Phobos

The Phobos Contributors

Apr 26, 2024

PROJECT INFO

This page lists general info that should be known about the project.

ONE

BUILD TYPES

There are three main types of Phobos builds:

- *stable builds* - those are numbered like your regular versions (something close to semantic versioning, e.g. version 1.2.3 for example) and ideally should contain no bugs, therefore are safe to use in mods;

- *development builds* - those are the builds which contain functionality that needs to be tested. They are numbered plainly starting from 0 and incrementing the number on each release. Mod authors still can include those versions with their mods if they want latest features, though we can't guarantee lack of bugs;

- *nightly builds* - bleeding edge versions which can include prototypes, proofs of concepts, scrapped features etc., in other words - we can't guarantee anything in those builds and they absolutely should NOT be used in mod releases and should only be used to help with development and testing.

1.1 Disabling development build warning

DISCLAIMER: We understand that everyone wants to try and use the new features as soon as they're released, but we can't do all the testing ourselves, so we only test the functionality on a basic level. We ask everyone who uses the new development build first to **test the new changes in every possible way first before disabling the development build warning** and proceeding to include the build in your mod release. This would allow us to concentrate on implementing the actual features, which is the most complex task. Learn more on testing *here*.

You can hide the warning by specifying the build number after `-b=` as a command line argument (for example, `-b=1` would hide the warning for development build #1 of Phobos).

TWO

SAVED GAMES FILTERING

Phobos fully supports saving and loading thanks to prototype code from publicly released Ares 0.A source and it implements it's own filtering which shouldn't conflict with Ares save filtering. Save games between different versions are incompatible due to changes to Phobos extension classes which are present in almost every build release. The filtering mechanism, hovewer, doesn't apply to nightly versions - those use latest development build number on which this nightly is based on. While different nightly version saves may be listed, they are most likely incompatible in case there were changes to extension class fields.

COMPATIBILITY

While Phobos is standalone, it is designed to be used alongside Ares and CnCNet5 spawner. Adding new features or improving existing ones is done with compatibility with those in mind.

While we would also like to support HAres we can't guarantee compatibility with it due to the separation of it's userbase and developers from international community. We welcome any help on the matter though!

WHAT'S NEW

This page lists the history of changes across stable Phobos releases and also all the stuff that requires modders to change something in their mods to accommodate.

4.1 Migrating

Hint: You can use the migration utility (can be found on Phobos supplementaries repo) to apply most of the changes automatically using a corresponding sed script file.

4.1.1 From vanilla

- Translucent RLE SHPs will now be drawn using a more precise and performant algorithm that has no green tint and banding. Can be disabled with `rulesmd.ini->[General]->FixTransparencyBlitters=no`.

- Iron Curtain status is now preserved by default when converting between TechnoTypes via `DeploysInto/UndeploysInto`. This behavior can be turned off per-TechnoType and global basis using `[SOMETECHNOTYPE]/[CombatDamage]->IronCurtain.KeptOnDeploy=no`.

- The obsolete `[General]` `WarpIn` has been enabled for the default anim type when technos are warping in. If you want to restore the vanilla behavior, use the same anim type as `WarpOut`.

- Vehicles with `Crusher=true` + `OmniCrusher=true` / `MovementZone=CrusherAll` were hardcoded to tilt when crushing vehicles / walls respectively. This now obeys `TiltsWhenCrushes` but can be customized individually for these two scenarios using `TiltsWhenCrusher.Vehicles` and `TiltsWhenCrusher.Overlays`, which both default to `TiltsWhenCrushes`.

4.1.2 From older Phobos versions

From post-0.3 devbuilds

- `ExtraWarheads.DamageOverrides` now falls back to last listed value if list is shorter than `ExtraWarheads` for all Warhead detonations exceeding the length.

- Air and Top layer contents are no longer sorted, animations in these layers no longer respect `YSortAdjust`. Animations attached to flying units now get their layer updated immediately after parent unit, if they are on same layer they will draw above the parent unit.

- `AnimList.ShowOnZeroDamage` has been renamed to `CreateAnimsOnZeroDamage` to make it more clear it applies to both `AnimList` and splash animations.

- INI inclusion and inheritance are now turned off by default and need to be turned on via command line flags `-Include` and `-Inheritance`.

- `Level=true` projectiles no longer attempt to do reposition against targets that are behind non-water tiles by default. Use `SubjectToLand=true` to re-enable this behaviour.

From 0.3

- `Trajectory=Straight` projectiles can now snap on targets within 0.5 cells from their detonation point, this distance can be customized via `Trajectory.Straight.TargetSnapDistance`.

