the result of the attack roll and subtract the target unit's size in RPs from the die roll, and if positive the difference is the damage in RPs

that is inflicted on the target. If the result is a negative number, that damage is done to the attacker instead *if the target unit was designated to defend in that turn.*

- Continuing the example above, the target unit's size of 3 RPs is subtracted from the die roll result of 5, a difference of 2; the target unit takes 2 RPs damage and survived the round with 1 RP left.

- If the attack roll had been a 1, the result would still have been a successful attack (result ≥ 7), however, if the target unit (above) had been designated to defend in the Combat Round, the attacking unit would have taken 2 RPs damage instead (1 – 3 = -2), despite the successful attack roll.

  - Flip the script, Part 2. If the 3 RP unit attacks a 10 RP unit, there is no successful attack die roll that will inflict damage on the larger defender because the defending unit is larger than 7 RPs. That is unfortunate, but historically, forces that were outnumbered more than 3 to 1 were usually defending, with very rare and historically notable exceptions. If the 10 RP unit had been designated to defend, the attacking 3 RP unit could be wiped out. It is obviously best in this case for the 3 RP unit to defend and hope the 10 RP unit attacks and has bad luck.

✓ A Ground Unit designated to defend in a round may do damage to multiple enemy Ground Units if attacked multiple times and has good luck.

✓ Ground Units which lose their last RP are eliminated. Ground Units at a friendly colony could be reinforced during Regular Turns by adding RPs and population from the colony. Ground Units that have landed on an enemy planet can generally only be reinforced by landing more units but not added to until they reach a friendly colony.

✓ A Ground Combat will end if all of the attacking Ground Units are either eliminated or retreat from the planet (they must be lifted, if they can't they are stuck, do or die).

- At the end of a Ground Combat won by the defender, the defending colony has a chance of some active Constructural Elements becoming inactive (as in panic in the streets). See The B-Team, 3 Disruption, p. 281, *supra*.

✓ A Ground Combat will also end if the colony is 100% occupied by the attackers and all Ground Bases are destroyed (*ut infra*); think of Germany in May 1945. The defenders can never retreat from a Ground Combat, so the only way to win is 100% victory, but defending Ground Units may remain for a short time.

➢ Vac-Suits: Ground Units may not initiate combat on a planet that is Unpleasant, Hostile, or Uninhabitable to their Native Population Type unless they have Controlled Environment Technology. Ground Units designated to attack on a planet that is Unpleasant to their Native Population Type add 2 to their attack die roll result and 4 if the planet is Hostile or Uninhabitable to their Native Population Type.[16] If the planet is Unpleasant to the target unit, subtract 2 from the attack die roll result, and if it is Hostile or Uninhabitable to the target unit's Native Population Type, subtract 4 from the attack die roll result. Adjustments can cancel out.

✓ Imagine two human armies fighting on Venus, or Mars, or the Moon? Artifact (1980) was a Metagaming 'microgame' about lunar surface combat between U.S. and Soviet forces (and later alien forces) over an extraterrestrial artifact discovered on the Moon. It featured scientists and astronauts/cosmonauts in hard vacuum suits and moon buggies armed with mortars and rockets (there was a similar scene in the movie Ad Astra (2019)). I had a copy when I was young and spent many hours playing it. It seemed like the alien artifact was bait and we were invited for dinner by the aliens. Maybe it was just a cosmic fishing expedition and they reeled us in?

✓ The most famous and protracted hostile environment battle in modern history is the Chinese attempt to surround and eliminate the 1st U.S. Marine division and army detachments strung out along the road to the Chosin Reservoir, North Korea, in 1950. In the extreme bitter cold and restrictive terrain, the Marines, with clear air superiority, struggled to extract themselves to the coast for naval evacuation.

At no time prior to 20th Century technological warfare would such a battle have been fought (there is a doubtful or greatly exaggerated claim of a Battle of the Ice between Teutonic Knights and the army of Novgorod in 1242 A.D.). In the end, two Chinese divisions together could muster only 200 men, and one of the final dawn assaults to clear the road was met with eerie silence; the Marines trudged up the hill to find that a platoon-sized contingent of Chinese defenders (remnants of a battalion or regiment) had all frozen to death in their foxholes during the night.

✓ Later, in 1984, the Indian Army fought the Pakistan Army over the Siachen Glacier, at altitudes of between 19,000 and 12,000 ft., the world's highest battlefield. Occupation by Indian Army posts is quickly degrading the glacier environmentally with heat, pollution and chemicals.

➢ Collateral Damage: Additionally, the colony's population and the planet's Maximum Habitability are both damaged by one population factor for each result of 7 or higher rolled by either side during a Ground Combat. Loss of population in this way may trigger Disruption effects (see Rousing the Rabble, 2 Disruption, pp. 271-272, *supra*).

