

ZED ALERT

ZOMBIE APOCALYPSE RTS

ZED ALERT GAME DESIGN DOCUMENT

Written and Developed by Steven Eiselen | Version 2.0 (12/14/21)

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Zed Alert / Survival Horror RTS

What is Zed Alert?

Blurb Description

Zed Alert is a single-player, 'Zombie Apocalypse' themed Survival Horror Real Time Strategy game focused on managing finite resources (e.g. supplies, fuel, and especially living humans to produce units from) among a finite yet finitely growable group of survivors throughout various aspects of continuing to survive the zombie horde...and maybe even eliminate it! The gameplay is thus focused on tasks/responsibilities such as:

- ★ **Commanding a finite group of survivors:** *while using them to find any if not all others in the area who can be recruited into the faction (i.e. added under player control); while*
- ★ **Strategically assigning each survivor's role:** *of which include soldier, worker, medic, technician, vehicle driver, aircraft pilot, and even remote/robotic vehicle operators); while*
- ★ **Gathering and maintaining finite resources:** *of which include fuel, scrap, supplies, and health/wellness of the survivors (who will start to die and zombify if the latter two gets too low!); while*
- ★ **Salvaging vehicles into custom useful types:** *via configuring civilian vehicles for purposes of either fighting (via a variety of weapons) or logistical support (via a variety of abilities); while*
- ★ **Building, fortifying, and defending a settlement:** *ranging from small tent camps in the wilderness to massive citadel bases composed of entire towns; then*
- ★ **Taking the fight to the enemy - undead and domestic!** *That is: mostly zombies (and/or their hordes); but also other survivors (and/or their factions) who, make no mistake, are as much alive as they are hostile!*

The main campaign of the 'completed version' encompasses a phased progression of mission types: such that the first few involve a small group scouting for better temporary shelter and basic needs (dealing with small packs of zombies); progressing to larger groups composed of humans recruited into the group securing larger, more permanent, and well-armed/fortified settlements (handling larger groups of zombies); and finally concluding with a campaign climax wherein a massive force of heavily-armed humans commence an all-out extermination of the undead (including massive zombie hordes thereof). Beyond the threat of the undead, there will also be hostile humans to contend with throughout the main campaign: ranging from competing groups of survivors to very powerful and dangerous military remnants.

The mini campaign for the 'Minimum Viable Product' version (henceforth 'MVP') encompasses the demo for Zed Alert encompasses a minimized 'sampling' of the full-scale version; which also demonstrates the ability for both the developer[s] and MOST IMPORTANTLY players of Zed Alert to create and share their own custom scenarios and otherwise experiences of survival in the Zombie Apocalypse (both as single standalone missions, mini-campaigns, and full-campaigns!)

Intro Narrative

It is several weeks since the corpse of 'patient zero' rose as the first of what are now billions of zombies (thus that many less living humans). How and why it happened isn't immediately important. How and why you're still alive: we leave to your imagination. What is known is that the initial effort to stop the zombie apocalypse failed, and did so rather miserably: reducing most of the world's military and police forces to either ravaged corpses eaten apart by zombies else zombies themselves; and mostly everyone else around the same time and in the weeks since. What were once population centers are now largely abandoned: save for the rare survivor[s] who still manage to dwell within; the countless zombies still lurking within its rooms, hallways, basements, alleys, and back streets; and the occasional swarm of zombies shambling along its main streets to points unknown.

What were recently evacuation centers and refugee camps now densely crawl with their former residents and the zombies who overwhelmed them (and likewise at the world's military bases, airports, and of course malls).

Most of the remaining human population are now within small groups of fellow survivors, sans the rare 'lone wolf' who choose to remain alone. The groups are typically composed of family members, individuals, remnant military/police forces, and/or a mix thereof. Alongside lone wolves, they range in disposition: friendly (i.e. open to trade, cooperation, and even merging with a group {such as yours!}), neutral (i.e. won't attack you if you don't attack them, but will become hostile if you trespass onto their territory and/or steal from them), and of course: hostile (i.e. will attack you and anyone else on sight with no questions asked, no 'hello' attempted, and no mercy shown). At this time, survivors like you and yours are mostly 'holed up' within their own shelters: be they apartments and shops in the cities/towns, houses and big box stores in the suburbs, farms and factories in the country, else cabins and bunkers in the wilderness. However, supplies in the less well-equipped hideouts are running low, while packs of zombies appear to be self-organizing into larger (ergo more uncontrollable and destructive) hordes: causing many of these groups to venture out into the dangerous unknown out of necessity to either resupply and/or seek better, more defensible shelter.

One of these small pockets of survivors happens to be yours, and you can select both the members thereof (in terms of basic attributes) and your starting supplies among several options in a style similar to 'Oregon Trail'; though all such configurations encompass a small group of several people commanding light supplies, at most decent firearms, and maybe a vehicle. So on the plus side: congratulations! You're not a shambling, rotting corpse...yet, nor are you a lone wolf (again, at least not yet). On the minus side: there are many more ways to wind up among the walking undead out there than to survive or even thrive despite the horde. But now is not a time to think pessimistic - and that latter goal of survival, especially sustained, is your primary objective at the moment. Thus your first objective is clear: leave your initial refuge into the surrounding area, carefully scout a better shelter [even if temporary], and secure it; possibly finding and adding survivors to your group along the way. Your second objective: find a more permanent settlement that can be well defended against both hordes of the undead and hostile humans alike; for which there is also a more sustainable amount of supplies to keep yourselves fed, armed, and healthy. The objectives will vary thereon, but you have a feeling that the main campaign will involve completely exterminating the zombie and hostile human threat throughout your entire region, and building the first city of living humans towards rebuilding civilization.

The world is at ZED ALERT! No standing armies to count on, limited supplies, even more limited reinforcements, and an army of countless tireless undead enemies alongside some ravenous human ones to deal with. Survival Horror Real-Time Strategy at the core. And although Sun Tzu didn't cover the undead in his classic text 'The Art Of War', maybe YOU can help fill in these lost pages, if not write a new 'Art of *Zombie War*' as its sequel?!?

Welcome to the Zombie Apocalypse.

What is Survival Horror RTS?

What is a 'Survival Horror' Game?

Survival Horror is a video game genre, as well as a similar and more recent movie genre. Wikipedia has a good definition of 'Survival Horror' video games [\[source\]](#), which we'll paraphrase several excerpts therefrom with respect to (hereafter WRT) the elements applicable to Zed Alert:

- *"Survival Horror is a subgenre of action-adventure / horror video games that focuses on survival of the character as the game tries to frighten players with either horror graphics and/or scary ambience. Although combat can be part of*

the gameplay, the player is made to feel less in control than in typical action games via limited weapons/ammunition, health, speed, vision, and/or through various obstructions of the player's interaction with the game mechanics"

- *"Survival horror refers to a subgenre of action-adventure games that include horror game elements. The player character is vulnerable and under-armed, which puts emphasis on puzzle-solving (in Zed Alert's case: strategic management of finite humans/resources) and evasion, rather than the player taking an offensive strategy. Such games commonly challenge the player to manage their inventory and ration scarce resources such as ammunition. Another major theme throughout the genre is isolation, as such games typically contain few non-player characters (hereafter NPCs, and in Zed Alert's case: recruitable in-map survivors and out-of-map reinforcements)"*

What is an 'RTS' Game?

Real-Time Strategy (hereafter 'RTS') is another video game genre for which Wikipedia again has a good definition thereof [\[source\]](#) which we'll paraphrase similar to 'Survival Horror' above:

- *RTS is a subgenre of strategy video games that do not progress incrementally in turns, but whose gameplay for all players (human and/or [AI] agent controlled) is in real time; while in contrast: turn-based strategy (TBS) games encompass discrete turns by which a player controls their units while the other players must wait for the turn. Or to put it in 'Classic AI' / Game Theory terms: the 'fluidity' of the game environment is dynamic, meaning it can [will] change while the player is deciding moves to make; whereas static fluidity is 'turn-based' as aforementioned.*
- *In a RTS game, each participant positions structures and maneuvers multiple units under their control with goals such as securing areas of the game map and/or destroying their opponents' assets. In a typical RTS game, it is possible to create additional units and structures, generally limited by a requirement to expend accumulated resources. These resources are in turn garnered by controlling special points on the map and/or possessing certain types of units and structures devoted to this purpose. More specifically, the typical game in the RTS genre features resource-gathering, base-building, in-game technological development, and indirect control of units.*
- *The tasks a player must perform to win an RTS game can be very demanding, and complex user interfaces have evolved for them. Some features have been borrowed from desktop environments; for example, the technique of "clicking and dragging" to create a box that selects all units under a given area.*

What is 'Survival Horror RTS'?

Survival Horror RTS (hereafter **SH/RTS**) blends key elements of both genres: to produce an experience encompassing the resource scarcity, inventory management, isolation, evasion/stealth tactics emphasis, and general horror elements of Survival Horror; with the resource harvesting, unit construction/upgrading, base-building, defense/offense tactics, and general 'commanding and conquering' (pun not intended) elements of Real-Time Strategy. There are several primary 'Elements of SH/RTS' which provide further detail to the description and definition of this [newly described?] genre, which are as follows...

The 6 Elements of SH/RTS

Version 1.0 (some old well-worded stuff cut, some new/revised stuff could be better-worded, though: KISS)

[1] Everything Needs A Person

Generally Speaking, for most vehicle units and structures in RTS games: once they are built, they are fully-functional; i.e. a battle tank will emerge from a war factory ready to engage in combat, and the war factory which made it could do so as soon as it was completed. It is thus left to the player to assume that the tank has a crew, and the factory has workers: but they're simply inside and cannot be seen nor individually interacted with (unless, as some games implement: one or two 'pops out' when the unit/structure is destroyed.

Instead: SH/RTS takes a more realistic approach. Generally speaking: every vehicle requires a driver, pilot, or operator to be activated (i.e. can at least move around the map), alongside additional crew where necessary to

operate other functions (i.e. gunners); while structures analogous to factories require one or more personnel to operate them (and can actually increase in efficiency the more there are).

[2] People Are Finite

Generally Speaking for most RTS games, those of similar genres, and analogous terms where appropriate: infantry units can be produced from a barracks, vehicles from a war factory, etc. for as long as the player/AI has enough resources to afford them, and as long as the game's per-player and/or grand-total limits on max numbers of units have not been exceeded. The latter mechanic is typically done to prevent CPU performance issues due to various calculations upon all units; and not to realize the fact that unless tunnels or teleporters are involved: troops cannot endlessly pour out of a tent barracks, nor battle tanks pour from a garage factory.

SH/RTS games do realize this, and again takes a more realistic approach. In Zed Alert's case: humans are needed to operate vehicles and structures (per the aforementioned), perform construction and repairs on each other and their vehicles/structures, and themselves serve the role of infantry/worker units. However: the only humans available to the player are those under their control at the start of a mission, and other survivors out in the mission's map of which can be 'recruited' into the player faction. That is: EVERYTHING in Zed Alert is limited to how many possible humans are in the world and under the player's control. Consequently, Zed Alert's loss condition is simple: zero humans remaining under the player's control means GAME OVER.

[3] Resources Are Finite

SH/RTS games especially realize resource finiteness. In Zed Alert, gaining new vehicles is not generally done by magically creating them in a factory (with two exceptions in the form of a specialized, small, unmanned air and ground vehicle); but instead by 'salvaging' abandoned civilian vehicles found in the map, much like how human units are found and recruited from the map. Furthermore: the additional tangible resources of {supplies, fuel, material scrap, electronics scrap} are themselves scarce and each serve different purposes; including WRT to the type[s] needed to build units and structures (see their relevant section for more info).

[4] Units Are Reconfigured

Another key element to SH-RTS are how units, especially vehicles, are 'created'; in that they're technically NOT. As aforementioned: neither infantry units nor vehicles are made from scratch nor appear magically; but are recruited xor salvaged from the world. Once converted into either 'soldier' or 'worker' base types either back on base or in a mobile outpost to do so: they can be 'reconfigured' with either a variety of weapons types (if 'soldier'), else a variety of specialization types (if 'worker').

[5] Remote/Robotic Units

One final key element of note is a caveat/offset to the 'human scarcity factor' of Zed Alert is in the option of drones (i.e. UAVs/UGVs) and fully-robotic units; which are intended to be available later in the full-game's campaign. The former allows humans to sit safely inside of a structure within the base when operating a remotely-controlled vehicle (e.g. of the types salvaged in the world and customized in an on-base garage as well as UAVs which can be 'built from scratch'); however if the human operator of a drone is killed at their post or vacates it: the drone becomes idle. The latter is the 'real deal'; as robotic units do NOT require a human operator. They are, however, quite expensive to construct (again: from existing vehicles); do require 'robotics technicians' to 'set up', repair, and 'keep an eye on' robots.

[6] Emphasis On Defenses

Generally Speaking for most RTS games: there is a more nebulous distinction between defensive assets and offensive ones. That is: the player typically has one giant cluster of units which are intended as their invasion force but which could be used defensively as well (i.e. if they're the first to be invaded!) Furthermore, due in large part to the ability to 'endlessly pump out units' as discussed within the prior SH/RTS elements: base defenses (including if not especially obstacles such as walls) play a reduced role, even one as low as being there mostly for 'cosmetic' purposes! This is because, again: the ability to produce, reproduce, and reproduce again a giant force of mobile units to serve both an offensive and defensive role effects an extremely better advantage of using them for as-needed defense over a dedicated, typically immobile system.

Instead, this advantage does not exist within SH/RTS games: due to the 'usual suspect' of scarce and finite 'person' units which are the only bodies available, thus the need to keep them alive and well however possible, while managing their roles as best as possible. Between this and the other Survival Horror elements within Zed Alert: there is a consequently a greater emphasis on utilizing base defenses than with other RTS games. Walls and other obstacles are much more needed to delay if not block zombies from entering the player's base; in complement with (i.e. alongside) defensive towers, bunkers, and rooftop terraces of which (if properly manned with trained human units) can stop, injure, and [ideally] destroy zombies.