- `LaunchSW.RealLaunch=false` now checks if firing house has enough credits to satisfy SW's `Money.Amount` in order to be fired.

- `CreateUnit` now creates the units by default at animation's height (even if `CreateUnit.ConsiderPathfinding` is enabled) instead of always at ground level. This behaviour can be restored by setting `CreateUnit.AlwaysSpawnOnGround` to true.

- Phobos-introduced attack scripts now consider potential target's current map zone when evaluating targets. *TargetZoneScanType* can be used to customize this behaviour.

- `Artillary`, `ICBMLauncher`, `TickTank` or `SensorArray` no longer affect whether or not building is considered as vehicle for AI attack scripts. Use *ConsideredVehicle* instead on buildings that do not have both `UndeploysInto` set and `Foundation=1x1`.

- `PassengerDeletion.SoylentFriendlies` has been replaced by `PassengerDeletion.SoylentAllowedHouses`. Current default value of `PassengerDeletion.SoylentAllowedHouses=enemies` matches the previous default behaviour with `PassengerDeletion.SoylentFriendlies=false`.

- `Grinding.DisplayRefund` is changed to `DisplayIncome`, `Grinding.DisplayRefund.Houses` is changed to `DisplayIncome.Houses`, `Grinding.DisplayRefund.Offset` is changed to `DisplayIncome.Offset`

- `[JumpjetControls]->AllowLayerDeviation` and `JumpjetAllowLayerDeviation` have been deprecated as the animation layering issues have been properly fixed by default now.

- `[JumpjetControls]->TurnToTarget` and `JumpjetTurnToTarget` are obsolete. Jumpjet units who fire `OmniFire=no` weapons **always** turn to targets as other units do.

- Buildings delivered by trigger action 125 will now **always** play buildup anim as long as it exists. `[ParamTypes]->53` is deprecated.

- `Shadow` for debris & meteor animations is changed to `ExtraShadow`.

From pre-0.3 devbuilds

- `Trajectory.Speed` is now defined on projectile instead of weapon.

- `Gravity=0` is not supported anymore as it will cause the projectile to fly backwards and be unable to hit the target which is not at the same height. Use `Straight` Trajectory instead. See *here*.

- Automatic self-destruction logic logic has been reimplemented, `Death.NoAmmo`, `Death.Countdown` and `Death.Peaceful` tags have been remade/renamed and require adjustments to function.

- `DetachedFromOwner` on weapons is deprecated. This has been replaced by `AllowDamageOnSelf` on warheads.

- Timed jump script actions now take the time measured in ingame seconds instead of frames. Divide your value by 15 to accommodate to this change.

- *Placement Preview* logic has been adjusted, `BuildingPlacementPreview.DefaultTranslucentLevel`, `BuildingPlacementGrid.TranslucentLevel`, `PlacementPreview.Show`, `PlacementPreview. TranslucentLevel` and `ShowBuildingPlacementPreview` tags have been remade/renamed and require adjustments to function. In addition, you must explicitly enable this feature by specifying `[AudioVisual]->PlacementPreview=yes`.

- Existing script actions were renumbered, please use the migration utility to change the numbers to the correct ones.

- `DiskLaser.Radius` values were misinterpreted by a factor of 1/2. The default radius is now 240, please multiply your customized radii by 2.

From 0.2.2.2

- Keys `rulesmd.ini->[SOMEWARHEAD]->PenetratesShield` and `rulesmd. ini->[SOMEWARHEAD]->BreaksShield` have been changed to `Shield.Penetrate` and `Shield.Break`, respectively.

- `Rad.NoOwner` on weapons is deprecated. This has been replaced by `RadHasOwner` key on radiation types itself. It also defaults to no, so radiation once again has no owner house by default.

- `RadApplicationDelay` and `RadApplicationDelay.Building` on custom radiation types are now only used if `[Radiation] -> UseGlobalRadApplicationDelay` is explicitly set to false, otherwise values from `[Radiation]` are used.

- Existing script actions were renumbered, please use the migration utility to change the numbers to the correct ones.

From 0.1.1

- Key `rulesmd.ini->[SOMETECHNOTYPE]->Deployed.RememberTarget` is deprecated and can be removed now, the bugfix for `DeployToFire` deployers is now always on.