✓ Consider what happened to the cities of Hue, Hamburg and Mosul. During the Tet Offensive, 80% of the City of Hue was destroyed by U.S. air and artillery strikes as we sought to push the NVA out of the city. We destroyed the city to liberate the city. The City of Hamburg was 90% destroyed by allied air raids during the entire course of WWII; the post-war aerial photos show that the entire center city area was leveled. The 2017 liberation of Mosul from IS forces is similar to Hue (noting that IS destroyed the Grand Mosque themselves); modern panoramic pictures speak volumes of the devastation of roads, buildings, and infrastructure. Mosul was 'liberated.'

✓ The early darling of military science-fiction writers were ion, plasma and fusion weapons. Traveller RPG in the 1970s and 1980s had Plasma Gun, Man Portable (PGMP) and Fusion Gun, Man Portable (FGMP) as the main infantry armaments. The main sidearm in Babylon 5 was the Phased Plasma Gun (PPG) or "plasma pistol/rifle" and the show had a neat visual special effect when they were fired. Plasma, with the spread of flat screen 'plasma television,' has lost some of its exotic charm, but undoubtedly, early science-fiction writers were thinking of hot plasma states, such as hydrogen plasma in the sun – fusion and plasma guns imply a controlled form of

the hydrogen fusion bomb – or maybe they envisioned lightening plasma. Lightning plasma can approach 20,000 °C or 50,000 °F and of course, plasma for solar or nuclear reactions is very much hotter.[17]

If GGDM Ground Combat is envisioned as being fought by legions of battle armored infantry firing hot plasma, fusion or other hot death-ray type weapons, backed by hover tanks and air power and tactical nukes, what is the effect on areas where they fight?

➢ Air Attacks in Ground Combat: Fighter Complements from orbiting warships and fighters from the defending colony may attack opposing Ground Units; this combat action is resolved as if they were attacking other fighters ('dogfighting') so that the damage result is expressed in RPs of damage to the Ground Unit.[18] Fighter Complements from the defending colony may also attack enemy ships in orbit and those ships may be Combat Screened by other ships and complements. See Combat Screening, 3 Carriers & Fighters, p. 1067 *et seq.*, *infra*.

✓ Fighter Complements of either side may Combat Screen Ground Units against other fighters only. All interception attempts by Complements attacking or screening Ground Units are automatically successful and result in a Dogfight. Complements that breakthrough the Dogfight may then attack opposing Ground Units with whatever they have left using Raid Combat procedure.

✓ Ground Units may not Combat Screen other Ground Units against Fighters.

✓ Ground Units attacked by Fighters while on a planet may fire Close-in Defense.

✓ Fighter Complements on the surface of the planet may not be attacked 'on the ground' (i.e. at their airbase) by Ground Units unless there are no friendly Ground Units or Ground Bases remaining. If a Fighter Complement is attacked by a Ground Unit it is eliminated (e.g., 11 MiGs were destroyed on the ground in Entebbe Raid).

✓ It is assumed in GGDM that ship-based Fighters attacking a colony are being launched from safe orbital distances; *however*, should a circumstance occur where it is deemed that a ship has launched Fighters from a low point over the colony (*a la* the Adama Maneuver[19]), any remaining Ground Bases (even if involved in a Ground Combat) may fire – in Ground Combat – at the ships launching the Fighters, attacking as Ground Bases. Effectively, by lowering themselves close to the surface to launch Fighters, the ships have temporarily become part of the Ground Combat.

"You may have turned your planets into fortresses, but this won't help if they are infected by nanobots that eat defenses from the inside out, or if your opponent is impolite enough to drop an asteroid on your favorite colony."

– from Armada 2526 game official webpage

Fortress North America: When Ground Combat is initiated, any Ground Bases of the defending colony become Ground Units in the defense, and may not attack further in any Colony Combat, but still may be targeted as Ground Bases from orbit and are destroyed if hit.

Ground Bases can still fire Close-in-Defense at attacking Fighters when acting as Ground Units, and attack with a +2 modifier to the die roll (not good at attacking) in Ground Combat. Ground Bases acting as Ground Units take damage as any normal Ground Unit, except that there is no

loss of population with loss of RPs. Ground Bases are eliminated when they have lost their last RP. Twilight's Last Gleaming: "This is Lawrence Dell, and we have taken control of Silo 3."

- ✓ Ground Combat can be initiated between colonies on the same planet or during the second round of any Colony Combat (*ut supra*), so there could be many Ground Bases involved.

- ✓ Fortress North America was a concept for the final defense of the U.S. and Canada during WWII and the Cold War if the rest of the world was lost to fascist or communist forces. It couples with the North American nuclear umbrella to protect against ICBMs and bomber penetration. If you thought the title referred to the 1986 classic board game, Fortress America, yeah, I've played that game a few times over the years, but have never played its predecessor, Invasion America (1976).