Survivor [Groups] And Settlements

Introduction

The player's group a.k.a. faction is defined as all units and structures under player control. However, theirs is not the only group of human survivors out in the zombie apocalypse. Although Zed Alert is designed to be a single-player experience, other survivors and groups thereof exist: brought to life (i.e. realized) via [reasonably realistic enough] game-AI as (Non-Player Characters); for which a cohesive group of survivors include their own version of the player as their 'faction commander'. NPC survivors, groups thereof, and the settlements they exist within serve several important roles within Zed Alert: from being the means by which the player can add additional survivors via 'recruiting' NPC civilians and their more equipped custom variants, to providing useful assistance as allies via trading supplies and collaborating on strategies, to serving the role as human (i.e. non-zombie) adversaries and otherwise hostile units.

Survivor/Settlement Types

The following description is more-or-less supplemental detail which might be used to guide the campaign and other missions, but which won't be realized in the appearance of units outside of their configurations. That is: there will NOT be a way to distinguish between an armed civilian, militia, or soldier outside of context given to the player in-mission; and settlements may (i.e. will) be composed of multiple types of survivors. At least for the MVP and likely full-release's first game as to KISS. That Said, they are as follows...

Type	Description
Civilian	A TON said thereof throughout this document, so refer thereto! Civilian settlements with various survivor types is most common. Mercenary Campaign missions or otherwise can encompass rescue/diplomacy missions where civilians can be saved and/or recruited.
Gang	Both pre-apocalypse street gangs and present-day raiders. Include mainly infantry and simple vehicles. Armament/Armor is generally light. Are very mostly hostile though rarely neutral, and

(Raider)	highly mobile and nomadic in nature; ergo offense-oriented. However might have their own bases, too. Can be found in developed areas / along highways.
Police Remnant	Arms/Armor ranges to basically that of gangs to military-grade. Are a mixed bag of either 'good cops' who are typically found in civilian settlements, else 'bad cops' who are found among packs of roaming raiders. Can be found in developed areas / along highways.
Militia	Independent militias, formed before or in the first weeks of the apocalypse. Includes lone wolves and otherwise in small packs thereof. Armament is closer to gangs/police than military, though are generally better armed with occasional heavily armed/armored. Are very mostly neutral and occasionally outright hostile, thus very suspicious to outsiders and fiercely protective of territory; ergo defense-oriented. Can be found in rural areas.
Military Remnant	Rogue member(s) of the armed forces: either solo or as an entire force. As with Police Remnants: 'good' types are usually seen defending civilian settlements, while 'bad' types are effectively highly powerful raiders (and will encompass the primary human i.e. non-zombie 'adversaries' in the Zed Alert main campaign (and custom /indie missions). Feature the most powerful Arms/Armor; including military-grade vehicles and aircraft.

Disposition

Introduction

Disposition encompasses the behavioral nature of an individual, group, and/or settlement of survivors; especially towards the player (for the MVP and even full-release, likely exclusive thereto - as anything else is heading into [group] personality sim ergo more advanced AI — KISS!) There are three types: {**Friendly**, **Neutral**, and **Hostile**} discussed below in further detail; including the 'benefits' that they either absolutely will offer, can be made/forced to provide, else absolutely refuse to offer (i.e. by way of opening fire). On that note: disposition with a survivor/group/settlement is dynamic, i.e. could change WRT actions/events caused by the player, greater world, and as scripted within a campaign mission / custom scenario. For example: firing on a friendly settlement might turn them hostile, while the same upon a neutral settlement might actually cause them to submit to annexation if the damage is great enough.

Disposition Descriptions

Friendly	Open to trade, cooperation, and even merging with a group (i.e. recruitment into player faction). Effectively considered to be player faction in every sense except not under player command.
Neutral	Won't attack unless either attacked, territory trespassed, or assets stolen. Very independent and indifferent to player faction (i.e. assist/collaborate RARELY, and NEVER accept recruitment [unless forced]).
Hostile	Will attack player faction and anyone else (living and undead) on sight with no questions asked, no 'hello' attempted, and no mercy shown. Might act like they're neutral and later ambush/attack.

Disposition Benefits

	Friendly	Neutral	Hostile
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Can be recruited into player faction	YES	CONDITIONAL	NO
Will offer repair and medical services	YES	CONDITIONAL	NO
Will let player 'raid' supplies, fuel, etc.	YES	NO	NO

Where '**CONDITIONAL**' implies WRT players' dialogue with / actions towards survivor[s] or settlement, other events happening in the world (i.e. zombie horde arrives and once neutral settlements are now very happy to be annexed if defended or evacuated), and via script within a custom designed mission.

Recruitment and Annexation

Introduction

As mentioned throughout this document: the primary means of getting new human units in Zed Alert is to 'recruit' them i.e. add them into the player's faction. As noted in the 'Disposition Benefits' chart above, Friendly and Neutral survivors, entire groups thereof, and even entire settlements thereof can be recruited under player control. There are various ways of doing this, mostly common whether to a lone wolf, nomadic group, or well established settlement; of which are described immediately below.

Out-Of-Scope Feature Note: Implement 'personality simulation' feature vis-a-vis dynamic disposition based on player's interactions with non-owned faction... but KISS - you're NOT doing this for the MVP!

Means Of Recruitment

WRT gameplay, the means of recruitment will be implemented via a dialogue mechanic and its corresponding UI/UX, as triggered through proximity-based encounter with an NPC representing / speaking-for themselves, their group, or their settlement. While the aforementioned is still TBD, the means to attempt recruiting them into the player faction can include the following, as either dialogue options and/or non-dialogue events/actions:

Task-Based	i.e. "fix our water pump", "defend us from horde", "provide us with security", "give us food (or some other resource type)" and we're yours!
Intimidation-Based	dialogue options like "either join our faction or we'll kill you and leave your bodies for the zeds to munch on!"; alongside actions to verify the threat e.g. attack a settlement
Mission-Based	i.e. one or more of the above else otherwise pre-scripted; whereby such is applied to i.e. implemented/realized as some 'campaign mission objective'
Non-Recruitable	Mostly applies to hostile and/or neutral survivors/settlements; else if true for friendly ones: likely is by-design via having recruitment prevented in custom mission script

Annexation

Annexation needs only one sentence, at least ATM. It's the same thing as recruitment, except for settlements. That is: recruiting one or more survivors brings them under player control, while annexing a settlement brings it and every single survivor, vehicle, and structure associated with it under player control.

Resources (What/Why/How)

Introduction

There are two kinds of resources in Zed Alert: **Tangible and Intangible**. Tangible resource types encompass those of which are found and extracted from the world (i.e. current map/scenario being played) for the purpose of building [up] and maintaining a force of survivors and the camp/settlement they reside in. There are seven tangible resource types: [Recrutable] **Survivors**, [Abandoned] **Vehicles**, **Supplies**, **Fuel**, **Materials Scrap**, **Electronics Scrap**, and **Storage Space**. The first two have their own [exhaustively] detailed sections within this design document: "Body Units" and "Vehicle Units", respectively; thus refer thereto for the details thereof. Intangible resource types encompass those of which cannot be directly seen, but are both affected by tangible types and [significantly] affect them. There is one such type: **Health and Wellness**. All eight aforementioned types (i.e. sans those with their own sections) are described via the following charts...

Resource Type Charts

— SUPPLIES —	
What It Represents	Food, medicine, soap, and other kinds of human needs/comforts. Reduces over time proportional to population size, ergo sufficient stock is necessary to recruit additional units into faction.
Where/How Utilized	'Health and Wellness' intangible resource type. I have two ideas for how it decrements: over time WRT population xor as recruits and vehicles come under player faction control.
Effects of Shortfall	Bad Stuff happens. Namely, when supplies approach and hit zero: units will start to die and may reanimate as zombies! See the 'Health and Wellness' intangible resource type for more info
Where To Extract It	Shelves within stores, offices, homes, and warehouses.

— FUEL —	
What It Represents	Fuel used for vehicles , structures, and weapons which require it for either power (i.e. shock trap, particle beam gun, IFV motors) or destruction (i.e. flamethrower, incendiary ordinance).
Where/How Utilized	See the aforementioned as that's a double-dip answer for here; and I might also have fuel slowly deduct over time WRT some TBD computation for how much electricity a base/settlement is using.
Effects of Shortfall	No configuration can be equipped for which fuel is part of the total cost, civilian vehicles cannot be upgraded to base IFV/LSV types, global unit health, armor, damage, and other updates R&D for which fuel is part of the cost can occur.
Where To Extract It	Gas/Fuel Pipeline openings as found at gas stations, along sub[urban] roads, in buildings; as well as large fixed propane and other gas tanks (i.e. hi Hank Hill)and loose fuel barrels.

— SCRAP MATERIALS —

What It Represents	Metal, Wood, Plastic, 'parts' or 'junk' thereof, and mostly any other kind of non-electronics stuff used to make things from.
Where/How Utilized	[Re]Configuring and Upgrading structures, body units, and vehicle units; and decrements whenever such are repaired.
Effects of Shortfall	no barricades, structures or vehicles can be built or maintained.
Where To Extract It	Rubble, basically. Typically within and adjacent to [ruined] buildings; and I <i>might</i> implement 'making it yourself' via units destroying stuff in the world

— SCRAP ELECTRONICS —

What It Represents	Circuits, computers and parts thereof, as well as acting as a 'catch-all' for any other high-tech, spiffy widget/material.
Where/How Utilized	Advanced structures, units, aircraft, and most noticeably: configuring and building UAVs, UGVs, robots, and automated base defenses / structures.
Effects of Shortfall	No UXVs, robots, and automated base defenses can be built or repaired
Where To Extract It	As of now: alongside scrap materials, s.t. part of a worker's 'bale' of stuff found will be electronics (e.g. 20% WLOG)

— STORAGE SPACE —

What It Represents	Conversion of existing player controlled buildings and/or construction of shacks to store (and workers deposit) supplies and other tangible resources with. Basically: what Supply Depots were to StarCraft-1 Terran Faction, and the [dreaded] silos were to C&C RA-1.
Where/How Utilized	Constrains limit of total population vis-a-vis supplies needing someplace to be stored. Also acts like C&C Refineries in that shacks/warehouses are where workers [finally] deposit supplies and other resources for actual addition to player inventory.
Effects of Shortfall	Player can't recruit any more humans; and I might also have both scrap types require storage in-tandem with supplies; such that player cannot build stockpile of other supply types.
Where To Extract It	The player can convert buildings in base to become supply houses increasing the supply cap. Note: On the plus side, and unlike RA-1's dreaded ore silo... there will be a very generous (i.e. unrealistic) capacity for each storage place secured and/or constructed.

— HEALTH AND WELLNESS —

What It Represents	Overall physical and mental health of player faction' units, including and WRT their immune system resistance against becoming zombified.
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Where/How Utilized	Affects damage, defense and health of player units as small-but-substantial factor thereof; as well as chance of human survivors turning into zombies.
Effects of Shortfall	Health, armor, speed, and DAM reduce via subtracted factor of the base (e.g. 25% WLOG). When it hits zero: random units will start to die and reanimate as zombies.
Where To Extract It	Keep Supplies coming in and at a level proportional to the current population; especially when multiple or many new recruits are brought into the faction. There should be more than enough supplies in a map/mission to avoid shortfall, WRT all but the most extreme missions and/or scarce [custom] maps.

Finite Unit Ammo and Fuel

Introduction

The following describes the gameplay/mechanism whereby units have finite ammo and vehicles finite fuel. This will NOT be implemented in either the MVP nor 'Full Version': as it would be too much a pain in the ass and/or Survival Horror 'overkill' for the player by providing another logistical challenge for them to worry about; especially as managing finite humans to perform all the roles needed to build and maintain a settlement is MORE THAN ENOUGH; especially for the MVP. Plus it's more implementation for me (and or future co-devs) ergo more stuff that can have bugs, and more per-frame computations atop what i fear will already be a lot.

Also: Don't misconstrue this for the 'reloading delay' of weapons (i.e. ROF between shots and bursts thereof) which models the time needed to reload a finite [and thus frequently empty] clip/magazine. Such will absolutely still be implemented within Zed Alert! The only difference is that there will be 'infinite clips//magazines in a magic box' for such units to draw from.

Overview

What: Ammo for all infantry and vehicle units is finite, such that they need to restock either by returning to base or visiting nearby mobile supply vehicle (and either of those can run out, too!). Fuel is also finite for vehicles, and they'll stop in place when depleted thereof.

How: Weapons shoot finite but can reload on the spot. So for shotgun soldier shotgun level 2, you see 10 small squares that go to 0, then one by one appears. If soldier is not shooting, weapon reloads, even if in motion. hitting 'r' for reload automatically has all forces not fully loaded to reload weapons.

Will it ever be implemented? If anything, for a full-release: we could implement something like an 'Extreme' xor 'Realism' Difficulty mode wherein ammo and fuel are finite and need to be restocked.

To Clarify - What will be implemented? Fuel and ammo will be unlimited, plus the aforementioned ROF delays. My justification for the 'suspension of disbelief' thereto is that endless fuel/ammo will instead be 'paid for up-front' via the supply, scrap, and/or fuel costs to build/train them. Besides: they've got other worries i.e. keeping themselves alive with undead all around them, sometimes hordes thereof!

Campaigns and Missions

Introduction

This section discusses the various mission types planned and envisioned for the 'Full Version' campaign, the scaled-down MVP campaign, and many other [mini-]campaigns and/or single missions as produced by both the developer[s] and player community (as expansions, spin-offs, or whatever else their creativity yields!) Consequently, this section also discusses the kinds of maps i.e. 'worlds' that can be encountered/experienced within these campaigns and/or missions.

What In The World?!?