4.1.3 New user settings in RA2MD.ini

- These are new user setting keys added by various features in Phobos. Most of them can be found in either in *user inteface* or *miscellaneous* sections. Search functionality can be used to find them quickly if needed.

```ini
[Phobos]
CampaignDefaultGameSpeed=4        ; integer
ShowBriefing=true                 ; boolean
DigitalDisplay.Enable=false       ; boolean
ShowDesignatorRange=false         ; boolean
PrioritySelectionFiltering=true   ; boolean
ShowPlacementPreview=yes          ; boolean
RealTimeTimers=false              ; boolean
RealTimeTimers.Adaptive=false     ; boolean
ToolTipDescriptions=true          ; boolean
ToolTipBlur=false                 ; boolean
SaveGameOnScenarioStart=true      ; boolean
```

4.1.4 For Map Editor (Final Alert 2)

In `FAData.ini`:

```
[ParamTypes]
47=Structures,28

54=Use GlobalVar,10
55=Operation,0
56=Variable index,0
57=Lower bound,0
58=Upper bound,0
59=Operate var is global,10
60=Operate var index,0
65=Campaign AI Repairable,0
68=House,1,2


[EventsRA2]
500=Local variable is greater than,48,6,0,0,[LONG DESC],0,1,500,1
501=Local variable is less than,48,6,0,0,[LONG DESC],0,1,501,1
502=Local variable equals to,48,6,0,0,[LONG DESC],0,1,502,1
503=Local variable is greater than or equals to,48,6,0,0,[LONG DESC],0,1,503,1
504=Local variable is less than or equals,48,6,0,0,[LONG DESC],0,1,504,1
505=Local variable and X is true,48,6,0,0,[LONG DESC],0,1,505,1
506=Global variable is greater than,48,6,0,0,[LONG DESC],0,1,506,1
507=Global variable is less than,48,6,0,0,[LONG DESC],0,1,507,1
508=Global variable equals to,48,6,0,0,[LONG DESC],0,1,508,1
509=Global variable is greater than or queals to,48,6,0,0,[LONG DESC],0,1,509,1
510=Global variable is less than or equals to,48,6,0,0,[LONG DESC],0,1,510,1
511=Global variable and X is true,48,6,0,0,[LONG DESC],0,1,511,1
512=Local variable is greater than local variable,48,3,0,0,[LONG DESC],0,1,500,1
513=Local variable is less than local variable,48,3,0,0,[LONG DESC],0,1,501,1
514=Local variable equals to local variable,48,3,0,0,[LONG DESC],0,1,502,1
515=Local variable is greater than or equals to local variable,48,3,0,0,[LONG DESC],0,1,
→503,1
516=Local variable is less than or equals local variable,48,3,0,0,[LONG DESC],0,1,504,1
517=Local variable and local variable is true,48,3,0,0,[LONG DESC],0,1,505,1
518=Global variable is greater than local variable,48,3,0,0,[LONG DESC],0,1,506,1
519=Global variable is less than local variable,48,3,0,0,[LONG DESC],0,1,507,1
520=Global variable equals to local variable,48,3,0,0,[LONG DESC],0,1,508,1
521=Global variable is greater than or queals to local variable,48,3,0,0,[LONG DESC],0,1,
→509,1
522=Global variable is less than or equals to local variable,48,3,0,0,[LONG DESC],0,1,
→510,1
523=Global variable and local variable is true,48,3,0,0,[LONG DESC],0,1,511,1
524=Local variable is greater than global variable,48,35,0,0,[LONG DESC],0,1,500,1
525=Local variable is less than global variable,48,35,0,0,[LONG DESC],0,1,501,1
526=Local variable equals to global variable,48,35,0,0,[LONG DESC],0,1,502,1
527=Local variable is greater than or equals to global variable,48,35,0,0,[LONG DESC],0,
→1,503,1
528=Local variable is less than or equals global variable,48,35,0,0,[LONG DESC],0,1,504,1
529=Local variable and global variable is true,48,35,0,0,[LONG DESC],0,1,505,1
530=Global variable is greater than global variable,48,35,0,0,[LONG DESC],0,1,506,1
```

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```
531=Global variable is less than global variable,48,35,0,0,[LONG DESC],0,1,507,1
532=Global variable equals to global variable,48,35,0,0,[LONG DESC],0,1,508,1
533=Global variable is greater than or queals to global variable,48,35,0,0,[LONG DESC],0,
↪1,509,1
534=Global variable is less than or equals to global variable,48,35,0,0,[LONG DESC],0,1,
↪510,1
535=Global variable and global variable is true,48,35,0,0,[LONG DESC],0,1,511,1
600=Shield of the attached object is broken,0,0,0,0,[LONG DESC],0,1,600,1
601=House owns Techno Type,68,46,0,0,[LONG DESC],0,1,601,1
602=House doesn't own Techno Type,68,46,0,0,[LONG DESC],0,1,602,1