➢ Verdun: First Era Ground Defense Bases become 10 RP Ground Units during Ground Combat, while 2nd Era Ground Bases become 17 RP Ground Units, and 3rd Era Ground Bases become 30 RP Ground Units. Ground Bases damaged as Ground Units, do not revert to being Ground Bases after Ground Combat until all RP damage is repaired (via activation of the Construction Power for the purpose of Colony Enhancement).[20] Repairing RPs on damaged Ground Bases does not require expenditure of population factors.

- ✓ [Interview] "In this sense, Verdun was one of the great, terrible, appalling battles of The First World War, just as Stalingrad became one of the terrible, great battles of the Second World War. In fact, the two have been compared as examples of terrible sacrificial battles which went on and on, which were a new hallmark in terms of the awfulness of war." – Malcolm Brown (author of <u>Verdun 1916</u> (1999), 50+ pages available free on Google Books), Under Siege television series (documentary, 2008), Ep. 4.

- ✓ [Interview in French with English Subtitles] "Verdun was the first great industrial battle. It was there that for the first time in the history of humanity, man has numerous types of weapons at his disposal, weapons of mass destruction. Artillery, of course, but also poison gas and flamethrowers. Verdun was also the great aviation battle, it was here in the skies of Verdun that for the first time, the importance of a fighter force was realized and demonstrated." – Antoine Rodriguez, Cultural & Communications Director, Mémorial de Verdun, Under Siege television series (documentary, 2008), Episode 4.

"At this date it remained a tactical mystery of World War II that no army had yet made any extensive use of poison gas. Never in history has a proved weapon been discarded for ethical reasons, and it may be concluded that all armies dreaded a return to the immobility of 1917."

– Lynn Montross, <u>War Through the Ages</u> (3rd Ed., 1960), pp. 875-876

NBC – Nuclear, Biological and Chemical Warfare: Any country that can make beer can make chemical weapons.

- ✓ "...fertilizer and beer brewing equipment can be converted to make chemical weapons..." – Zak Karamally, <u>Export Savvy: From Basics to Strategy</u> (1998), p. 88.[21]

Ground Combat is the most likely opportunity in GGDM for the use of tactical nuclear weapons, biological weapons and chemical weapons. It is, of course, possible to use these weapons strategically during Orbital Bombardment and Raid Combat, but that's a different issue.

- ✓ In L. Ron Hubbard's novel Battlefield Earth (1982), the alien attacker simply teleported in a large airborne drone that began circling the Earth emitting a poison gas that wiped out humanity (I have never seen the 2000 movie which received awful reviews). The desperate late 20th Century defenders hit the drone with a nuclear missile over Europe but did not stop it; when the drone was found centuries later, it had a dent and a scratch from the nuclear detonation. There was little resistance when the alien infantry arrived, the aliens just moved in and took over the planet. The last organized body of humanity retreated to Scotland and laid a line of nuclear land mines across the neck, but they were irrelevant.[22]

GGDM makes no assumption as to whether or not Ground Combatants are using tactical nuclear, biological or chemical weapons. If in 1960 and later, the U.S. had 155mm nuclear artillery shells and the 122mm recoilless Davy Crockett nuclear warhead, it may be assumed that the infantry in GGDM might have shoulder-held nuclear missile launchers (as in the 1976 Avalon Hill Starship Troopers board game). By 1976, we had 'dial-a-yield' nuclear warheads (e.g., the W-80).

Their use may be assumed to occur on a local scale during Ground Combats, or their use can be an issue for separate play and News Events, depending on the sensitivities of the participants.[23] However, the Collateral Damage rule (p. 995, *ut supra*) suggests that some really nasty weapons are being used in Ground Combats; the threshold damage die roll can be adjusted up or down depending on arms conventions and how the participants envision air-ground warfare in the game.[24] See also, EN 15, p. 1003, *ut supra*, regarding issues with troops wearing chemical protective gear (MOPP suits).

- ✓ It is probably possible for a side to determine/declare that they are not using weapons in a Ground Combat that will damage the planet. This the defenders might do if they are concerned about the long term damage to their colony world. Presumably however, the side that restricts their use of weapons is at a grave disadvantage against a side that ruthlessly uses every weapon they have available. The Concierge may impose combat penalties on the side trying to avoid Verdun- or Hiroshima-like results. A side may also develop weapons that are less damaging through technology and doctrine that are just as effective as less environment-friendly weapons.[25]

➢ Battle of the Somme: During the weeklong preparatory bombardment before the Battle of the Somme in 1916, the allied artillery fired chlorine gas shells to force the German infantry to abandon their trenches and deep bunkers. For the record, the bombardment and the chlorine gas were largely ineffective, the British took horrendous casualties crossing no-man's land on the first day. The use of chemical weapons makes sense in the context of WWI stagnate trench warfare, but was rarely effective over the long term and was not the solution to the WWI military problem. WWI however created a particular public and military sensitivity to chemical weapons warfare; chemical weapons have killed far less people than bombs, bullets and missiles, but there is something particularly offensive about their use: one suggestion is that it is because they poison the air and ground and soldiers have no chance against them (as opposed to bombs, bullets, and missiles, sort of a leftover Chivalric code).