A Map in Zed Alert may feature one or more of the following environments, though likely no more than two or three which are close enough for transitional geography between them. They are listed in order of 'difficulty' WRT to conditions expressed in their descriptions, as follows:

Type	Environment Description	Zombie and Combat Description
Wilderness	Forest or desert environments with no signs of [former] civilization sans occasional service station, ranger station, cabin/shack, and/or campground. Ideal for small survivor camps.	Very sparse zombies (sans passing horde), thus combat is mostly ideal for long-distance engagement sans occasional CQC (i.e. when investigating a cabin in the woods).
Rural	'The Country'. Farms/Ranches and their structures, plus small towns whose main streets contain various shops and sheriff's office. Ideal for survivor camps/outposts.	Sparse zombies (sans passing horde and small groups on the main street). Combat is similar to wilderness plus low/mid-distance engagements, but still easily manageable.
Suburban	Rows of houses partitioned by commercial corridors, parks, commercial strips as well as 'blobs', schools, etc. Ideal place for small[er] survivor settlements.	Passing hordes most likely. Remnant zombie groups exist outside throughout (ergo low/mid distance street fights), met by more zombies 'hidden' within their homes (ergo CQC).
Industrial	Factories, fuel depots, warehouses; and other industrial, utility, and infrastructure kinds of places. Ideal place for supply harvesting outposts; yet less-so for survivor settlements.	Mostly sparse with least chance of passing swarms; but just as high a risk of 'hidden' zombies (and packs thereof), thus a greater CQC emphasis as 'Facility' environments.
Urban	Grid-Like blocks of buildings s.t. generally shops exist at ground level and residential and/or offices in the upper floor[s]. Ideal place for larger/largest settlement types.	2nd highest risk of passing hordes to suburbs (though encompass the largest in number!) Similar street-by-street battle as suburbs, only with more CQC and less mid-distance.
Facility	This encompasses everything from Military Bases to Airports, and is generally a catch-all for places not aforementioned. Also ideal place for larger/largest settlement types.	Military Bases and Airports can be expected to either crawl with mobs of zombies; else be a CQC challenge via the ones still remaining. Tread carefully therein, else avoid entirely!

Individual Missions

Introduction

This subsection discusses individual mission types i.e. 'styles' which might be found as either standalone else within a greater campaign of multiple missions 'connected' to one another. Consequently: the 'Main Campaign' subsections (both 'Full-Release' and MVP) will reference these styles, as they are composed thereof (this is also why I swapped the original order of this section to discuss individual mission styles first, then campaigns!)

Common Mission Styles

Commando Group: Player starts with a few units and scarce resources, objective is to either escape area, go through an area, bunker down or achieve several objectives, etc. Reminiscent of classic C&C missions with only the Commando/Tanya unit (and sometimes a few infantry units along the way).

Base Builder: 'Sim City' for Zombie Apocalypse – Objective is to secure a certain area (factory district, military base, island) and then build either a large settlement and/or resource base upon it.

Evacuation/Restoration: Civilian-Oriented mission where the first half involves rescuing and evacuating some minimum-or-better number of civilians from one part of the map to another (e.g. island, town, prison, etc.); while setting up the destination to be a much better defended and sustainable settlement than their former.

Sterilization/Containment: Shoot Em Up! – Go into an area and kill anything undead or shooting at you; and contain horde of zombies into a dead end area and send in the artillery or bombers. Action, Action, Action!

Human Adversary: 'Classic RTS' – Someone on the map is building a base and/or attacking you. Eliminate that someone before they eliminate you!

Operation Overlord: Large scale invasion mission against a heavily guarded hostile human stronghold else massively infested/overrun area (e.g. island, military base, city district, etc.)

Saboteur Management: A saboteur is compromising your base! Perhaps by detonating the settlement's walls part-by-part, attracting zombies from a nearby facility or suburban/city blocks, or otherwise. Stop them ASAP!

Horde-At-The-End: Typically mixed among aforementioned types as a 'final test' of successful completion (i.e. is the new settlement you made for the evacuated civilians REALLY well-enough defenced?), a massive horde of zombies will enter the map and head straight for the settlement or other player faction units/places.

Mixed: Multiple game types in the same level: Go from RPG/Adventure-type where you command just a few units to a C&C-type RTS to SIM-type settlement management to a vanilla RTS game all on one map.

SSDD (Seek/Secure/Defend/Dominate): More specific (and via old TAZW Design Document much more detailed) description of a 'mixed' mission (i.e. composite of several common types). It is also a means to implement a single-mission MVP demo which samples the mission types that will be found in a fully-developed version of Zed Alert. It is described thoroughly within its own subsection below...

Random/Sandbox Mode

Kind of like Skirmish in C&C. No map mission selection, just a screen allowing player to select settings for a single-mission game of Zed Alert. Includes a map randomizer (ideally at-or-beyond that of C&C Tiberian Sun) and set of pre-made maps like the classic C&C games. Also, certain rules modifying/editing and cheats can be activated only in this mode for experimentation, sandbox and fun purposes.

Replayability Note

Replayability via trying out different places to 'set up camp and fortify it', adding to the "Zombie Apocalypse Survival Simulator" key-element of ZAC! Some missions/scenarios might force the player to camp at the 'main/intended' place, while others let them choose from whatever's on the map.

SSDD Compound Mission

The SSDD Compound Mission type encompasses 5 main player objectives, in the following [rough] order:

1. Find, secure, establish, and begin building a base to operate and defend from. These bases will all be at least some distance from the player group's starting point - requiring an expedition thereto.
2. Seek and gather resources (including recruitable humans and salvageable vehicles) throughout the map, using them to continue building up the base while improving and upgrading forces.
3. Defend the settlement, resource gatherers, and all other units from occasional encounters with zombies and hostile humans (ranging from individuals and small groups to large groups).
4. Successfully defend against a single massive 'boss horde' or series of larger 'boss waves' sent towards the settlement (else all player units if overrun / never built)
5. Eliminate all remaining zombie and hostile human units from the map. MISSION ACCOMPLISHED!

Gameplay Flow WRT Missions

Introduction

The following describes a basically general yet 'SSDD'-oriented description of gameplay flow WRT when, how, and how many zombies appear throughout the mission; which could be used as a model/example for others.

WRT SSDD Phases

- **Adventure Phase (i.e. finding a place to settle):** Very generous xor constrained by 1+ hours before 'boss horde' encompassing [Defend] phase
- **Secure Phase (i.e. building initial base and initial resource harvesting):** Smaller zombie groups might arrive (i.e. non-'boss' and 'mini-boss' hordes) WRT how much 'noise' i.e. 'influence' i.e. activity the player starts building up upon during this phase. IOW, as the player builds more of a noticeable presence - more of the undead (and the hostile living) will notice!
- **Scout/Salvage Phase (i.e. full-scale human recruitment and vehicle salvaging):** Follows from [Secure] phase; for same reason of player factions increasing activities
- **Defend Phase (i.e. defend against some final massive 'boss hoard' of zombies):** Timed waves up to the 'worst' of the 'boss horde' before it's time to [Offend]
- **Offend Phase (i.e. eliminate remaining zombies and/or hostile humans):** None, really. At this point, the player has won the main offensive and needs to 'clear out and clean up' the remaining zombies; i.e. those that were part of a [boss] horde which got stuck, individual groups that weren't 'swept up' into one of the hordes (vis-a-vis SA flocking behavior WLOG) and/or which were located far away thereof but never interacted with by the player, etc.

WRT General Triggers

Other Events that can and/or will trigger boss-horde or other significant events, such as:

- **Objective/Event** i.e. “power reroute causes transformer explosion, causing all zombies in 20 cell radius to hear and move towards”, “entering influence region of hostile humans activates their AI commander from idle to ‘seek and destroy’ human units”, etc.
- **Button click (i.e. via UI)** to send one of several hordes leading to a final ‘boss horde’ objective; which is very similar if not exactly the same as seen in most Tower Defense Games. Ergo: this can be its own kind of gameplay style which could be realized via an **‘Arcade Mode’**.

Campaigns

‘Full’ -vs- ‘MVP’ Campaign

MVP: Demo campaign for proof of concept prototype. Involves SSDD compound-mission type and/or several missions in a small series; as ideally a ‘sampling’ for all major elements within a fully-developed campaign.

‘Full [Game]’: Main official campaign which will be considered canonical Zed Alert Storyline with addition of select official canon Mercenary Campaigns. Main plot involves player surviving through key chronological events of classic zombie apocalypse scenario: from initial society chaos, to full zombie apocalypse, to securing initial outposts, to converging smaller groups/outposts into larger settlements, to starting full ‘zed sterilization’ campaign, to beginning of rebuilding society/civilization (which is where Sid Meiers can continue the story).

‘Mercenary’ Campaigns

Operates similarly to main campaign mode but are usually smaller and more specialized, kind of like Fallout’s DLC expansions. Some can be official and canonical.

- Can have different ‘init-conditions’ s.t. players start already fortified or fresh-build
- Can also include Independent/ specialty/ sandbox/ bonus/ challenge/just-for-fun missions.
- These missions are independent of each other with the exception of maybe some small sequential missions in a mini campaign and include challenges, special and sandbox missions among others.

[Human] Body Units

Introduction

Living humans are the most important resource in Zed Alert. They provide the basis from which all infantry and workers are trained, while being required to operate if not build/repair all vehicles and structures. Furthermore, as noted multiple times in this design document: they’re also the lose condition. That is: zero humans under player control means GAME OVER, and for the exact reasons aforementioned.

This section describes ‘body units’, basically any unit that’s not a vehicle (but including those who operate vehicles). Specifically: we discuss the base ‘Civilian’ type, which can become a member of either the ‘Soldier’ xor ‘Worker’ skilled unit types (via the ‘Basic GI Training’ xor ‘Worker Training’ upgrades), and thereafter switch back-and-forth as needed between various armaments xor specializations within their skill types (e.g. Grenade Launcher to Sniper Rifle, xor ‘Field Medic’ to ‘UAV/UGV Operator’).

Common to ALL Body Units

ALL Body Units can:

- **Drive non-military ground vehicles.** The Humvee, Abrams Tank, and Blackhawk Helicopter each require Basic GI Training, while the S-70 Helicopter (i.e. 'Civil Blackhawk') requires either Basic GI Training or a worker with the Technician Specialization.
- **Attempt to salvage civilian vehicles** (i.e. 'attempt to get them started up and driveable' to be driven back to base for further customization), though the odds of success vary WRT the type of unit doing so.
- **Ride aboard vehicles as passengers and inhabit housing**

Zombification Corpse Conversion: 50% chance that the corpse of any Body Unit will (within some low interval of time) reanimate into a zombie. MAYBE some future global update or a large-enough health and wellness score might reduce or prevent this from happening to player's units; but in any case: the best strategy will be for a nearby [worker-only?] unit to 'burn the corpse' as to prevent reanimation from happening in the first place. IOW: the same strategy one might employ with zombies in the Resident Evil 1 remake to prevent them from becoming Crimson Heads. [UI/UX Note: Provide an option via per-unit side-screen UI to do this, if the unit detects that they're within $\sim\frac{1}{4}$ a map cell width of a nearby corpse.

Civilian Units

Introduction

Civilians encompass living human survivors who have not received either the Basic GI Training nor Worker Training upgrades, as to advance into either soldiers or workers. Thus as noted in the introduction: they are effectively the 'clay' found out in the map from which all units are made...assuming, of course, that they've been recruited into the player's faction ergo control. There are two kinds of civilians: the basic (i.e. generic) form, and the custom (i.e. specialized) form; both of which only differ by their attributes, armament, etc.

Basic Form

Generic civilians are typically soft, squishy, usually idle (when not running away from zombies and/or hostile humans), and unarmed (save perhaps implementing a [desperate] melee attack thereto). They encompass elements of the general public who have zero skills for survival in the zombie apocalypse yet are [somehow] still alive, and their utility within Zed Alert is simple: be found and recruited by the player before the zombies and/or hostile humans find them.

Custom Form

Specialized civilians are simply better armed, armored, and otherwise equipped than their counterparts, thus encompass more experienced survivors and members of groups thereof. They are the **ONLY** civilian units who are equipped with weapons and/or specializations - and such are **FIXED** before they get either of the two training upgrades. There are two utilities within Zed Alert by which they are used can be found, as follows:

- 1) **Player's Starting Units** for which configuration options and other settings are provided to the player before the game starts. These civilians will obviously have greater health, armor, weapons, etc.; as they're the player's first units in many typical [starting] scenarios.
- 2) **Discovered Out In The 'Wild'** which are basically the 'neutral/NPC faction' equivalent of the player's starting party of survivors (whether in their own group/settlement or lone wolves). This will not be ALL civilians out there, as the intention are for most to be of the basic form (e.g. a settlement might have 1 custom type for every 5 basic types).

- 3) **Specified Via Custom Scenario** i.e. customized via scripting or otherwise config/settings via a mission designed by the developer[s] of Zed Alert or players of the game for both themselves or others to enjoy and try their hand at accomplishing. Pretty obvious, but worth enumerating alongside the other two.

From Civilian To Skilled

Training: How and How Much

As aforementioned, there are two per-unit updates encompassing/modeling 'training' from which civilians first become a basal type thereof before they can then become more specialized within the subtypes thereof. The basal types, 'GI' and 'BW', are discussed in the following subsection. As with all unit upgrades, the civilian must be near or inside an on-base barracks (or mobile equivalent i.e. tent) to receive either type, and there is a small resource cost associated for each. They are as follows:

Type	Description	Cost _[1]
Basic [GI] Training	Sets civilian to type 'soldier'. When done, they transform into a 'GI'	50s, 60u
Worker Orientation	Sets civilian to type 'worker'. When done: they transform into a 'BW'	50s, 60u

1. Per-Resource costs, where 's' implies 'scrap' and 'u' implies 'time units'

If Civilian is of Custom Form

If the civilian is a Custom Form, then the weapon and/or specialization they possessed is debited (i.e. its value added to the player's resources) less the desired training's cost; similar to what happens when a skilled unit switches between the different subtypes of its primary type. For example: if the player recruits a custom civilian with a Sniper Rifle and desires to train him as a worker, the cost of upgrading a base soldier to the Sniper Rifle type will be added to the player's funds; which effectively models the civilian 'turning in his rifle to the armory in return for a pair of overalls'.

Cost WRT to other RTS games

The 50 scrap cost for both training types as to upgrade civilians into the base soldier and worker types is an ironic yet welcome coincidence to StarCraft-1's 50 mineral cost to produce both the Marine and SCV units, which are effectively their analogs. However unlike StarCraft-1, the training times for the base soldier and worker are equal; whereas SCVs take roughly 16 seconds and Marines 20 seconds in the 'Faster' game speed type (see 'Time Logic' [sub]section notes for more info!)