[ActionsRA2]
125=Build at...,-10,47,0,65,0,0,1,0,0,[LONG DESC],0,1,125
500=Save game,-4,13,0,0,0,0,0,0,0,[LONG DESC],0,1,500,1
501=Edit variable,0,56,55,6,54,0,0,0,0,[LONG DESC],0,1,501,1
502=Generate random number,0,56,57,58,54,0,0,0,0,[LONG DESC],0,1,502,1
503=Print variable value,0,56,54,0,0,0,0,0,0,[LONG DESC],0,1,503,0
504=Binary operation,0,56,55,60,54,59,0,0,0,[LONG DESC],0,1,504,1
505=Fire Super Weapon at specified location (Phobos),0,0,20,2,21,22,0,0,0,Launch a Super␣
↪Weapon from [SuperWeaponTypes] list at a specified location. House=-1 means random␣
↪target that isn't neutral. House=-2 means the first neutral house. House=-3 means␣
↪random human target. Coordinate X=-1 means random. Coordinate Y=-1 means random,0,1,505
506=Fire Super Weapon at specified waypoint (Phobos),0,0,20,2,30,0,0,0,0,Launch a Super␣
↪Weapon from [SuperWeaponTypes] list at a specified waypoint. House=-1 means random␣
↪target that isn't neutral. House=-2 means the first neutral house. House=-3 means␣
↪random human target. Coordinate X=-1 means random. Coordinate Y=-1 means random,0,1,506
510=Toggle MCV Redeployablility (Phobos),0,0,15,0,0,0,0,0,0, Set MCVRedeploys to the␣
↪given value,0,1,510

; FOLLOWING ENTRIES REQUIRE FA2SP.DLL (by secsome)
[ScriptTypeLists]
1=ScriptLocalVariable
2=ScriptGlobalVariable
3=ScriptLocalVariable_Local
4=ScriptLocalVariable_Global
5=ScriptGlobalVariable_Local
6=ScriptGlobalVariable_Global

[ScriptLocalVariable]
HasExtraParam=Yes
BuiltInType=14

[ScriptGlobalVariable]
HasExtraParam=Yes
BuiltInType=5

[ScriptLocalVariable_Local]
HasExtraParam=Yes
ExtraParamType=ScriptExtType_LocalVariables
BuiltInType=14

[ScriptLocalVariable_Global]
```

```
HasExtraParam=Yes
ExtraParamType=ScriptExtType_GlobalVariables
BuiltInType=14


[ScriptGlobalVariable_Local]
HasExtraParam=Yes
ExtraParamType=ScriptExtType_LocalVariables
BuiltInType=5


[ScriptGlobalVariable_Global]
HasExtraParam=Yes
ExtraParamType=ScriptExtType_GlobalVariables
BuiltInType=5


[ScriptExtType_LocalVariables]
BuiltInType=14


[ScriptExtType_GlobalVariables]
BuiltInType=5


[ScriptsRA2]
10100=Timed Area Guard,20,0,1,[LONG DESC]
10101=Wait until ammo is full,0,0,1,[LONG DESC]
10102=Regroup Temporarily Around the Team Leader,20,0,1,[LONG DESC]
10103=Load Onto Transports,0,0,1,[LONG DESC]
10104=Chronoshift to Enemy Base,20,0,1,[LONG DESC]
18000=Local variable set,22,0,1,[LONG DESC]
18001=Local variable add,22,0,1,[LONG DESC]
18002=Local variable minus,22,0,1,[LONG DESC]
18003=Local variable multiply,22,0,1,[LONG DESC]
18004=Local variable divide,22,0,1,[LONG DESC]
18005=Local variable mod,22,0,1,[LONG DESC]
18006=Local variable leftshift,22,0,1,[LONG DESC]
18007=Local variable rightshift,22,0,1,[LONG DESC]
18008=Local variable reverse,22,0,1,[LONG DESC]
18009=Local variable xor,22,0,1,[LONG DESC]
18010=Local variable or,22,0,1,[LONG DESC]
18011=Local variable and,22,0,1,[LONG DESC]
18012=Global variable set,23,0,1,[LONG DESC]
18013=Global variable add,23,0,1,[LONG DESC]
18014=Global variable minus,23,0,1,[LONG DESC]
18015=Global variable multiply,23,0,1,[LONG DESC]
18016=Global variable divide,23,0,1,[LONG DESC]
18017=Global variable mod,23,0,1,[LONG DESC]
18018=Global variable leftshift,23,0,1,[LONG DESC]
18019=Global variable rightshift,23,0,1,[LONG DESC]
18020=Global variable reverse,23,0,1,[LONG DESC]
18021=Global variable xor,23,0,1,[LONG DESC]
18022=Global variable or,23,0,1,[LONG DESC]
18023=Global variable and,23,0,1,[LONG DESC]
18024=Local variable set by local variable,24,0,1,[LONG DESC]
18025=Local variable add by local variable,24,0,1,[LONG DESC]
```