✓ It is important to understand that modern casualty figures, especially those during and after WWI arise not only from technological weapons' destructive capabilities, but also from universal conscription and the ability (and national will) of modern industrialized nations to concentrate large masses of humanity and equipment in combat theatres and sustain them for long periods of time. This creates a completely different operational zeitgeist than previous ages; additionally WWII was waged exceptionally as total war (e.g., the Potsdam Declaration). Dispersion is the answer to destructive area weapons, concentration is necessary for effective attack against a line or point.

✓ See the poem, "Dulce et Decorum Est," by British soldier and poet, Wilfred Owen, written in 1917-1918, and published posthumously in 1920. He was killed on the Western Front on November 4, 1918, one week before the Armistice. The poem is widely available online.

➤ Bug Spray: Science-fiction stories, except for post-Apocalyptic, rarely mention chemical weapons. In the 1989 board game Red Storm Rising, the East German troops will leave the game if the Soviets initiate chemical warfare, a situation that probably indicates that the Soviet offensive has stalled and the front has become stagnate (which makes East Germans cannon fodder). Chemical weapons are less effective in mobile warfare, except as persistent area denial weapons. The 1976 Avalon Hill board game Starship Troopers (not to be confused with the 1997 and later games that were published to merchandise the movie) in my youth *featured shoulder-fired nuclear missiles,*[26] *psychic talents, and a chemical weapon –* Heavy Nerve Gas – which was dropped into Arachnid tunnels through bore holes from the surface. Neither the later 1997 movie nor the CGI animated series (Roughnecks: Starship Troopers Chronicles, 1999)[27] was like the Avalon Hill board game due to production costs.

✓ The issue of psychics being used as weapons, is at the core of the later Babylon 5 television series (1994-1998).

✓ The first recorded instance of biological warfare occurred at the Siege of Caffa in 1346 A.D. when besiegers catapulted bodies of those who had died of the plague over the walls into the city. What happened following this local incident is what terrifies us now; Genovese ships fleeing Caffa brought the plague back to Europe, which became the Black Death (see Mark Wheelis, "Biological Warfare at the 1346 Siege of Caffa," Emerging Infectious Diseases Journal (of the CDC), Vol. 8, No. 9, September 2002). Just as any country that can make beer can make chemical weapons, any combatant that has a diseased dead body can locally attempt biological warfare; truces are often arranged in long intense battles so that the sides can remove the bodies (e.g., Gallipoli, Monte Cassino). What makes Caffa the first recorded instance of biological warfare is the intent, the clear intent, and the implication of some rudimentary understanding of the spread of disease.

▪ Historians may quibble over whether Caffa was the first such intentional attempt at biological warfare; there may be other recorded instances from times ancient of which I am not aware. The reason, of course, that we have focused on Caffa is because of its link to the Second Pandemic.

▪ The 1918 Spanish Flu Pandemic may have been caused/enhanced by WWI; this is relevant to GGDM as a potential aftermath of Ground Combat.

Fat Man from Beneath the Planet of the Apes (1970):

"You don't understand, Mr. Brent. The Bomb is a holy weapon for peace."

Occupation: Ground Units occupying and/or defending a colony 100% occupy and control the colony for military purposes. On the Regular Turn in which Ground Combat is initiated, the invading or attacking Ground Units gain 15% control of the colony by virtue of being there. At the end of each Combat Round, control of the colony may change:

- ✓ If the attackers did more damage than the defenders in the round, the attackers gain control percentage equal to the total RPs of their Ground Units divided by the *total RPs* of all Ground Units involved in the Ground Combat.

- ✓ If the defenders did more damage in the Combat Round, they gain control percentage equal to the total RPs of their Ground Units divided by the total RPs of all Ground Units involved in the Ground Combat.

    - ▪ For example, in a combat where the invaders have 30 RPs of Ground Units and the defenders have 8 RPs of Ground Units at the end of the Combat Round. If the attackers did more damage during the round, they gain 79% control of the colony. If the defenders did more damage in the Combat Round, they gain 21% control of the colony.

The attackers can never have less than zero percent control. If the attackers ever gain 100% control of a colony **and** eliminate all Ground Bases, they have captured the colony (see Surrender discussion, 5 Combat generally, *infra*). This does not mean the Ground Combat has ended, however.

- ✓ Ground Units are there to defend their colony and all of its outlying resources, territory, and infrastructure, not to defend their planet. Colony and planet may or may not be congruent. They aren't Flash Gordon!