Base Types of Skilled Units

Common To BOTH Base Types

Once a civilian has obtained either training, they become a skilled unit within one of the two 'schools' and transform into their respective base type (discussed immediately below). For either of these base types:

- **Their base health and armor improve** (soldiers MUCH more than workers for obvious reasons)
- **They can carry a sidearm** (i.e. single 'Pistol' s.t. soldiers by default, workers via per-unit upgrade)

Switching Between GI and BW

Workers can be turned into Soldiers and vice versa, depending on the player's need. The 'return value' mechanic (as discussed in the 'Reconfiguring/Upgrading Units' section) will apply, meaning that replacing an 'expensive' soldier unit (e.g. Plasma Rifle with several per-unit upgrades/improvements) with the least expensive basic worker will put the difference back into the player's resource totals for as-desired use. This effectively models the soldier returning his gear to an armory, then putting on a uniform, boots, and hardhat.

Soldier Base Type: 'GI'

GI (General Infantry): Any civilian who has received 'Basic GI Training'. Their health and armor is improved significantly: modelling the gaining of combat armor and improved strength/endurance training. Furthermore, GIs are 'born' with the soldier weapon subtype '[Single] Pistol' as a sidearm.

Worker Base Type: 'BW'

BW (Basic Worker): Any civilian who has received 'Worker Orientation'. Their health is slightly improved, though not as much as with a GI: modelling the gaining of a clean uniform and practicing tasks with legos? Unlike their GI counterpart: they are unarmed by default (sans the 'desperate melee' attack shared by all body units); but a global update and per-unit updates thereafter allows them to be just like their counterparts via carrying a sidearm in the form of a single pistol.

Regarding tasks - theirs is basically equivalent to the SCV from StarCraft-1 with additional roles as seen with the 'Dozer' units of C&C Generals; and more specifically include the following:

- **Gather and Deliver Resources** such as food, fuel, supplies, and scrap. Workers will have a 'carry capacity' of maximum supplies they can carry to bring back to base; analogous to that of C&C harvesters and/or StarCraft-1's SCV/Probe/Drone units (resp. to factions thereof, therein).
- **Build and Repair Structures** such as garages, barracks, fortifications (e.g. guard towers), obstacles (e.g. walls, chain-link fences), and traps (e.g. shock-pit, fire-pit, maybe mines, etc.)
- *Else sit around idle biting the dust*

These tasks can increase depending on their further specializations; i.e. will be supplemented with:

- **Re[Configure] and Repair Vehicles and Aircraft**, including unmanned variants
- **Remotely Operate Unmanned Air/Ground Vehicles**
- **Maintain and Manage Robotic Units**

Soldier Unit Types

Introduction

A soldier's unit type is defined by the primary weapon they are currently carrying (with emphasis on 'currently', as they can switch between different weapons). There are 18 total weapons partitioned evenly into 6 groups organized by similar functionality: in which each group contains a base weapon which can then be upgraded into one of two advanced weapons that are more specialized/powerful. The weapon groups and weapon types therein are discussed immediately below. Note: More info can be found in the 'Weapon Types' chart and 'Weapons and Ordinance' section.

Soldier Weapon Groups

Pistols (Sidearms) are the default weapon provided to GI's on completion of basic training (and for all workers via a global upgrade option, while some other types also provide a pistol as a side-arm. The basic type is a single pistol, and its two upgrades are Dual Pistols (2x ROF, increased DAM) and Scoped Pistol (increased DAM and RGE).

Precision Firearms feature rifles focused on longer range and damage-per-shot than their counterpart 'Automatic Firearms'. The basic type is a Hunting Rifle, with the two upgrades thereof being Semi-Auto Rifle (with medium RGE and ROF) and Sniper Rifle (with ultra RGE at cost of lower ROF).

Automatic Firearms feature weapons focused on higher [overall] damage via higher ROF than their counterpart 'Precision Firearms'. The basic type is a SMG (submachine gun), for which there might be an [expensive] global upgrade providing 'Dual SMGs' (i.e. 2x); with the two upgrades thereof being Fully-Auto Rifle (high ROF) and Minigun (constant ROF at cost of lower DAM and RGE); though note that the Minigun's low DAM is MORE than made up for by its ROF, while the low RGE corresponds mostly to its [very] wide spread (so pro-tip: use it for CQC suppressing/defensive fire against the zombie horde and human enemy armor!)

Fragmentation Weapons are the shotguns, 'Nuff Said. The base type is a simple consumer-level single shotgun, while the two variants are a semi-auto Combat Shotgun (medium ROF) and Double-Barrel Shotgun (with ultra DAM at the cost of lower RGE and, naturally, ROF). Note that such stats are also WRT the spread of their shells; i.e. the 'lower medium' damage of the base shotgun will still take out a small pack of zombies if they're at close range and within the 'cone' of the shot [i.e. unit's forward vector], since they'd be absorbing much of the spread.

Projectile Weapons are, basically: stuff that launches other stuff. The base type and one of the upgrades types encompass grenade launchers of several ordinance types (the RPG Launcher basically being an ROF and RGE upgrade of the base Grenade Launcher); while the Missile Launcher fires one of two missile types which provide it a larger RGE and greater 'precision' (WRT/via the missile types' respective 'ways') than the grenade launchers. See the 'Weapons: General and Additional Notes' section for more info on ordinance/missile types.

Energy Weapons are the 'easter egg' weapon type, because [1] they're not necessarily intended for use in the 'full game' until at least late into the campaign (and even then only for anti-human purposes per one or more human-enemy oriented missions), [2] will only be in the MVP to show themselves off, and [3] the upgrade types are so powerful as to likely break the game (as they can *easily* cut through mobs of zombies like a glowing red knife through butter, slicing them in half to immobility whenever not instantaneously scorching if not vaporizing them! The base type is a [relatively] unimpressive but still rather powerful 'Laser Blaster, while the two upgrade types are a Plasma Burst Rifle and Laser Burst Rifle which relate to each other coincidentally analogous to the Fully-Auto Rifle and Minigun within 'Automatic Firearms'.

Soldier Special Upgrades

Drive-By-Shooter (Unsure if Per-Unit or Global): [Most] Soldiers who are passengers on vehicles can fire out the windows, even if the vehicle is moving! This likewise effectively realizes such vehicles of having a 'gun pods' upgrade without doing anything more than opening their windows. The exceptions are likely to be only soldiers with Grenade/Missile Launchers and GIs (even though they have simple pistol).

- **Issue : What if I don't want [these] soldiers to fire out of [that] Vehicle?** For example, maybe I want to keep a low profile when moving a convoy of units through an area with nearby zombies; especially as 'sound aggro' will be realized in Zed Alert?
- **[Resolution : Per-Unit Toggle Button in Per-Unit options via side panel GUI?]** Such that the default option is 'OFF' (as it would be prior to getting the global upgrade)? Maybe also have a hotkey thereto?

Worker Unit Types

Introduction

A worker's unit type is defined by their current specialization[s], which provide them with additional abilities beyond those of the basal worker as aforementioned. As with their soldier counterparts: workers can switch back-and-forth between specializations, though there are only two cases of advanced types 'atop' their corresponding base type (one of which requires two different specializations! That said: each specialization is discussed immediately below.

Worker Specialization Types

Medic: Heal units in the field and improve health (ergo reduce zombification chance) for all units. I might add a 'Doctor' upgrade which would be both more effective in healing, boost health resource, and maybe get full exclusivity on R&D for unit health/armor (but likely not and stick with engineer to KISS.

Mechanic: Repairs ground vehicles within garage or mobile equivalent. Can repair broken down but fixable (i.e. not blown apart) vehicles to operational (which most out-in-the-world are, thus provides the means to acquire a greater number of chassis needed to build IFVs and other technicals).

Technician: Basically, a more advanced Mechanic. Only worker type that can salvage, repair, upgrade, and pilot aircraft (Helicopters). Prerequisite to 'UAV/UGV Operator' and 'Robotic Unit Operations' types. Maybe find a special role for them WRT structures (e.g. automated turrets and anything involving electricity).

Engineer: Researches & Develops global unit-{health/armor/firepower} upgrades, alongside some other perks/things I can't quite think of right now. They're also a requirement (alongside Technician training) for Robotic Unit Operations technicians (also discussed [almost] immediately below)...

UAV/UGV Operator: These vehicle types are effectively remote-controlled (see their notes in the 'Vehicle Units / Types' section for more info) and thus need operators to utilize them. This requires a technician to get one more training upgrade as to gain the ability to control such vehicles (as well as repair and create them!)

Robotic Unit Operations: The most advanced unit type in the game, a Robotics specialist must have BOTH the Mechanic AND Engineer trainings in order to receive this ADDITIONAL training. On the plus side: if you have one or more of them in your base, and enough resources to produce robotic units: you have the ability to do the 'impossible' within Zed Alert - and create waves of units pouring out of their assembly plants [garages].

Worker Special Upgrades

Global Upgrades:

- **Scrapper:** Repair costs (both on-base and in-field) cost LESS in total resource[s].

- **Salvager:** Chances of getting broken vehicle (neutral or player-owned) working VASTLY increased (note: the 'vehicle recruitment' mechanism is discussed in detail elsewhere in the design document).
- **Scavenger:** MUCH more scrap, supplies, and fuel can be extracted from sources in the world; e.g. a grocery store shelf typically yielding 500-food will now yield something like 1500-food.
- **Sidearm:** Enables workers to get counterpart per-unit upgrade; i.e. this is a prerequisite for the per-unit worker sidearm upgrade (and consequently will be much cheaper than typical global upgrades).

Per-Unit Upgrades:

- **Sidearm:** Enabled by global counterpart. Arms workers with a pistol sidearm. I'm unsure if we will deduct a few capacity points to model the extra weight, encumbrance: but probably not to KISS!

Vehicle Units

Introduction

Walking around on foot might be fine, even advantageous for a lone wolf or small group of survivors out in the zombie apocalypse. Though this requires keeping themselves close enough to supplies as to make a shorter, safer walk to restock; and far enough from larger packs of zombies as to only require dispatching individuals or small groups (i.e. numbers within their ability to safely dispatch). Indeed: such is the scenario faced by most groups trekking out at the start of the main Zed Alert campaign. But what about the means by which to build larger and more sustainable populations of human survivors en-route to restoring civilization; and for that matter: taking the fight directly to the larger hordes of undead as to take back command of the terrain to the living? Soldiers and workers travelling around long[er] distances to accomplish these tasks won't suffice for a number of logistical reasons. For example: walking into a horde of undead that they can't repel against, walking into an ambush of heavily-armed raiders that they can't defend against, transporting troops and supplies over to a battlefield and back thereafter efficiently, and leading [long distance] expeditions into surrounding areas as to scavenge supplies and/or salvage vehicles alongside other things for use back at their settlement (if not exploring for a suitable place to even build a settlement).

That's where vehicles come in handy! This section describes 'vehicle units': which encompass both ground and aircraft types; of which are either operated directly (i.e. via a driver within), remotely (i.e. UAVs and UGVs), or fully autonomously (i.e. robotic units). There are two main types of vehicles: civilian ground vehicles which can be [re]configured into various types (similar to infantry units), military vehicles or aircraft which cannot be as fully customized (though CAN be upgraded/improved), and UAVs/UGVs (which are effectively the only units in Zed Alert which can be 'built from scratch' in a garage).

Survival Horror RTS Elements

Much like civilians are the 'clay' found in the world from which to create Body Units: vehicles are 'recruited' (i.e. salvaged) from the world from which most types can be customized for a number of useful purposes. This also means that most vehicles are likewise constrained by Survival Horror RTS: both via needing to be salvaged from basic types found in the world, reconfigured therefrom at a garage or mobile equivalent (A/A), and most importantly: require a human unit dedicated SOLELY to operating them (i.e. a driver and [mounted] weapon gunners). There are two exceptions to this via unmanned vehicles: i.e. UAV/UGV 'remote controlled' and fully robotic units; each in their own ways (as will be discussed further below). All vehicles except completely robotic need Body Units to operate them, and all vehicles can be evacuated; such that evacuees will include the driver as well as all body units loaded into them.

Again: this realizes the 'finite human resources' element of Zed Alert. For example: scenarios such as entire battalions of armored cavalry and [more commonly] supply convoys needing to have their passengers and crew fully evacuated and the vehicles abandoned due to an unmanageable swarm of zombies or hostile humans. To the former case: this would lead to the zombies largely leaving the abandoned vehicles (and even [food] supplies therein) alone; in the hopes that they'll eventually disperse and personnel be brought back to reoccupy the vehicles and drive them to their destination else back to base. To the latter case: this would at least mean that FAR MORE valuable living humans can be evacuated to fight another battle, as [generally] more vehicles can always be salvaged and configured to replace lost ones. In other words, and perhaps unique in Zed Alert among most [all?] other RTS games: vehicle and equipment casualties are ALWAYS preferable to human losses!

A Note On Boats (i.e. Water Vehicles)

They might be implemented in the MVP, and should be implemented if a 'full development/release' is ever realized; but I'd like to keep things simple for both this design document and the MVP Proof-Of-Concept, so I'll spare discussion/ideas on the implementation thereof. There are two exceptions to this (as of 12/2), as follows:

- 1) The 'Advanced Reinforcement Mechanisms' [sub]section discusses the means by which water-based reinforcements can be realized, as well as describing a 'pier/dock' structure which can be 'captured' by the player's units to both repair existing water units and enable reinforcements.
- 2) When I do implement water units, I'll likely implement three types:
 - a) **Civilian Boat** 'Workhorse' analogous to civilian ground vehicles, for which config options such as 'gunboat', 'supply runner', etc. will be available.
 - b) **LCAC 'Hovercraft'** which can both operate on land (slowly) and be reconfigured to roles such as gunboat and passenger/cargo transportation.
 - c) **Military Gunboat** analogous to the Humvee / Abrams Tank WRT being just as rare and likewise have its per-unit upgrades limited to add-ons (i.e. cannot be reconfigured into other types).
- 3) I'll also likely allow anyone to salvage and drive a civilian boat, only Soldiers to drive a Military Gunboat, and only Technicians to salvage and drive a Hovercraft.

Civilian Vehicles

Introduction

As aforementioned, the means by which the player can 'build' almost all vehicle units is to salvage their civilian base forms from the world itself, then upgrade them to one of multiple possible types/uses. Generally: this involves first securing the vehicle, which ideally ends in it successfully 'starting up' and being placed under player control; then being brought to either a stationary garage or mobile 'mechanic shop' vehicle for further upgrades. There are 4 'families' of civilian vehicle types (whose relative similarity within and difference without is largely self-explanatory); and are described below. However we first discuss the process by which a vehicle in the world is salvaged and brought under player control.