```
18026=Local variable minus by local variable,24,0,1,[LONG DESC]
18027=Local variable multiply by local variable,24,0,1,[LONG DESC]
18028=Local variable divide by local variable,24,0,1,[LONG DESC]
18029=Local variable mod by local variable,24,0,1,[LONG DESC]
18030=Local variable leftshift by local variable,24,0,1,[LONG DESC]
18031=Local variable rightshift by local variable,24,0,1,[LONG DESC]
18032=Local variable reverse by local variable,24,0,1,[LONG DESC]
18033=Local variable xor by local variable,24,0,1,[LONG DESC]
18034=Local variable or by local variable,24,0,1,[LONG DESC]
18035=Local variable and by local variable,24,0,1,[LONG DESC]
18036=Global variable set by local variable,25,0,1,[LONG DESC]
18037=Global variable add by local variable,25,0,1,[LONG DESC]
18038=Global variable minus by local variable,25,0,1,[LONG DESC]
18039=Global variable multiply by local variable,25,0,1,[LONG DESC]
18040=Global variable divide by local variable,25,0,1,[LONG DESC]
18041=Global variable mod by local variable,25,0,1,[LONG DESC]
18042=Global variable leftshift by local variable,25,0,1,[LONG DESC]
18043=Global variable rightshift by local variable,25,0,1,[LONG DESC]
18044=Global variable reverse by local variable,25,0,1,[LONG DESC]
18045=Global variable xor by local variable,25,0,1,[LONG DESC]
18046=Global variable or by local variable,25,0,1,[LONG DESC]
18047=Global variable and by local variable,25,0,1,[LONG DESC]
18048=Local variable set by global variable,26,0,1,[LONG DESC]
18049=Local variable add by global variable,26,0,1,[LONG DESC]
18050=Local variable minus by global variable,26,0,1,[LONG DESC]
18051=Local variable multiply by global variable,26,0,1,[LONG DESC]
18052=Local variable divide by global variable,26,0,1,[LONG DESC]
18053=Local variable mod by global variable,26,0,1,[LONG DESC]
18054=Local variable leftshift by global variable,26,0,1,[LONG DESC]
18055=Local variable rightshift by global variable,26,0,1,[LONG DESC]
18056=Local variable reverse by global variable,26,0,1,[LONG DESC]
18057=Local variable xor by global variable,26,0,1,[LONG DESC]
18058=Local variable or by global variable,26,0,1,[LONG DESC]
18059=Local variable and by global variable,26,0,1,[LONG DESC]
18060=Global variable set by global variable,27,0,1,[LONG DESC]
18061=Global variable add by global variable,27,0,1,[LONG DESC]
18062=Global variable minus by global variable,27,0,1,[LONG DESC]
18063=Global variable multiply by global variable,27,0,1,[LONG DESC]
18064=Global variable divide by global variable,27,0,1,[LONG DESC]
18065=Global variable mod by global variable,27,0,1,[LONG DESC]
18066=Global variable leftshift by global variable,27,0,1,[LONG DESC]
18067=Global variable rightshift by global variable,27,0,1,[LONG DESC]
18068=Global variable reverse by global variable,27,0,1,[LONG DESC]
18069=Global variable xor by global variable,27,0,1,[LONG DESC]
18070=Global variable or by global variable,27,0,1,[LONG DESC]
18071=Global variable and by global variable,27,0,1,[LONG DESC]

[ScriptParams]
22=Local variables,-1
23=Global variables,-2
24=Local variables,-3
25=Local variables,-4
```