- ➢ Rebel Lines: Whenever either side has lost control of the colony (have 0% control), the Ground Units may continue fighting as long as they can remain supplied. Thus, the Ground Combat can continue until the units run out of supply and fail Supply Rolls.

    - ✓ In the early part of the Siege of Budapest, Hungarian defending units obtained intelligence by telephoning houses of residents who were behind the Soviet front lines. Imagine your phone ringing with enemy troops outside? This clever idea worked until January 1945 when the telephone network had been destroyed by fighting.

- ➢ Fait Accompli: If Ground Combat is initiated against a colony that has no Ground Units or Ground Bases, the colony is 100% occupied at the end of the first Combat Round, even if it has a Fighter Complement. The Fighter Complement may do their damage for one Round.

- ➢ Combat Construction: When a colony is being defended in a Ground Combat, the owner receives the proportional benefit of whatever part of the colony they control during any Power Activation. For example, if the defenders retain 43% control of the colony, then during Taxation, the colony will produce 43% of what it would normally have produced, during Construction activation (probably to reinforce defending Ground Units), the colony has 43% of its GDP available, and during Census, population growth is 43% of what would be normal.

"After almost a month of intense fighting, local units of Strephon's Imperium surrendered to Lucan's forces here on Phaln. There was little joy among Lucan's command staff, who have lost over 350,000 men in the fighting. Although the Strephonists fared little better, their stiff resistance has blunted the two-pronged Gushemege campaign, which Lucan's general staff has dubbed the 'Extermination Offensive' (referring to its intended objective of eliminating Strephon's Imperium).... There are also unconfirmed rumors of disproportionate losses in TankRon assets. These various factors suggest that the recent decline in the pace of the Extermination Offensive may in fact portend a complete standstill. If this were to be the case, it is unknown how long Lucan's forces could remain on site, given their already overextended logistical situation."

– Traveller News Service (Traveller RPG), Imperium Date 352-1121

Endnotes.

[1] Commentary: Discussing the Battle of Seneffe (1674), where both sides suffered 17% casualties in 10 hours of fighting using muskets, cannon, bayonets and sabers in close formations (Hint: Unless your name is Hannibal, trying to envelop an enemy army that is 50% larger than yours is a risky proposition). In recent years, many films have been produced that accurately portray 17th and 18th Century European warfare, including early 17th Century pike and arquebus formations. One of the earliest accurate depictions of linear advance at 80 steps per minute is seen in Stanley Kubrick's classic movie, Barry Lydon (1975), in the battle at the crossroads orchard. Except there would have been a big thick cloud of smoke over the French line after the first volley, and that's not good for filming.

[2] Commentary & Citation: In human terms, during the mid-18th Century, Great Britain had 1 soldier for every 310 citizens, whereas Prussia had 1 soldier for every 28 citizens (3.5% of the population). Hesse-Kessel became the leading prosperous mercenary state of Germany (source of the famous Hessians), with 5.2 to 6.7% of its population in the army, 1 in every 4 households had someone in the army. Citizens, of course, includes everyone, whereas only males of military age – a much smaller population pool – were allowed (or compelled, tricked by crimps) to serve. Such was the ultra-masculine militarism of Prussia that it was commonly said that Prussia was not a state with an army, but rather an army with a state. It is thus that the Concierge may judge large standing forces of ground units to be a sign of a militaristic society.

- ✓ According to globalfirepower.com, in 2018, the United States has a population of 326M, of which 145M is "manpower available," while 120M are "fit for service," and 4.2M are reaching military age in 2018. Continuing, the United States has just over 2M military personnel, of which 1.2M are on active duty in 2018. The current US military ratio is then about 1 soldier (including reservists) for every 157 citizens, and 1 soldier per 57 "fit for service," which unlike in the 18th century, includes the entire military age population of both sexes. The number reaching military age in 2018 is twice the entire size of the military. Captured April 11, 2018 from https://www.globalfirepower.com/country-military-strength-detail.asp?country_id=united-states-of-america.

[3] Commentary: This is how the Roman military grew, they eventually needed non-Roman and even non-Italian units. At first, those units were auxiliaries, but gained equal status. This is how every Empire in history has grown.

[4] Commentary: The Soviets always exploited ethnic hostilities by stationing units in other ethnic regions on the theory that they depend on the Soviet national government and will not become too friendly with the local population.

[5] Commentary & Citation: In Alfred Coppel's unusual 1950 short story "The Rebel of Valkyr" (see top feature quote, 1 Stardrive, p. 779, *supra*), feudal knights with horses were loaded into the holds of ancient starships for transport. The starships landed outside the city walls at the destination and it took hours to unload the feudal army.