Securing/Salvaging Civilian Vehicles

The following algorithm describes the process for securing/salvaging civilian ground vehicles in detail; for which we note that the process for civilian aircraft (i.e. Helicopters) is similar if not exact, sans requiring a Technician to salvage and operate them:

- 1) **Player orders Worker or Soldier unit 'onto' cell containing the vehicle** to attempt starting it up.

2) On entering the cell, unit 'opens door to inspect it'; which causes two events to occur, as follows...

3) Event #1: Is There a Zombie Inside?

- a) There is some percent chance $p^{VZ} \in [0.0, 1.0]$ of the vehicle having a zombie 'pop out' (presumably its most recent driver and/or occupant WLOG).
- b) RNGesus provides a float $rand \in [0.0, 1.0]$ such that if $(p^{VZ} \leq rand)$: then a zombie will appear outside of the vehicle which will attack the nearest human unit (presumably the poor dude who opened the door to check inside — hope he is a soldier and/or has support nearby!)

4) Event #2: Is the Vehicle Broken?

- a) There is some percent chance $p^{VB} \in [0.0, 1.0]$ of a vehicle being 'broken' and thus unable to be activated and salvaged (i.e. placed under player control and able to move).
- b) If the interacting unit is of type Mechanic or Technician: then this chance is disregarded and the vehicle is instantly ready-to-go without any hassle/delay; as even if it happened to be broken: they have the means to instantly magically fix it to working condition!
- c) Else: RNGesus provides a float $rand \in [0.0, 1.0]$ such that if $(p^{VB} \leq rand)$: then the attempt to start the vehicle fails, meaning it remains immobile and not under player control. Furthermore:
 - i) **The Bad News: Broken means Broken.** That is, once an attempt fails, the vehicle is declared broken, and the player will be unable to send any more units to try again. There is, of course, one exception...
 - ii) **The Good News: Mechanics (and Technicians) exist!** That is, they CAN enter the vehicle and, by the same means aforementioned: will magically automatically get the vehicle operational and under player control.

5) **Once working and under player control:** the vehicle can already serve the role of transporting passengers/cargo; and even serve as a basic armed vehicle if infantry are among the passengers and the player has the 'Drive-By Shooter' global update. And of course: it can remain in this 'civilian but under player control' state for as long as desired.

6) **If the player wishes to upgrade it:** they will as aforementioned need to bring it to a Mobile Vehicle Shop or on-base Garage structure; and then purchase the 'Base IFV' xor 'Base LSV' Vehicle per-unit upgrade to pursue their respective upgrade [sub]trees. Though again: the player can also elect to automatically do both the basic and custom upgrades in the same button click by selecting the desired custom type (and if-n-assuming they have the necessary resources for the total cost thereof).

Civilian Vehicle 'Families' i.e. Classes

Class	Types (Found On Map)	Description (Utility Pro[s] Con[s])
Cars	Sedan	<ul style="list-style-type: none">• Use: Scout/Recon and fast ground transportation• Pro: Cheapest to set up and fastest speed• Con: Min health/armor, lowest passenger/cargo capacity
Light Trucks	Pickup Minivan SUV	<ul style="list-style-type: none">• Use: Multi-Use 'workhorse' with most balanced stats• Pro: Most efficient cost/benefit Con: Nothing significant
Medium Trucks	Box Flatbed Rec	<ul style="list-style-type: none">• Use: Large cargo transport, mobile repair/config, IFV 'tank'• Pro: Big Con: Slow

Buses	School Transit Coach	<ul style="list-style-type: none"> • Use: Large passenger transport, mobile repair/config • Pro: Big Con: Slow
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Ground Vehicle Unit Upgrade Types

Two Routes For Ground Vehicle Units

There are two upgrade routes based on two factors: the type of vehicle they are (i.e. 'car' <vs> 'medium truck'), and their main role as similar to body units (i.e. 'IFV' and 'LSV' analogous to 'Soldier' and 'Worker'); as follows:

- **IFV = Improved Fighting Vehicle** (a.k.a. 'technical') encompass combat-oriented vehicles. Side Note: IFV and technical are both 'real' i.e. actual/official terms used for such vehicles.
- **LSV = Logistical Support Vehicle** (not an official term as far as I know); encompass utility-oriented vehicles (e.g. cargo/passenger transportation, mobile repair and construction, etc.)
- **Yes: You Can Swap Back-And-Forth!** As with body units: an IFV can be reconfigured to a LSV role, and vice-versa; and via the same “sell the current type, then purchase the new type” mechanic.

IFV + Military Weapon Types

Type	DAM	RGE	ROF	Effect	Blurb
Heavy Tactical Rifle	HIGH	XTRM	MED	N/A	Semi-Auto (Higher ROF) Sniper Rifle
Heavy Machine Gun	HIGH	MED	HIGH	Anti-Air	50 Caliber as mounted on Humvee
Assault Shotgun	HIGH	LOW	MED	Spread	'4th member of Frag Weapons'
Flamethrower	MED	LOW	CNST	Incendiary	Roasts zombies with fire, 'Nuff Said
RPG Launcher	PROJ	MED	MED	PROJ	Effectively the same as Body Unit
Missile Launcher	PROJ	HIGH	LOW	PROJ	Effectively the same as Body Unit
Tesla Coil	HIGH	LOW	CNST	Shock	Toasts zombies with zaps, 'Nuff Said
Particle Beam Gun	XTRM	LOW	CNST	Incendiary	Inappropriately Powerful, 'Nuff Said
120mm Cannon	HIGH	XTRM	LOW	Splash	M1-A1 Tank Primary Weapon <u>ONLY</u>

IFV + Military Config Types

The following two charts detail which weapon options are available WRT each Family of vehicle types (including the two military ones which are discussed in detail below). However there are two important details that must be discussed first, as follows:

- **Default [Primary] Weapon:** The default weapon for a civilian vehicle which has just been upgraded to the base IFV type is NONE, sorry! It will, however, have additional health and armor, so there's that!
- **Primary Weapon:** All IFVs can install a primary weapon, though not all weapon types are available; and both military type already have a primary weapon installed.
- **Secondary Weapon:** Some IFV types, as well as both military types, can install a secondary weapon to increase their damage as well as be suited for two purposes (i.e. a short-distance and long-distance config which naturally complement each other). There are similar exceptions and restrictions on which options are available WRT the vehicle's chassis type, as shown in the chart.

PRIMARY WEAPONS	CAR	LIGHT TRUCK	MED TRUCK	BUS		HUMVEE	M1-A1 TANK
Heavy Machine Gun	YES	YES	YES	YES		DEF	NO
Assault Shotgun	YES	YES	YES	YES		YES	NO
Heavy Tactical Rifle	NO	YES	YES	YES		YES	NO
Flamethrower	NO	YES	YES	YES		YES	NO
RPG Launcher	NO	YES	YES	YES		YES	NO
Missile Launcher	NO	NO	YES	YES		NO	NO
Tesla Coil	NO	NO	YES	YES		NO	NO
Particle Beam Gun	NO	NO	NO	YES		NO	YES
120mm Cannon	NO	NO	NO	NO		NO	DEF

SECONDARY WEAPONS	CAR	LIGHT TRUCK	MED TRUCK	BUS		HUMVEE	M1-A1 TANK
Heavy Machine Gun	NO	NO	YES	YES		NO	DEF
Assault Shotgun	NO	NO	YES	YES		NO	YES
Heavy Tactical Rifle	NO	YES	YES	YES		YES	YES
Flamethrower	NO	YES	YES	YES		YES	NO
RPG Launcher	NO	YES	YES	YES		YES	YES
Missile Launcher	NO	NO	NO	YES		NO	YES
Tesla Coil	NO	NO	NO	NO		NO	NO
Particle Beam Gun	NO	NO	NO	NO		NO	NO
120mm Cannon	NO	NO	NO	NO		NO	NO

LSV Specialization Types

Type (Via Role[s])	Purpose / Specs
Passenger / Cargo Transport	Transports Cargo and Passengers (both at same time, xor mutex?)
Vehicle Repair / [Re]Config	Effectively a 'Mobile Garage' providing vehicle support
Body Unit Heal / [Re]Config	Effectively ½ 'Mobile Armory', ½ 'Field Ambulance' via Body Unit support
Mobile Construction Vehicle _[1]	Allows [larger?] structures to be built by workers outside of support radius

1. There's really no better name, but I might have to change it or else EA will be assholes and sue (though can they?)

LSV Config Types

The following two charts detail which specialization options are available WRT each Family of vehicle types (including the Humvee). However there is one important details that must be discussed first, as follows:

- Seeing **(fX)** implies that, for the vehicle it appears in: the specialization is available, and its capacity (for transports) and speed (for field vehicles) is 'f' many times greater than the preceding chassis type. For example: the **(4x)** in MED TRUCK Transport implies that transports of this type can fit 4 times as many passengers and/or cargo than with the LIGHT TRUCK.

SERVICE	CAR	LIGHT TRUCK	MED TRUCK	BUS		HUMVEE
Passenger/Cargo Transport	DEF	DEF	(4X)	(8X)		DEF
Vehicle Repair / [Re]Config	NO	NO	YES	(2X)		NO
Body Unit Heal / [Re]Config	NO	NO	YES	(2X)		YES
Mobile Construction Vehicle	NO	NO	YES	YES		NO

Military Vehicles

Introduction / Overview

There are two types of less-upgradeable ground vehicles. Both are strictly military in nature, are rare to encounter in an arbitrary game/scenario map, and thus cannot be completely modifiable for those reasons. Also: no civilian vehicle can EVER be upgraded to these types, adding another feature of 'exclusivity'. Despite these constraints, each CAN be upgraded with various components that can be swapped out (though there are limits thereof [to be] discussed below); and they also enjoy the 'all unit' upgrade types for health, armor, and firepower. That Said, they are as follows...

Humvee

Official DOD Name: *HMMWV (High Mobility Multipurpose Wheeled Vehicle)*

Humvees are basically a stronger and more powerful version of IFVs of the Light Truck kind: WRT both base health and armor, as well as providing a 'magical' boost to DAM for all weapons (and maybe armed infantry?) onboard; on the justification that these fighting vehicles are NOT improvised but intended for this purpose! They are the less rare of the two types: as they can be found with abandoned/overrun military convoys; on military bases, evac/shelter centers, etc.; and even randomly in the world e.g. along a highway or in a town (though this random of a discovery is rarest of all).

M1-A1 Abrams

Official DOD Name: *M1A1 Abrams MBT (Main Battle Tank)*

Battle Tanks are basically to 'Gunship IFVs' of the Medium Truck type what Humvees are to the Light Truck type; only with MUCH more health/armor, MUCH more rare to find, and more constrained in terms of upgrade types (also TBD as with specifics of Humvee). As with Humvees, they can be found in abandoned/overrun military bases; but that's pretty much the ONLY place (sans purpose-placed within custom designed missions),

as the military didn't really have a use for them when trying to contain the zombie apocalypse (sans, perhaps, some #YOLO experiments using them as 'zombie steamrollers' – which MUST be included in either an MVP or especially full-game mission!) In any case, they're thus the rarest of all ground vehicles. Lastly: their primary weapon (120mm Cannon) can ONLY be exchanged with the Particle Beam Gun, for obvious reasons!

UAVs / UGVs / Robots

Introduction / Overview

UAVs and UGVs (Unmanned Aerial/Ground Vehicles respectively, hereafter 'UXV' to denote both types) are effectively 'remote-controlled vehicles' which are operated by humans located elsewhere on the map. Robotic vehicles (of which also have air and ground types) are fully autonomously controlled; but do require special human unit types to build, repair, and 'keep an eye on'. Both types are realized via two vehicle classes:

- 1) **Adapting human-driven 'full-size' vehicles** (e.g. of IFV group) to remote xor robotic control; and
- 2) **Creating specialized small[er] drone vehicles** (yes: creating) without onboard controls/cockpit

Survival Horror RTS Constraint + Advantage

We [again] note that UXV units without human operators and robotic units by themselves [obviously] do NOT count as living humans under player control. On the minus side, this means that if the player has such units but no living human units: the game is over - Mission Failed! On the plus side, these same units enable the player to avoid having human units outside of a well-fortified base and thus placed in less danger / risk of dying.

Furthermore: the total costs to set up and operate both remote-controlled but especially robotic UXVs further offset the advantages they have WRT them not being precious living humans out in danger. Specifically, they:

- Require a salvaged, base-type upgraded, and weapon/specialty-type upgraded vehicle to already exist; else the resources and technicians to build the costly unmanned-only drone UAV/UGV unit.
- Require UXV Operator xor Robot Operator specialist Body Unit to both configure a desired vehicle (as produced via the above step) for remote/robot control, then to repair and/or maintain it.

Special Remote/Robot ONLY Vehicles

As aforementioned, there are specialized smaller ground and air units which can only be operated under remote or robotic control. As they are constructed in a garage/factory <vs> customized from a base type salvaged in the world, these are the ONLY units in Zed Alert which can be 'built from scratch'; albeit costing substantially more scrap, fuel, and other resource costs than configuring a base unit. This higher cost effectively also maintains the condition of SH-RTS given the relative scarcity of resources, and the necessity of more than 1 human unit to build and maintain them. There are only 2 types of these units, one UGV and one UAV: described as follows, followed by the role types shared between both:

Mosquito Drone (UAV)	4-6 foot diameter 'decently heavy-duty' Quadcopter
Scarab Tank (UGV)	Half to full car-sized mini-tank (i.e. treaded vehicle)

TYPE	DESCRIPTION	DAM	RGE	ROF
Assault Gunship	Fully-Auto Light Machine Gun	HIGH	LOW	HIGH
Precision Gunship	Semi-Auto High-Powered Rifle	MED	HIGH	MED

Projectile Gunship	Drops/Launches Grenade Types	PROJ	MED	LOW _[1]
<i>Gargo Drone</i>	<i>Transports Cargo and Supplies</i>	N/A	N/A	N/A

1. Purposely low ROF, as no need to 'spam drop' a bunch of frag grenades <vs> deploying one-at-a-time

On Remote Controlled UXVs

Remote-Controlled UXVs need to be operated by a 'UXV Operator' worker unit, and such units require a 1-to-1 mapping of operator-to-vehicle. As mentioned throughout this design document: if the operator leaves their station (especially via getting killed/zombified) and there are no idle qualified operators to replace them: then the vehicle will be 'idle' i.e. 'disabled'. If idle: UGVs will stop in place and idle, while UAVs will hover in place and idle. There are a few more ideas thereof which I either will or might implement, as follows:

- **Unmanned UAVs Eventually Crash:** I MIGHT implement a mechanic wherein if not manned by another operator within [x] minutes: they'll fall to the ground (possibly exploding, but definitely broken beyond repair).
- **Unmanned UXVs Return To Base:** I likely WILL implement a Global Update wherein if a UXV is idle (by means of no operators available to man them), it will automatically drive or fly back to base (defined by either a designated command post, closest helipad/airfield [UAVs] xor garage/factory [UGVs], else closest human unit/vehicle).