```
26=Global variables,-5
27=Global variables,-6
```

4.2 Changelog

4.2.1 Version TBD (develop branch nightly builds)

New:

- `Crit.AffectsHouses` for critical hit system (by Starkku)

- Warhead or weapon detonation at superweapon target cell (by Starkku)

- Super Weapons launching other Super Weapons (by Morton)

- Launching Super Weapons on building infiltration (by Morton)

- Building airstrike target eligibility customization (by Starkku)

- IvanBomb detonation & image display centered on buildings (by Starkku)

- Forcing specific weapon against cloaked or disguised targets (by Starkku)

- Customizable ROF random delay (by Starkku)

- Animation with `Tiled=yes` now supports `CustomPalette` (by ststl)

- Toggleable DieSound when grinding (by Trsdy)

- Shields can inherit Techno ArmorType (by Starkku)

- Income money flying-string display when harvesters or slaves are docking to refineries (by Trsdy)

- Allow random crates to be generated only on lands (by Trsdy)

- Iron-curtain effects on infantries and organic units (by ststl)

- Custom `SlavesFreeSound` (by TwinkleStar)

- Allows jumpjet to crash without rotation (by TwinkleStar)

- Customizable priority of superweapons timer sorting(by ststl)

- Customizable aircraft spawner spawn delay (by Starkku)

- Customizable Cluster scatter distance (by Starkku)

- Customizable FlakScatter distance (by Starkku)

- Customizable debris & meteor impact and warhead detonation behaviour (by Starkku, Otamaa)

- Custom warhead debris animations (by Starkku)

- Multiple burst shots / burst delay within infantry firing sequence (by Starkku)

- Attached particle system for animations (by Starkku)

- Removal of hardcoded AA & Gattling weapon selection restrictions (by Starkku)

- Projectile `SubjectToLand/Water` (by Starkku)

- Real time timers (by Morton)

- Default campaign game speed override and custom campaign game speed FPS (by Morton)

- Trigger actions that allow/forbid MCV to redeploy in game (by Trsdy)

- `AnimList` on zero damage Warheads toggle via `AnimList.ShowOnZeroDamage` (by Starkku)

- Including INI files and inheriting INI sections (by Morton)

- Additions to automatic passenger deletion (by Starkku)

- Buildings considered as vehicles (by Starkku)

- TechnoType target evaluation map zone check behaviour customization (by Starkku)

- `CanC4=false` building zero damage toggle (by Starkku)

- OpenTopped transport target sharing customization (by Starkku)

- Vanish animation for `AutoDeath.Behavior=vanish` (by Starkku)

- `AAOnly` for projectiles (by Starkku)

- `CreateUnit` improvements & additions (units spawning in air, spawn animation) (by Starkku)

- Option to center pause menu background (by Starkku)

- LaunchSW.DisplayMoney (by Starkku)

- Disguise logic improvements (by Starkku)

- Custom insignias (by Starkku)

- Upgrade logic to allow altering of SpySat status (by Otamaa)

- Allow `ZShapePointMove` to apply during buildup via `ZShapePointMove.OnBuildup` (by Starkku)

- `UndeploysInto` building selling buildup sequence length customization (by Starkku)

- Allow overriding `Shield.AffectTypes` for each Warhead shield interaction (by Starkku)

- TechnoType conversion warhead & superweapon (by Morton)

- TechnoType conversion on ownership change (by Trsdy)

- Unlimited skirmish colors (by Morton)

- Example custom locomotor that circles around the target (*NOTE: For developer use only*) (by Kerbiter, CCHyper, with help from Otamaa; based on earlier experiment by CnCVK)

- Vehicle voxel turret shadows & body multi-section shadows (by TwinkleStar & Trsdy)

- Crushing tilt and slowdown customization (by Starkku)

- Extra warhead detonations on weapon (by Starkku)

- Chrono sparkle animation display customization and improvements (by Starkku)

- Script action to Chronoshift teams to enemy base (by Starkku)

- Customizable ElectricBolt Arcs (by Fryone, Kerbiter)

- Digital display of HP and SP (by ststl, FlyStar, Saigyouji, JunJacobYoung)

- PipScale pip customizations (size, ammo / spawn / tiberium frames or offsets) (by Starkku)

- Auto-deploy/Deploy block on ammo change (by Fryone)

- `AltPalette` lighting toggle (by Starkku)

- Unhardcoded timer blinking color scheme (by Starkku)

- Customizing shield self-healing timer restart when shield is damaged (by Starkku)

- Customizing minimum & maximum amount of damage shield can take from a single hit (by Starkku)

- Players can now be given ownership of preplaced buildings in Skirmish and Multiplayer in maps using houses of the format <Player @ X> where X goes from A to H for spawn positions 1-8 (by ZivDero)