[6] Citation: "In spite of suffering from a fever, Pope Pius II left Rome for Ancona in the hope of increasing the morale of the crusading army. However, the crusading army melted away at Ancona for want of transport, and when at last the Venetian fleet arrived, the dying Pope could only view it from a window." – from Wikipedia article, "Pope Pius II," captured July 4, 2020.

[7] Commentary: My senior drill instructor at Parris Island said, "If you get killed by an obsolete weapon system, guess what? You are still dead. And I have to write a letter to your mother. And I hate writing letters!"

[8] Commentary: If the Allied Forces had not landed at Normandy in June 1944, the Soviets may have liberated Paris. It would have taken longer for the war to end, but there is no reason to think that the Germans could have won against the Soviet Red Armies in 1944 while keeping sufficient units in France to guard against invasion, while being bombed day and night from the air, and while propping up the Italian front. It is possible that in 1945, the Allied Forces may have been required to invade Calais or some area where they could race against the Soviets for Paris and to create an allied enclave in Northern France and Belgium. And there is no reason to think that the Soviets would have stopped at the German-French border. History in the balance. Conversely, had the Russians not smashed the German Army Group South in the Korsun Pocket in early 1944 – which was only possible after stalemating the Germans at Kursk in mid-1943, if neither of those events happened, the Allied Forces may have liberated Berlin and headed for Krakow and perhaps reached Warsaw or Prague. The Allied Forces would not have stopped at the German-Polish-Czechoslovakian border.

✓ The Battle of Kursk, routinely called the largest tank battle in history (may not have been, see Battle of Brody, 1941) featured the first time that an entire armor formation was destroyed by airpower alone.

[9] Commentary: The classic historical holdout in siege warfare is the citadel. Often times, after the capture of a city or castle, the last remaining defenders held out in the citadel, while the attackers had effective control of the city and surrounding countryside. These situations could go on for a while, with the attackers being forced to keep troops around the citadel and to watch for approaches of relief forces or escape attempts, while the shut in defenders' food and supplies dwindled along with hopes of escape, break out or rescue.

[10] Commentary: The infantry combat scenes in the original Star Wars movies were awful. Clearly Lucas and his team had no actual understanding of weapons or combat. The combats, especially the corridor fights, were unimaginative, competent Rebel defenders would have held out longer and inflicted greater losses on the attackers (Storm Troopers can't hit anything!). But Lucas did understand what was important to make a convincing movie scene, flashing lights, people getting hit, fatal bravery, giving the impression of a fierce fight and moving the story along.

[11] Commentary: You know the joke.

[12] Commentary & Citation: The few times that the Star Trek OS USS Enterprise fired at a planet surface (e.g., "The Alternative Factor" (1967)) were unimpressive, although it is implied strongly (probably bluffing) in "Taste of Armageddon" (1967) that the Enterprise could destroy an advanced planetary civilization from a distance.

[13] Commentary & Citation: This issue was discussed in Robert Heinlein's 1959 novel, Starship Troopers: If the Terrans have the planet-destroying Nova Bomb, why does the infantry have to land and fight the Arachnids on the surface? The basic conclusion of the long argument was: "There can be circumstances when it's just as foolish to hit an enemy with an H-Bomb as it would be to spank a baby with an axe." – Robert Heinlein, Starship Troopers. The Nova Bomb – the proxy for the collective power of the world's nuclear arsenal in Cold War science-fiction – was probably invented in Starship Troopers and was used in later science-fiction, e.g., Andromeda television series.

[14] Commentary & Citation: The smallest 'nuclear' weapon ever developed was the Davy Crockett nuclear warhead which was designed to be fired from a 122mm recoilless anti-tank gun. It was available in the late 1950s, with a yield of just 10 or 20 tons of TNT (.02 Kt.) and was intended to be used in defending Korea and the Fulda Gap in Germany. There is a government video on YouTube with Pres. Kennedy watching from about 1960 demonstrating the M-29 150mm 1 Kt. version in a tactical situation, the explosion barely looks like a nuke (cf. the 15 Kt. yield bomb at Hiroshima). See "M388 Davy Crockett Operational Test," posted by jaglavaksoldier, February 22, 2010.

✓ This weapon is also sometimes called the M65 recoilless nuclear rifle. So, nukes can be really small. Since at least 1960, a tactical nuke could be carried in a suitcase (i.e. 'suitcase nukes') or in special backpacks. Most have a yield of 1 Kt. (kiloton) or less. In the rise of terrorism in the 1970s someone realized what a terrorist could do with a suitcase nuke; once again, the arms race produced a genie (the Special Atomic Demolition Munition, SADM) that could not be put back into the bottle. We've been lucky so far.

✓ The W48 155mm Nuclear Artillery Shell was available after 1963, and had a yield of .072 Kt. There was also a shell for the 203mm (the Marines had M110 Self Propelled 203mm howitzers) called the W33. The W48 was replaced by the W82 with a yield of up to 2 Kt. According to UPI, by 1981, scientist had developed a neutron warhead for the 155mm howitzer, see Richard C. Gross, "Scientists have developed a neutron warhead for the 155mm..." UPI Archives, December 11, 1981 (available free online).