On Robotically Controlled UXVs

Robotic-Controlled UXVs do not need to be actively operated by a human, but Robotics Technician worker units are required to build, repair, and 'keep an eye on' them. What does this 'Keep An Eye On Robots' mechanism mean? It accounts for the fact that robotic units might have bugs and glitches, which periodically need to be 'magically fixed from afar' by a Robotics Technician; though on the upside: those currently busy doing other tasks DO COUNT, thus there is no need to have a separate team idle one on standby! That Said: Robotic Units can be deactivated (via a toggle in their per-unit subpanel in the side panel GUI, WLOG); as for those the player does not wish to have activated (thus included in and subject to the mechanic described immediately below) to be excluded until so desired.

If there are no Robotics Technicians, then there is a small base chance that a robotic unit will periodically either shut down (same as idle unmanned state for RC UXVs) or rarer still: turn hostile to all factions. This base chance is affected corresponding to the proportion of technicians to robots, both negatively xor positively depending on the balance of technicians to robots; such that having one technician for every ~4 or so robots implies an very low chance for them to glitch (though it MIGHT happen if RNGesus feels you have sinned). Thus the player will only REALLY start to notice their robot units misbehaving in scenarios where there are something like:

- Zero technicians for a total number of ~8 robots, else
- A small handful of technicians for 64+ robots.

Aircraft Vehicles

Introduction / Overview

Zed Alert has some Aircraft Units which can be utilized by the player faction. For the MVP and likely almost ALL of the main campaign of a full-release: the only such units will be customized (i.e. [re]configured) civilian helicopters salvaged from the world, with the rare non-configurable military helicopter found at an evac/refugee camp or military base. Both the Civilian and Military Helicopter have the same configuration options, with

performance and other stats thereof being the difference: such that the Military Helicopter is 'more powerful in most if not all areas'; i.e. effectively the same situation to that of the Light-Truck IFV and Humvee.

Helicopters require a 'Helipad' for [re]configuration and repair, which can be set up in-the-field, as a ground base structure, or on the rooftop of buildings with enough square area (e.g. [3x3] cells or more). However if neither service is needed, a helipad is not required to operate helicopters; as they can technically land anywhere and/or remain in the air indefinitely (as we'll pretend their fuel is unlimited as with vehicles). As to the real Helicopters for which each will derive from, especially WRT visuals and stats (i.e. passenger capacity and armament); they are as follows:

Route 1: Base Models Differ	Civilian: Bell 412 xor Sikorsky S-70 (from which UH-60 was derived) Military: Sikorsky UH-60 Black Hawk (which derives from S-70)
Route 2: Base Models Same (MY PREFERENCE)	BOTH: Sikorsky S-70 s.t. all I need to do is slightly differ their visuals!

Configuration Types

The configuration types follow from that of Military Helicopters in terms of both name and role (sans 'Rust-Off' which is my original addition), and are defined as follows:

Slick	Passenger/Cargo Transport
Gunboat	'Nuff Said. Likely options are the usual suspects from the '6 Types'.
Dust-Off	Provides air-mobile body unit healing and [re]configuration services
Rust-Off	Provides air-mobile vehicle repair and [re]configuration services

- The Gunboat Weapon Types will be largely analogous to the '6 Weapon Types', but IOU a fancy table for it. No immediate rush though - as it's again analogous to that seen {and already described with fancy viz} for both body and vehicle units (i.e. in its respective section and further up this one, resp.)

[Flight] Behaviors

The transition from grounded to airborne will be realized via conditional buttons on the helicopter's per-unit subpanel in the main side panel GUI. Also: this behavior is somewhat analogous to a siege tank; wherein it can be 'deployed' into its airborne state and 'undeployed' into its grounded state. Of course: I'll provide hotkey support for this too, likely via the 'd' (i.e. 'deploy') keyboard key. Helicopters have the following 4 behaviors involving their airborne status:

	Precondition	Postcondition
	State Description	
Liftoff	Helicopter is grounded	Helicopter is airborne and hovering
Hover	Helicopter is airborne and hovering idle over current position. More specifically: its current velocity is $\{x: \sim 0, y: \sim 0, z = b\}$ which implies no forward/backward/left/right movement (beyond that of extremely small float differences), while its vertical velocity implements a slight 'bobbing' effect to simulate hovering (realized in Zed Alert only WRT physics and scaling 2D sprites up and down to simulate elevation)	

Land	Helicopter is airborne	Helicopter is grounded (if it can land on desired cell)
Ground	Helicopter is on the ground; which means that it cannot move nor fire its weapons. It can, however: load and unload both its pilot and passengers/cargo.	

Global Upgrades

The following upgrades all involve passenger/cargo transportation via and/or extraction from the helicopter:

- **Paratrooper Extraction:** Enables passengers to land upon the ground from an airborne helicopter via jumping out of it before deploying parachutes. Different from the similar Rope Extraction upgrade in that a Helicopter can be either moving (even at full velocity) or stationary, the time to land upon the ground is typically [much] slower, and the landing position for each paratrooper is not exactly known until they're close to the ground (especially as the accuracy thereof varies WRT the helicopter's velocity).
- **Rope Extraction:** Enables passengers to land upon the ground from an airborne helicopter via descending from (i.e. sliding down) ropes dropped directly below it; while also being the ONLY way to accurately extract passengers directly onto the roof of a building which does not have a helipad atop it. Otherwise different from the similar Paratrooper Extraction upgrade in that the helicopter MUST be stationary, the time to land upon the ground is typically [much] faster, and the landing position is exactly known (i.e. directly below the helicopter by definition).
- **Vehicle Carrier:** Enables single vehicle (of 'Cars' or 'Light Trucks' family ONLY) to be carried by a helicopter; via "Helicopter Vehicle Load/Carry/Unload" process described immediately below...

Helicopter Behavior : Vehicle Load/Carry/Unload Process

LOAD >>>

- 1) Vehicle is evacuated of all passengers (except MAYBE the driver)
- 2) Airborne helicopter is ordered to move directly over the unit
- 3) GUI option for 'Load Vehicle' in helicopter's per-unit subpanel lights up and is enabled
- 4) On click thereof:
 - a) GUI option for 'Load Vehicle' darkens and disables (as with all other options at this time)
 - b) Helicopter will spin in place as for its forward vector to match that of the vehicle
 - c) 4 Ropes will descend from helicopter over/near the vehicles corners
 - d) After a small delay, vehicle will appear to lift upwards until 'below' the helicopter
 - e) Helicopter officially declared to be carrying a vehicle, and vehicle as currently being carried
 - f) Vehicle cannot move on its own, i.e. its position is now directly derived from that of helicopter
 - g) Helicopter's speed decreases by some [substantive if not significant?] amount

CARRY >>>

- 1) Player can now order Helicopter anywhere on map s.t. it travels there per usual (sans speed decrease)

UNLOAD >>>

- 1) Whenever helicopter is hovering (i.e. not moving) AND its midpoint is over unoccupied (or otherwise 'land-able' cell), 'Unload Vehicle' GUI option in helicopter's per-unit subpanel lights up and is enabled
- 2) On click thereof:
 - a) Helicopter moves directly on top of the DZ cell, then spins to line up with one of its 4 edgewise directions. That is: its midpoint matches that of cell, then its orientation matches either {N,S,E,W}; because aircraft are allowed to move in a freely continuous manner WRT position and orientation (versus 'gridwalker' bound which is fixed to either cell midpoints facing an edge xor corner, else in the process of transforming thereto)
 - b) Opposite effect of Step sequence {4d, 4c, 4e, 4f, 4g} occurs, followed by analog to Step 4a

Configuring and Upgrading Units

[Re]Configuring Units

Introduction

When a 'civilian' becomes a 'GI' and a 'pickup' becomes an 'IFV', they each start out with their respective default settings; and can be equipped thereon with the other available options (unless player chooses to merge both steps into one, but we get to the same situation regardless). Units can reconfigure i.e. 'swap out' their weaponry and/or equipment (e.g. Sniper-Rifle soldier can change into Combat-Shotgun soldier, Field Medic can become Technician, 'Worker' can even switch into a 'Soldier' type and vice-versa!) But they cannot do this anytime, anywhere; as there are places they need to go to do this. How units can do this both 'at base' and 'in the field' is discussed below after a word on how this fits with SH/RTS followed by how resource costs work.

SH/RTS 'Sales Pitch'

- **The Good:** Zed Alert allows you to change a single IFV from troop/cargo transport to machine gun to frag gun to and more - versus having to buy more than one 'specialty unit' like most other RTS games. Imagine if, for the classic RTS game 'Red Alert 1': the Mammoth Tank could replace its twin 120mm cannons with Tesla Coils, then later become disarmed but can serve as an APC for a dozen or so soldiers - as well as hauling supplies and fuel back to base, then later still be armed again with the Tesla Coils but also have a missile launcher equipped as its secondary weapon? Versus having to purchase a Mammoth Tank, then a Tesla Tank, then an APC, then another Tesla Tank plus a V2 Missile Vehicle all as separate units?
- **The Bad:** As aforementioned, this hypothetical Mammoth Tank cannot simply switch its configuration anytime, anywhere. It will need to be brought to either an on-base 'Garage' or mobile 'Vehicle Repair Vehicle' and then disabled during the reconfiguration process [time delay]; and that's only if the player can afford to do so (see 'Cost Mechanics' notes immediately below for more info thereof).
- **The Ugly:** Is the player down to their last few men with a bunch of approaching zombies, and all of the units happen to be unarmed civilians, and the player needs to turn them into some armed form ASAP and has the funds to do so: but there's no worker unit to man the barracks? Too bad...

How They're Paid For

'Algorithm' for reconfiguration costs:

- 1) Compute the balance of resource costs WRT debiting the existing type and crediting the desired type.
- 2) If any resource value[s] in step 1 are negative: compute their balance against current player resources.
- 3) If there still exists at least one negative balance: player CANNOT afford reconfig request - reject it!
- 4) Else: Add step 1 balance to player resources (reflecting cost[s] and surplus[es]), then permit request!

Example: A 'Heavy Machine Gun' IFV wishes to become a 'Flamethrower' IFV.

- The cost of 'Heavy Machine Gun' IFV is: **{supplies:50, scrap:50, fuel:25}**
- The cost of a 'Flamethrower' IFV is: **{supplies:100, scrap:45, fuel:500}**
- The player's current resources are: **{supplies:500, scrap:480, fuel:475}**
- Via Algorithm Step 1, request balance is: $\{50-100 \ 50-45 \ 25-500\} = \{-50 \ +5 \ -475\}$
- Via Algorithm Step 2, total balance will be: $\{500-50 \ 480+5 \ 475-475\} = \{450 \ 485 \ 0\}$
- Reconfig costs more than current type, but player has enough to cover balance: therefore ALLOW reconfig request, and adjust player resources accordingly WRT to this transaction i.e. **{450 485 0}**

[Re]Configuring 'At Base'

Body Units	Must have a Barracks occupied by at least one GI acting as 'quartermaster' (whom can be of basic type, also: maybe allow civilian workers this role too?) Unit will be allowed to reconfigure when near (within one cell) or inside such a barracks.
Vehicle Units (Manned)	Must have a Garage occupied by at least one worker of type 'mechanic' (or 'technician') who is not currently on 'R&D task' (i.e. servicing a armor/speed/dam global upgrade). Vehicle will be allowed to reconfigure when docked inside of such a garage.
Vehicle Units (Unmanned)	Same as manned vehicles, except there must be a UXV Operator alive somewhere in the map if UGV; else a Robotics Unit Operator occupying the garage (in addition to worker or technician) for robotics units.
Aircraft Units	Analogous to manned and unmanned vehicles; except swap garage with helipad/airfield

[Re]Configuring 'In The Field'

Body Units	Must have a 'mobile barracks vehicle' occupied by at least one GI acting as 'quartermaster' (whom can be of basic type, also: maybe allow civilian workers this role too?) Unit will be allowed to reconfigure when near (within one cell) or inside such a vehicle.
Vehicle Units (Manned)	Must have a 'mobile workshop vehicle' occupied by at least one worker of type 'mechanic' (or 'technician') who is not currently on 'R&D task' (i.e. servicing a armor/speed/dam global upgrade). Vehicle allowed to reconfigure when adjacent (within one cell) of such a vehicle.
Vehicle Units (Unmanned)	Same as manned vehicles, except there must be a UXV Operator alive somewhere in the map if UGV; else a Robotics Unit Operator inside the vehicle (in addition to worker or technician) for robotics units.
Aircraft Units	NONE - It needs to be on a helipad or airfield!

Healing/Repairing Units

- Mobile i.e. 'in-the-field' healing/repair are more expensive WRT resource[s] costs than 'on-base'
- How repairs are done is analogous to [re]configurations WRT where unit desiring repairs needs to be and what units need to be inside the structure/vehicle providing the service (and in the world for robots).

Global All-Unit Upgrades

Introduction

Unit Damage/Armor/Health upgrades will be similar to StarCraft 1: in that they will be 'researched and developed' via an 'R&D' task at their respective base facilities, and benefits apply to ALL units applicable thereto. However, my version has two spins on this idea...

Feature 1: Limitless Upgrades

Updates increase exponentially in both resource and time costs to accomplish the next update; such that:

- **On the minus side:** This will set an implicit limit of upgrades within 'a normal game where cheats/mods aren't used' to around maybe 10 or so.
- **On the plus side:** The benefits improve exponentially as well (though not at the rate of costs).