- `AutoDeath.Technos(Dont)Exist` can optionally track limboed (not physically on map, e.g transports etc) technos (by Starkku)

- Wall overlay `Palette` support (by Starkku)

- Show designator & inhibitor range (by Morton)

- Owner-only sound on unit creation (by Fryone)

- Allow using `Secondary` weapon against walls if `Primary` cannot target them (by Starkku)

- Reloading ammo in transports (by Starkku)

- Dump variables to file on scenario end / hotkey (by Morton)

- "House owns TechnoType" and "House doesn't own TechnoType" trigger events

- Allow toggling `Infantry/UnitsGainSelfHeal` for `MultiplayPassive=true` houses (by Starkku)

- Customizable straight trajectory detonation & snap distance and pass-through option (by Starkku)

- Airstrike & spy plane fixed spawn distance & height (by Starkku)

- Allow enabling application of `Verses` and `PercentAtMax` for negative damage (by Starkku)

- In addition to `PlacementGrid.Translucency`, allow to set the transparency of the grid when PlacementPreview is enabled, using the `PlacementGrid.TranslucencyWithPreview` tag (by Belonit).

- Show briefing screen on singleplayer mission start (by Starkku)

- Allow setting mission par times and related messages in `missionmd.ini` (by Starkku)

- Allow setting default singleplayer map loading screen and briefing offsets (by Starkku)

- Allow toggling whether or not fire particle systems adjust target coordinates when firer rotates (by Starkku)

- `AmbientDamage` warhead & main target ignore customization (by Starkku)

- Flashing Technos on selecting (by Fryone)

- Customizable DropPod properties on a per-InfantryType basis (by Trsdy)

- Projectile return weapon (by Starkku)

- Allow customizing aircraft landing direction per aircraft or per dock (by Starkku)

- Allow animations to play sounds detached from audio event handler (by Starkku)

- Game save option when starting campaigns (by Trsdy)

- Carryall pickup voice (by Starkku)

- Option to have `Grinding.Weapon` require accumulated credits from grinding (by Starkku)

- Re-enable the Veinhole Monster and Weeds from TS (by ZivDero)

- Recreate the weed-charging of SWs like the TS Chemical Missile (by ZivDero)

- Allow to change the speed of gas particles (by ZivDero)

- Allow upgrade animations to use `Powered` & `PoweredLight/Effect/Special` keys (by Starkku)

- Toggle for `Explodes=true` BuildingTypes to not explode during buildup or being sold (by Starkku)

- Toggleable height-based shadow scaling for voxel air units (by Trsdy & Starkku)

Vanilla fixes:

- Allow AI to repair structures built from base nodes/trigger action 125/SW delivery in single player missions (by Trsdy)

- Allow usage of `AlternateFLH%d` of vehicles in `OpenTopped` transport. (by Trsdy)

- Improved the statistic distribution of the spawned crates over the visible area of the map. (by Trsdy, based on TwinkleStar's work)

- Teams spawned by trigger action 7,80,107 can use IFV and `OpenTopped` logic normally (by Trsdy)

- Prevented units from retaining previous order after ownership change (by Trsdy)

- Break the mind-control link when capturing a mind-controlled building with an engineer (by Trsdy)

- Fixed BibShape drawing for a couple of frames during buildup for buildings with long buildup animations (by Starkku)

- Cloaked & disguised objects displaying to observers (by Starkku)

- Cloaked objects from allies displaying to player in single player missions (by Trsdy)

- Skip `NaturalParticleSystem` displaying from in-map pre-placed structures (by Trsdy)

- Made sure that `Suicide=yes` weapon does kill the firer (by Trsdy)

- Made sure that vxl units being flipped over get killed instead of rotating up and down (by Trsdy)

- Allow jumpjet units to visually tilt or be flipped over on the ground even if `TiltCrashJumpjet=no` (by Trsdy)

- Fixed the range for number of debris spawned by Warhead to use MaxDebris instead of MaxDebris - 1 (by Starkku)

- Fixed `LandTargeting=1` not preventing from targeting TerrainTypes (trees etc.) on land (by Starkku)

- Fixed `NavalTargeting=6` not preventing from targeting empty water cells or TerrainTypes (trees etc.) on water (by Starkku)

- Fixed `NavalTargeting=7` and/or `LandTargeting=2` resulting in still targeting TerrainTypes (trees etc.) on land with `Primary` weapon (by Starkku)

- Fixed an issue that causes objects in layers outside ground layer to not be sorted correctly (caused issues with animation and jumpjet layering for an instance) (by Starkku)

- Restored `EVA_StructureSold` for buildings with `UndeploysInto` (by Trsdy)

- Allow MCV to redeploy in campaigns (by Trsdy)