✓ The W23 was a nuclear shell designed to be fired from the 16" naval gun of the Iowa-class battleships that were still in service in the early 1950s. It had a yield of 15-20 Kt. making each the equivalent of the bomb

dropped on Hiroshima, with a range of 23 miles. The implications of this were horrific for coastal cities. The big battleships were retired in the early 1960s, but brought out again briefly in the early 1980s.

- ✓ Small linear implosion weapons of this sort require twice or three times as much material, making them very costly. Still, in terms of resources available in GGDM and technology we know already exists, it is not inconceivable that small nukes could be the normal munition in planet surface battles; consider Steve Jackson's Ogre game (which has also spawned fan fiction, e.g., Joshua Megerman, "The Rise and Fall of Pittsburgh," February 23, 2019, found on Steve Jackson Games website) where Davy Crockett-like *nuclear rounds* are the standard munition of the game.

- ✓ The Davy Crockett was mentioned in Billy Joel's "We Didn't Start the Fire" (1989). Everything mentioned in the song happened between 1949 and 1989 so Davy Crockett would seem to be out of place, unless you know the reference. Some think the reference is to a 1955 Disney TV series, but the nuclear reference makes much more sense and was public knowledge in 1989. My impression of the song in 1989 was quite different than others who focused on trying to figure out all the dizzying references; my interpretation of the meaning of the song rested on the chorus lines: Americans were fed up with being blamed for what was wrong with the world, being abused for trying to help. Also, History Channel has an episode on it.

[15] Commentary: Historically, unit sizes and composition are cultural and historical artifacts; in WWI, a U.S. Division was equal to a European Corps in size and equipment. Since WWII, most Western national armies' divisional sizes, compositions and equipment have standardized (under NATO especially), but the Korean War showed that this was far from global, as Chinese unit sizes and compositions were significantly different than the West.

[16] Commentary: In training a couple of times, we had to shoot our M-16 combat rifles while wearing gas masks. You can't hit anything with a gas mask on. I do not believe we ever fired howitzers with gas masks on; the risk would be too great because of the way the optical sights work. In the summer of 1986/1988, in Okinawa, Japan, we had to evacuate our howitzers after firing while wearing MOPP 4 gear – the full chemical attack suit from head to toe, gas mask, overalls, boots and gloves – in 90 plus degree heat. Afterward, we pulled out onto the road, went a short distance, then sat there on our trucks for over an hour until the all clear. I have never been so hot in my life. These personal experiences always come to mind (not to mention all the trips to the gas chamber) whenever I read about offensive chemical attacks, or certain post-apocalyptic settings, or combat operations in hostile environments.

[17] Commentary: A recent conversation with a Traveller RPG aficionado at the monthly game club confirmed as I believed all along that Plasma Guns in Traveller were hot plasma and not lightening plasma. He further pointed out that in holding and firing this weapon unprotected, the heat would probably kill you (or at least you'd be severely burned); thus Imperium troops wore battle armor to protect themselves from their own weapon. This is the best case to be made for collateral environmental damage, with tens of thousands of such heat discharges in a battle.

[18] Citation: **Capt. Harris:** Be advised. We've got zips in the wire down here. **Phantom Pilot:** Roger your last, Bravo Six. Can't run it any closer. We're hot to trot and packing snake and nape, but we're bingo on fuel. **Capt. Harris:** For the record, it's my call. Dump everything you've got left on my pos. I say again, expend all remaining in my perimeter. It's a lovely fucking war. Bravo Six out. **Phantom Pilot:** Roger your last, Bravo Six. We copy. It's your call. Get them all in their holes down there. Hang tough, Bravo Six. We're coming cocked for treetops. – Platoon (1986).

[19] Citation & Commentary: Battlestar Galactica television series, "Exodus, Part 2" (2006). Note that the Galactica took considerable damage in the maneuver (going to FTL in a planet atmosphere, think about that!)

[20] Citation: "I got no delusions about you or your men's democracy Jones. We are gonna refortify this shit hole and protect it like it was your daughter's cherry. I ain't gonna die here." – Sgt. Maj. Hafner, Siege of Firebase Gloria (1989).

[21] Citation: "BTW [biological and toxin weapons] agents would be relatively easy and inexpensive to produce for any nation that has a modestly sophisticated pharmaceutical or fermentation industry. Indeed, mass production methods for growing pure cultures are widely used in commercial production of yogurt, yeast, beer, antibiotics and vaccines. Nearly all of the equipment needed for production of pathogens and toxins, is dual use and widely available on the international market.... In contrast to chemical warfare (CW) agents, no specialized starting materials are required for production of biological and toxin agents except for a small seed stock of disease-producing organism. Nutrients such as fermentation medium, glucose, phosphates ... are widely available and routinely imported by developing countries..." – Technologies underlying weapons of mass destruction, p. 86, U.S. Congress, Office of Technology Assessment, December 1993 (DIANE Publishing).