Feature 2: 'Guns Or Butter'

Which in this context alludes to the fact that these upgrades (and possibly other global upgrades involving units too) can only be R&D at the same 'factory' structures which produce units. Again:

- **On the minus side:** This means a factory will have its unit production/upgrade/repair functionality halted whenever it's doing an R&D task.
- **On the plus side:** I'm not making you build special upgrade-only structures such as the 'Academy', 'Armory', 'Engineering Bay', etc. as-seen-in StarCraft 1; and
- **Another plus:** If you need to switch back to production: R&D progress is always SAVED i.e. preserved at current progress! You can even play 'hot potato' where, for example: a factory in a safe part of the map can continue R&D progress from another which [desperately] needs to do repair/config jobs.

Weapons and Ordinance

Introduction / General Details

This section provides some additional notes regarding various weapons and ordinance types; especially regarding how they incur damage upon nearby things. The details are purposely kept minimal, as this is still a largely experimental area for which we'll have additional details during the implementation of the MVP

NOTE: Appendix Exhibit #2 features a detailed table which lists and describes ALL Weapon Types!

RE: Friendly Fire

[Question] Should splash damage and friendly fire (i.e. friendlies in range of frag/bullet spread) hurt player units too? Same with damaging effects of weapons/ordnance (e.g. fire, acid, etc.)?

[Answer] I think they ought to; especially vis-a-vis 'Survival Horror RTS' theme for Zed Alert. Perhaps with the following 'considerations' as a means to a fair compromise:

- Friendly splash/spread damage onto obstacles (e.g. walls), owned buildings (e.g. former civilian shop converted into a barracks), and built structures (e.g. 'shack' garage) will not count; unless the player is purposely firing on their own such structures.
- Friendly splash/spread damage onto body and vehicle units could be reduced in severity: i.e. to 25% or 50% (or a [difficulty/realism] setting thereto in the 'full release' options menu).

RE: Human Melee

[Question] Should we implement an 'ultimate default' and 'backup' melee weapon for all body unit types (especially base civilians) wherein they [desperately] push/shove/punch/kick immediately adjacent zombies?

[Answer] Probably, even for the MVP. Mostly since it's basically the same attack that zombies use - so I'll be implementing melee fist-and-foot attacks in any case.

Payload Ordinance Notes

Introduction / Default Settings

The following discusses the various payload ordinance types available to any unit or defensive structure equipped with any type of Grenade, RPG, and Missile Launcher; as well as Landmines and Wallmines. Note that WRT unit weapons (i.e. the aforementioned sans mines): differences between each weapon are what determines their ROF, range, and the additional damage factor for military vehicles (i.e. RPG fired from a Humvee or Abrams Tank incurs maybe 15-25% more damage than from an IFV or otherwise). Also note that 'Fragmentation' will be the DEFAULT ordinance type for units that were just [re]configured into equipping a Grenade/RPG launcher as well as mines.

Ordinance Types

Type	Description			
	Grenade?	Land Mine?	Wall Mine?	Missile?
Fragmentation <i>[Default Type]</i>	Lead with Spread, 'Nuff Said. Good for pausing crowds at mid distances while shredding small[er] groups at close distances.			
	YES	YES	YES	NO
High Explosive	Effectively a more powerful version of fragmentation ordinance, while including a high chance (50% WLOG?) to set nearby entities on fire.			
	YES	YES	YES	YES
Flash Bang	Distracts zombies and human body units, temporarily freezing them (similar to human response to Banshee screams). Will deal a [very] small amount of splash damage.			
	YES	NO	NO	NO
Incendiary <i>(i.e. 'Fire')</i>	Sets targets on fire, 'Nuff Said (at least sans detailed mechanics which remains TBD as aforementioned). Though I'll note that the spread of flames will be 'minimally sloppy' and have more 'seed particles' from which flames grow (lol - so much for 'TBD')			
	YES	NO	MAYBE	YES
Chemical <i>(i.e. 'Acid')</i>	As with fire, continuously decrements health of anything covered in it. But where a zombie on fire might run around catching nearby zombies [Good!] and friendly humans [Bad!] on fire: acid does not have splash' damage sans that initially done by warhead.			
	YES	NO	NO	YES

Ordinance Detonation Modes

Mode	Description			
	Grenade?	Land Mine?	Wall Mine?	Missile?
Collision-Detonate <i>[Default Mode]</i>	Warhead detonates when it collides with either the ground (after a small delay) else an enemy unit (immediately detonating on impact)			

	YES	NO	NO	YES
Proximity-Detonate	Obligatory from the good 'ol days of Goldeneye-64 Proxy Mines. Warhead detonates when target is within some distance and within forward-facing cone.			
	NO	YES	YES	NO
Remote Detonate (i.e. 'Manual Trigger')	Detonates when player decides to do so. This will likely be realized			
	NO	MAYBE	MAYBE	MAYBE
Squeal-Wait-Detonate (<i>Timer xor Remote</i>)	Basically, analogous to the pipe bomb in L4D, except with an additional 'wait' behavior of remote-control (i.e. manually-triggered). It has three phases: <ul style="list-style-type: none"> • Squeal: Starts when shot out the barrel. Uses a radio's speaker to make a bunch of electronic squeals and other noises a-la 'Doom 3 Radio Combat Sounds' as it travels: which attracts zombies to it (and, BTW: will REPEL enemy human soldiers away from it!) • Wait: Includes the projectile's travel time to hitting the ground, followed by either a small waiting period xor remote-controlled trigger; in either case as to maximize the number of zombies crowding towards it • Detonate: Click-Click-Boom, 'Nuff Said 			
	YES	NO	NO	NO

Grenade/Missile Weapon Info

Switching Between Types and Modes: The Player xor 'AI Commander' will be able to change ordinance types for one or more unit[s] via a toggle in the Unit Options GUI; WRT to those available to them (see 'Upgrading' immediately below). In any case: this switch will effect 'instantly and magically' to the affected unit[s], i.e. no need for them to go to a tent/barracks for an equipment exchange. Mines CANNOT have their ordinance type switched once installed into the ground / onto a wall!

Upgrading: Sans the default type/mode, some or all of the other types might be locked behind either a campaign progress trigger and/or purchasable via resource cost[s] as global upgrades; and at [roughly] the same costs to each other (as the purpose is 'upgrade only what you want, when you want it').

Missile Behavior Modes

To-Target [Default Mode]: Simply flies to where the unit decided (or was ordered) to fire it. Analogous to that of most 'Missile Trooper' and 'rocket launcher' units of classic RTS games, the [vanilla] Rocket Launcher of classic DooM, and the 'Stinger MLS' of Metal Gear Solid.

Homing: Analogous to those fired by the 'Revenant' of classic DooM, homing missiles will steer towards the target (likely using simple 'pursue' with a lower max-force than as used for unit motion); detonating within very close range of the target (e.g. ~8 pixels or so?), first mobile AND/OR stationary obstacle, or some time limit (e.g. 10 seconds) - whichever occurs first. Ideal/intended for mobile targets, though other strats are likely/TBD.

Pathing: Analogous to those fired by the 'Nikita CML' of Metal Gear Solid, pathing missiles will 'walk' a path to the target in 'gridwalker' style; detonating at the target, first mobile obstacle, or some time limit (e.g. 10 seconds) - whichever occurs first. Ideal/intended for stationary targets, though other strats are likely/TBD.

Mine Types (Wall/Land)

There are two kinds of mines (as placed by either a base-or-above worker and/or mobile Minelayer). They do not differ in terms of behavior outside of their specific ordinance types

- **Wall Mines:** As seen in the classic Duke Nukem games and/or Goldeneye-64
- **Land Mines:** As seen (and remain) in too many real-life war-zones, 'Nuff Said.

Bullet Ordinance Notes

Bullets In General

Bullets will be implemented as 'Linecasts' with no projectile and which travel instantaneously (i.e. target will receive damage on the same frame else next frame of colliding with a bullet. I might also implement bullets which can collide with multiple targets (i.e. 'armor-piercing' or 'high-velocity' rounds as would be utilized by the minigun and sniper rifle); whereby each successive collision reduces the bullet's damage until a threshold in which it terminates (whereas 'regular' bullet terminates on first collision).

Spread/Splash Damage

Spread Damage: Implementing frag weapon (and other) 'spread' damage will be done via common heuristic of using "lines shot out of a cone from the player's forward origin [WRT the weapon's barrel]"; thus they utilize bullets. Also similar to classic Doom shotguns and/or BFG-9000 via its analogous 'tracers shot out of a cone'.

Splash Damage: Function and mathematics R&D work thereto has been kept in its own page within the 'Technical Notes' pages of the Zed Alert section, as there's no need for it to be moved here (at least ATM, and as its definition might change over time). That said: I'll be using a specially-tuned exponential function.

Zombie Units

Introduction

This section lists and describes each of the current zombie types. Content related to stats and zombie AI (i.e. the infamous Z-Dispo) is largely TBD at this time and will be added as the MVP implementation proceeds.

NOTE: When You DO Write Z-Dispo, do so WRT different 'plans' / 'behaviors'; e.g. "follow human scent will be realized via Steering Agent Flow Field Follow wherein the field will be the one realizing human scent"

Current Zombie Types

Name	Description
Type 1 : 'Classic' Zombies (WILL be implemented in MVP)	
Walker	Classic 'Romero-Style' zombie; i.e. stumbles and shambles around as to not be much of a threat in small numbers and some distance away
Fatso	Walker with more hitpoints and damage, larger size [obviously], and slower speed.
Runner	'28 [X] Later' infected and/or L4D-style zombie; i.e. more athletic and runs.

Sneaker	Can keep itself quiet enough to hide and stalk targets, as well as slowly sneak towards them, as well as sprint to ambush a target. Basically: Zed Alert's analog to L4D 'Hunter'.
Type 2 : 'Specialty Zombies' (MIGHT be implemented in MVP)	
Skeleton	Incredibly skinny zombie, advanced signs of mass loss, kind of like 'Boney' from Doom 3. These could be seen as 'older zombies less able to preserve/maintain their corpses over time'.
Bigfoot	Muscle and hair mutation, extremely muscular, 7+ feet tall, can break through some walls. Basically: Zed Alert's analog to L4D's 'Tank' zombie type; or simply, yep: a [zombie] Bigfoot.
Werewolf	Small quadruped zombie that could use a shave. They take back to our genetic past and so have stronger muscles and run on 4 legs, and are more aggressive. Think of a human mutated with the body and strength of a gorilla and the legs of a bull. Basically: A lighter, faster Bigfoot.
Spiker	Another semi-fast, these former humans have claw or horn-like growths (Cornus Cutaneum) replacing the tips of their fingers, coming out of their shoulder blades, knees, backs (along spine) and heads. Cause more melee damage and increased damage to light armor. Basically: analogous to the 'Tunneler' from Fallout New Vegas Lonesome Road.
Vamp	Stealthy and can use mutated leg muscles to 'spring' short distances to ambush humans (as to insta-convert them to Adult Runners under their control {i.e. via placing his 'thralls' within a SA flock of uniquely high cohesion with their fellow group members})
Banshee	Female counterpart to 'Vamp', is able to use her screams to [1] Freeze unhardened human body units s.t. they'll be unable to move (or even attack) within a timeframe determined by their distance from her (s.t. no effect if far enough); and [2] Rally nearby zombies in a group similar to the vamp's 'thralls' (except he turns humans where she can only rally undead)

Note on 'Zombie Commander'

If you wanted to play with 'unit commanding AI' for hostiles WRT the undead faction: a 'natural' way to realize this is via vamps and banshees vis-a-vis the groups they form/rally.

Structures and Defenses

Introduction

This section discusses the various types of pre-existing and buildable structures in Zed Alert. It is perhaps the most WIP section, as the least amount of detail is 'comfortably' certain thereto; though additional details will be available as I start implementing parts of Zed Alert and experimenting thereto as to figure them out. There are three main subsections discussing structures, as follows:

- **Existing Buildings** are structures which existed before or at the Zombie Apocalypse; and they include everything from houses and shops, to schools and armories, to gas stations and grocers. The player will be able to scavenge them for various resource types (e.g. food and supplies), purposely destroy these buildings for materials scrap, and 'annex' them before reconfiguring them for various uses (e.g. barracks, supply depot, base defenses, even [rooftop] helipad).
- **Obstacle Structures** are those which can stop (or at least slow) zombies and hostile humans from entering the player's settlement, while some provide a further defensive role via units firing therefrom.
- **Defensive Structures** are those which either damage nearby enemy units, ideally killing if not scaring off any threats to the base/settlement; else provide a role of support [body] units which do.

Existing Buildings

Blurb/Stub

This is the only subsection which I am going to leave largely devoid of details, as they encompass their own subset of multiple implementation ideas, constraints, and concerns. They're also the 'lowest fruit' of the MVP; i.e. I'm going to leave them as inaccessible external shells if the remainder of the build [barely] works and/or the MVP undergoes enough scaling-down thereto.

Teaser Overview

That Said: they will be civilian or other buildings of which the ground floor as well as some others (e.g. basement and rooftop) are accessible, explorable, and useable for a variety of purposes. In the style of Fallout 1 and 2: their external facade shells will be fully or partially hidden whenever the player selects and/or hovers over them, as to reveal the events happening inside.

Thus if [when] fully implemented, they are where worker units will be sent when scavenging for resources. They can also be used as fortifications (temporary or longer WLOG) and parts of settlements: though can be broken-through by zombies (even when windows and doors are sealed with concrete if attacked by the stronger zombie types, and of course by enemy humans with their own grenades and missiles!)