✓ As noted in the Farhad Manjoo feature quote in 1 Patents, p. 727, *supra*, the Congressional Office of Technology Assessment was defunded (i.e. shut down) by the Gingrich Republicans in 1995. Congress has since then proceeded without an unbiased, organic technology assessment staff; technology assessment has shifted instead to the U.S. Government Accountability Office, which is also technically part of the legislative branch. This is the usual way it is done, a mistake is made, and rather than admitting to and reversing the mistake, the services are quietly transferred to and taken up by another initially less-qualified agency. Some information from Wikipedia article, "Office of Technology Assessment," December 28, 2018.

[22] Commentary: In the Babylon 5 movie, A Call to Arms (1999), the Drakh (former minions of the Shadows) sacrificed a planet killer and an entire fleet in an attack on Earth just to release a biological weapon to poison the Earth and kill humanity (they were really mad at us). This was the bridge-pilot movie for the short-lived spin-off TV series, Crusade (1999), which like the early 80s anime series, Star Blazers (1979-1984), was premised on finding a cure and returning it to the poisoned Earth before time ran out for humanity.

[23] Commentary & Citation: At the end of the Cold War, historical conferences were held to reexamine the Cuban Missile Crisis. The conferences revealed that local Soviet commanders had pre-delegated authority to use tactical nuclear weapons and that a Soviet submarine commander had been prevented from launching a nuclear armed torpedo at U.S. Navy ships that were shadowing the submarine. Some felt that the conference organizers overstated the revelations for publicity purposes, see Mark Kramer, "Tactical Nuclear Weapons, Soviet Command Authority, and the Cuban Missile Crisis: A Note," The International History Review, Vol. 15, No. 4 (Nov., 1993), pp. 740-751.

✓ Less widely publicized or noticed was the revelation that U.S. President Eisenhower had pre-delegated authority to certain commanders to use nuclear weapons in defined extreme situations (apparently, the conditions precedent of this pre-delegation were narrower than the Soviet pre-delegation) and that this policy continued long after Eisenhower left office. See, "First Documented Evidence that U.S. Presidents Predelegated Nuclear Weapons Release Authority to the Military," National Security Archive, https://nsarchive2.gwu.edu//news/19980319.htm, March 20, 1998.

✓ The conceptual importance of such pre-delegation to the military is the perceived erosion of the nuclear firebreak; *a local commander under pressure from the enemy will make decisions differently than top civilian authorities* and might unleash global thermonuclear holocaust (paraphrasing McGeorge Bundy).

[24] Commentary & Citation: But as stated in The Come As You Are Party, 1 Combat, p. 932, *supra*, if one side has a weapon, the other side must have an equal or better weapon, or they lose, unless no one is willing to use the weapons. There must be retaliation threat.

[25] Commentary: One day while training at Twenty-nine Palms, a Lt. told us to dig a hole to bury the trash. Three Marines with shovels took to the task, and within minutes, had a respectable hole dug. The Lt. came running back and told us to stop; he had been informed that we were not allowed to bury 🗑. He looked at us, looked at the hole we dug, then told us to go back to our gun positions and give him a shovel, he took care of filling in the hole.

[26] Commentary: In bootcamp, I heard a serious mention of man-portable nuclear missiles; I do not know if such a thing exists, but I would not be surprised if it did. In 1987, I was invited to attend nuclear artillery school. Yes, 155mm nuclear artillery shells are real. It was common lore among the artillery men in my unit that firing a nuclear artillery shell was a suicide mission. One gun, one powder, one shell. I declined. The reasons I gave at the time, though not stated in the correct terms, amounted to a type of firebreak argument-conscientious objection. I am sure this destroyed my chance of meritorious promotion as the one who did go was promoted to Corporal shortly after.

✓ The existence of these nuclear artillery shells is not secret; if I recall correctly, my copy of Sir John Hackett's The Third World War: August 1985 (1978), which I had and read somewhere around the mid-1980s, discussed nuclear artillery shells and provided a number of how many shells NATO forces had in Germany.

[27] Commentary: Both the 1997 Starship Troopers movie and the 1999 CGI animated series, Roughnecks: Starship Troopers Chronicles, were produced and directed by Paul Verhoeven, but have *opposite* tones and outcomes. In the movie, the Bugs home planet is destroyed with a Nova Bomb (background to a romantic kissing scene), while in the animated series, the Terran government is an oppressive military dictatorship, and the Bugs take over and infest Hawaii, genetically adapting humans to their purposes, then attack the West Coast, implying the fall of humanity.