Defensive/Obstacle Structures

Obstacle Structures: Overview

Obstacle Structures are fences, walls (including those of buildings), and [maybe] pits. As with other RTS games, they do take damage and will wither away until being fully broken through when their 'health' hits zero. Perhaps unlike other RTS games: the effect of such damage exponentially increases as health decreases, thus it is more important to keep an eye on and maintain them after every defensive engagement. They are also 'segmented objects': i.e. will change their appearance to reflect adjacent obstacles of the same type, and can be built in one of several ways (TBD reduced to one as I implement MVP). See the page 'Segmented Wall Construction' in the Technical Notes section of the OneNote for more info on this mechanism. Worker units are needed to build and maintain obstacles. The types are as follows (sans pits which have their own subsection below), and there's really no need for a blurb/description; as such is pretty self-explanatory:

Obstacle Structures: Types

Type	Description / Upgrade Options
Chain-Link Fences	Enhancement Upgrades: one or both of the following two (i.e. NOT mutually exclusive)... <ul style="list-style-type: none">• Barbed Wire: Increases health of fence to 125% of base health (maybe even sets back to full if damaged); and does [very] small damage to zombies attacking it.• Electrified Fence: Increases armor of fence from 0% to ~25%; and damages any zombie attacking it via a shock attack, s.t. able to quickly kill weakest type or two. Type Upgrades (i.e. changes it to base form of [better] obstacle): Wooden xor Concrete Wall
Wooden Walls	Description: Narrow but sturdy ~8 foot tall palisade wall. Soldiers can 'shoot through it' (via loopholes cut into it which we cannot see). Be careful with units armed with flamethrowers, ordinance launchers, and energy weapons, however: it can also catch on fire!

	Type Upgrade: Can be upgraded to Concrete Wall
Concrete Walls	<p>Description: Thick and formidable ~12 foot tall castle wall. Soldiers can NOT shoot through it (though can shoot over it via Rampart upgrade). Obviously fireproof (i.e. wont catch on fire)!</p> <p>Enhancement Upgrades: two, wherein at least one of the latter is required for the first type...</p> <ul style="list-style-type: none"> • Rampart: Adds 1-tile walkway for soldiers to defend from / travel along. Unless a wall has a rampart, soldiers cannot fire out from it (i.e. cannot magically hover and fire) • 'Rampart Steps' allow soldiers to enter/exit rampart (ergo at least 1 is needed). Requires [1x3] cell clearance to fit the steps [1x2] and clearance 'bib' [1x1] composing it.
Existing Buildings	<p>Ground Floor Upgrades can be fortified via the following four sequential improvements (i.e. are mutually exclusive WRT each other) which are numbered {1,2,3,4} accordingly...</p> <ul style="list-style-type: none"> • Board-Up Windows and Doors with [1] Shelves/Rubble [2] Wooden Planks • Fill-In Windows and Doors with [3] Bricks [4] Concrete <p>Rooftop Upgrades are realized via Defensive Structure types</p>

Defensive Structures: Overview

There are two main kinds of defensive structures accordingly:

- **'Automated Defenses'** which are considered 'robots' and thus require Robotic Operations Specialists to construct and remain alive to 'babysit' (with similar/same mechanics as robotic UXVs if they don't). Furthermore: these defenses work with a modular 'socket' system similar to the 'Component Tower' of the GDI faction within 'C&C Tiberian Sun'; such that one among a variety of different weapon types can be attached to either a ground 'pedestal', elevated 'tower', or existing building rooftop.
- **'Manned Defenses'** of which body units inhabit as to fire their weapons from. Furthermore, similar to automated defenses: there are ground, tower, and rooftop types of structures for soldiers to occupy.

Defensive Structures: Range Differences

As immediately aforementioned: there are a further three subtypes of 'platforms' of which automated xor manned defensive structures are placed upon. Each of these encompass differences in the range of possible attack (which for manned types can override and/or mutate via some factor that of the inhabiting unit[s]); such that some feature a 'min range' whereby enemy units at or closer cannot be fired upon. Details are as follows, noting that values (in game units {i.e. pixels}) are rough for reference only, assuming a [32x32]px cell size:

MANNED	Min Range	Max Range		ROBOTIC	Min Range	Max Range
Ground	0px	[1x] Base		Ground	0px	[1x] Base
Rooftop	32px	[2x Base]		Rooftop	40px	[3x] Base
Tower	64px	[4x Base]		Tower	80px	[6x] Base

Automated Defensive Structures

Weapon Type	Weapon Options 'Mount' i.e. 'Socket' Type		
	Pedestal	Rooftop	Tower
Heavy Machine Gun	DEFAULT	NO	DEFAULT

Assault Shotgun	NO	DEFAULT	NO
Flamethrower	YES	NO	NO
Tesla Coil	NO	NO	YES
RPG Launcher	YES	YES	YES
Missile Launcher	YES	YES	YES
Particle Beam Gun	YES	NO	NO
Heavy Tactical Rifle _[1]	NO	YES	YES

Manned Defensive Structures

Manned Defensive Structures feature a base type and upgrade type. Analogous to the Obstacle Wall types: these encompass a base which is mostly made of wood, and an upgrade which is made of concrete; with the same fire risk of the base type, and the health/armor improvements of the upgrade type. They are as follows:

Structure Type	Base Type	Upgrade Type
Grounded	Guard Post	Pillbox
Elevated	Guard Tower	Turret
Rooftop	Guard Terrace	Parapet

Pits: Implement? Ideas How

Disregarding the technical questions which make them questionable: Pits encompass parts of the map's 'ground level' which has been dug out to form segmented trenches and/or, well - pits. Their intended purpose was to act as both obstacles (e.g. via perimeter segments acting as 'moats') and defensive traps (e.g. via 'fire', 'acid', 'shock', and even 'water' upgrades). I don't want to dismiss them from any consideration in the MVP nor 'fully complete' versions because they are the kind of things that a group of survivors might build to assist their ability to defend a settlement. However I'm apprehensive towards an absolute need to realize them, because implementation is a bitch and there's already a ton of it for even the MVP. That said: the following paragraph offers a general idea for how this could be implemented with minimal headache.

Zed Alert is a 2D top-down game, that's unquestionable. It might have 3D considerations for physics and other computations, with corresponding GFX/VFX, but still: 2D Gridworld. So we can't simply submerge the pits as could be easily done via a 3D mesh/heightmap world. Zed Alert DOES, however, pseudo-realize the visual and obstacle nature of multiple elevations in the same way that many classic 2D RTS games did it: use impassible tiles which visually represent the partitioning of the landscape; i.e. which look like cliffs; while other tiles act as 'transitory' terrain smoothly elevating up/down to the other surface (e.g. [natural] camp against the cliff), which correspondingly connects the passable tiles between the two areas. This is doable for Zed Alert, and we could implement similar to the [multi-]segment walls: except where a concrete wall needs [1x1] tiles, any pit tile will need [3x3] tiles corresponding to the degree-1 Moore Neighborhood of the pit cell; sans any such cells of which are either already pits, already 'cliffs', and/or transitional tile[s] encompassing a ramp.

Final Note: I'll likely create a visual demo of this (or even implement it within a side-project build) at some point in the near future; ergo whoever can check with me on reading this with interest to see if that's been done!

Production and Repair Structures

Introduction

This subsection discusses production and repair structures (which are one-in-the-same WRT to what exactly they produce/[re]config and repair). How they work vis-a-vis roles and required personnel have largely already been discussed throughout this design document, so additional notes will be as-needed in brevity.

Structure Types

Barracks: [Re]Configures and heals body units, if manned by at least one worker. Adding a medic (or doctor if I do partition into two types) enables the barracks to do body unit oriented R&D for 'all units' health/armor Upgrades. Barracks can be built as either a 'tent' as seen in small settlements/outposts, else a full barracks within a created 'shack' structure, else a repurposed [abandoned/empty] existing building (as might be expected for large settlements); alongside the mobile vehicle analog.

Garage: Analogous to 'Barracks' except WRT vehicle units. Further: a technician/engineer must occupy it for similar R&D into 'all units' vehicle health/armor upgrades; while a UXV Operator xor Robotic Operations Specialist must occupy it in order to enable, construct, [re]configure, and/or repair UXV xor robotic units. Garage can be built as either a 'workshop tent' as seen in small settlements/outposts, else a full Garage within a created 'shack' structure, else a repurposed [abandoned/empty] existing building (as might be expected for large settlements); alongside the mobile vehicle analog.

Helipad: As aforementioned: Helipads are needed to [re]configure and repair helicopter units, as well as R&D for their 'all-units' upgrades (likely via a technician and/or engineer as with vehicle R&D within garages). Further, helipads can only be built on a [3x3] cell area of unoccupied ground tiles, else a [3x4] cell rooftop whose 'roof cells' are also unoccupied (the extra 'row' xor 'col' realizes a [2x1] space for units to step of the helipad, and a [1x1] access door to a staircase leading down the building into ground level.

Supply Warehouse: As mentioned in the 'Resource Types' section, these are needed to both store gathered supplies, and to serve as the place in which workers actually physically place them (as they won't be incremented to the player's inventory otherwise. They can exist as either fully constructed standalone 'shack' structures, else repurposed existing buildings (which will be the main purpose of a settlement containing multiple existing buildings, as not many garages, barracks, etc. will be needed.

Appendix

[1] Common Acronyms/Words

Acronyms and General Expressions			
A/A	As Applicable	WRT	With Respect To
TBD	To Be Determined	TEMP	Temporary
NAT	Next Actionable Task. Via David Allen's 'Getting Things Done': it refers to individual tasks which can be completed immediately and within a short time (i.e.1-3 hours)		

KISS	Keep It Simple, Stupid. Specifically: me telling myself not to overthink, overword, overstress, etc. in order to get something sketched, described, and implemented.		
Unit and/or Weapon Stats		[TEMP] Unit Stat Categorical Values	
DAM	Base Damage	CNST	constant rate of fire
RGE	Max Range (WRT world units, which are currently pixels)	XTRM	extremely high damage value
ROF	Rate Of Fire (WRT frames between shots xor bursts thereof)	PROJ	damage varies WRT projectile type (incendiary, frag, etc.)

[2] Complete Weapons List

NOTE: The following is attached as an image, but is defined within its own Google Doc (and is planned to be defined as an HTML table wherein it will be appended accordingly to this appendix item).

FAMILY	WEAPON	DAM	RGE	ROF	UNITS	BLURB
PISTOLS	Pistol	LOW	LOW	LOW	BODY	<i>Simplest firearm and [typically] default weapon. Fires ~7 shot burst before reload delay</i>
	Dual Pistols	MED	LOW	MED	BODY	<i>Basically: two times the base type, because two times the base pistols, 'Nuff Said</i>
	Scoped Pistol	HIGH	MED	LOW	BODY	<i>Basically: 'Revolver' with better [DAM] and [RGE] at cost of [ROF]</i>
PREC RIFLES	Hunting Rifle	LOW	MED	LOW	YES	<i>Average rifle, as owned by your neighborhood outdoorsman / Fallout 3 character build</i>
	Semi-Auto Rifle	HIGH	MED	MED	YES	<i>Think AR-15. Ideal for CQC and engaging small[er] groups of zombies / enemy infantry</i>
	Sniper Rifle	HIGH	XTRM	LOW	YES	<i>Ideal for dispatching smaller groups of zombies / enemy infantry at long[er] distance</i>
	Heavy Tactical Rifle	HIGH	XTRM	MED	VEH DEF	<i>Semi-Auto xor/i.e. Higher ROF Sniper Rifle. Heavy/Bulky: so vehicle/structure only</i>
AUTO RIFLES	Submachine Gun	LOW	LOW	MED	BODY	<i>Note: I might add a 'Dual SMGs' global upgrade that would increase DAM to [MED]</i>
	Fully-Auto Rifle	MED	MED	HIGH	BODY	<i>Think M-16. Ideal for combat / suppressing fire on small to mid sized groups of bodies</i>
	Minigun	XTRM	LOW	CNST	BODY	<i>Minigun Goz Brrrrrr! Note: Might implement 'wind-up' deay; and it has [bad?] spread</i>
	Heavy Machine Gun	HIGH	MED	CNST	VEH DEF	<i>Fully-Auto Rifle with boosted [DAM] and [ROF]. Heavy/Bulky: so vehicle/structure only</i>
FRAG WEAPS	Shotgun	MED	LOW	LOW	BODY	<i>Pump-Action single barrel (as owned by your neighborhood convenience store owner)</i>
	Combat Shotgun	HIGH	LOW	MED	BODY	<i>Semi-Auto (6-8 rounds / reload delay, as owned by your neighborhood Rooftop Korean)</i>
	2X Barrel Shotgun	XTRM	LOW	LOW	BODY	<i>Double-Barrel (analogous to Doom Super-SG owned by your neighborhood Doom Guy)</i>
	Assault Shotgun	HIGH	LOW	MED	VEH DEF	<i>Combat Shotgun with boosted [DAM] and [ROF]. Heavy/Bulky: so vehicle/structure only</i>
PROJ WEAPS	Grenade Launcher	PROJ	LOW	LOW	ALL	<i>Simple base version (i.e. longer [ROF] and shorter [RGE] than its successor upgrade)</i>
	RPG Launcher	PROJ	MED	MED	ALL	<i>Improved [ROF] and [RGE] of base type (i.e. enough to more than merit upgrade cost)</i>
	Missile Launcher	PROJ	HIGH	LOW	ALL	<i>Intended for human enemy anti-air/armor, but ironically also good for packs of zombies!</i>
ENERGY WEAPS	Laser Blaster	LOW	MED	HIGH	BODY	<i>Blaster goes [pew! pew! pew!], and analogous to TD-P5JS 'Laser Blaster Tower'</i>
	Plasma Rifle	HIGH	MED	LOW	BODY	<i>'Semi-Automatic' improvement with different VFX (i.e. 'plasma ball' <vs> 'beam rod')</i>
	Laser Burst Rifle	XTRM	LOW	LOW	BODY	<i>'Sniper Rifle' improvement which fires single but powerful and long-range 'beam point'</i>
	Particle Beam Gun	XTRM	LOW	CNST	VEH DEF	<i>Cuts through enemies like a hot knife through butter. Analogous to TD-P5JS 'Beam Tower'</i>
	Tesla Coil	HIGH	LOW	CNST	VEH DEF	<i>Shocks enemies (pun intended). And no, EA: you can't claim trademark/IP thereof, silly!</i>
MISC WEAPS	Flamethrower	MED	LOW	CNST	VEH DEF	<i>No RTS is complete without it. Though be careful: it can also set your units on fire!</i>
	120mm Cannon	HIGH	XTRM	LOW	M1A1 ONLY	<i>Only available as M1A1 Tank primary weapon, serving as Zed Alert's 'artillery' weapon.</i>

END OF DOCUMENT