- Allow buildings with `UndeploysInto` to be sold if `Unsellable=no` but `ConstructionYard=no` (by Trsdy)

- Fixed infantry without `C4=true` being killed in water if paradropped, chronoshifted etc. even if they can normally enter water (by Starkku)

- Fixed `WaterBound=true` buildings with `UndeploysInto` not correctly setting the location for the vehicle to move into when undeployed (by Starkku)

- Allow more than 5 `AlternateFLH` entries for units (by ststl)

- Buildings with `CanC4=false` will no longer take 1 point of positive damage if hit by negative damage (by Starkku)

- Buildings with primary weapon that has `AG=false` projectile now have attack cursor when selected (by Starkku)

- Transports with `OpenTopped=true` and weapon that has `Burst` above 1 and passengers firing out no longer have the passenger firing offset shift lateral position based on burst index (by Starkku)

- Light tint created by a building is now able to be removed after loading the game (by Trsdy)

- Prevented crashing jumpjet units from firing (by Trsdy)

- Fixed disguised infantry not using custom palette for drawing the disguise when needed (by Starkku)

- Reenabled the obsolete `[General] WarpIn` as default anim type when units are warping in (by Trsdy)

- Fixed permanent health bar display for units targeted by temporal weapons upon mouse hover (by Trsdy)

- Buildings with superweapons no longer display `SuperAnimThree` at beginning of match if pre-placed on the map (by Starkku)

- AI players can now build `Naval=true` and `Naval=false` vehicles concurrently like human players do (by Starkku)

- Fixed the bug when jumpjets were snapping into facing bottom-right when starting movement (by Kerbiter)

- Suppressed the BuildingCaptured EVA events when capturing a building considered as a vehicle (by Trsdy)

- Objects with `Palette` set now have their color tint adjusted accordingly by superweapons, map retint actions etc. if they belong to a house using any color scheme instead of only those from the first half of `[Colors]` list (by Starkku)

- Animations using `AltPalette` are now remapped to their owner's color scheme instead of first listed color scheme and no longer draw over shroud (by Starkku)

- Fixed `DeployToFire` not considering building placement rules for `DeploysInto` buildings and as a result not working properly with `WaterBound` buildings (by Starkku)

- Fixed `DeployToFire` not recalculating firer's position on land if it cannot currently deploy (by Starkku)

- `Arcing=true` projectile elevation inaccuracy can now be fixed by setting `Arcing.AllowElevationInaccuracy=false` (by Starkku)

- `EMPulseCannon=yes` building weapons now respect `Floater` and Phobos-added `Gravity` setting (by Starkku)

- Fixed position and layer of info tip and reveal production cameo on selected building (by Belonit)

- Fixed `TurretOffset` to be supported for SHP vehicles (by TwinkleStar)

- `Powered/PoweredSpecial` buildings' powered anims will update as usual when being captured by enemies (by Trsdy)

- Fixed a glitch related to incorrect target setting for missiles (by Belonit)

- Skipped parsing `[Header]` section of compaign maps which led to occasional crashes on Linux (by Trsdy)

- Fixed units' turret rotation and jumpjet wobble under EMP (by Trsdy)

- Fixed `AmbientDamage` when used with `IsRailgun=yes` being cut off by elevation changes (by Starkku)

- Fixed railgun and fire particles being cut off by elevation changes (by Starkku)

- Fixed teleport units' frozen-still timer being reset after load game (by Trsdy)

- Fixed teleport units being unable to visually tilt on slopes (by Trsdy)

- Fixed teleport and drill units being unable to be visually flipped (by Trsdy)

- Aircraft docking on buildings now respect `[AudioVisual]->PoseDir` as the default setting and do not always land facing north or in case of pre-placed buildings, the building's direction (by Starkku)

- Spawned aircraft now align with the spawner's facing when landing (by Starkku)

- Fixed infantries attempted to entering buildings when waypointing together with engineer/agent/occupier/etc (by Trsdy)

- Fixed jumpjet crash speed when crashing onto buildings (by NetsuNegi)

Phobos fixes:

- Fixed a few errors of calling for superweapon launch by `LaunchSW` or building infiltration (by Trsdy)

- Add `ImmuneToCrit` for shields (by Trsdy)

- Reimplemented the bugfix for jumpjet units' facing when firing, discard the inappropriate `JumpjetTurnToTarget` tag (by Trsdy)

- `Gunner=true` transports now correctly change turret if a passenger is removed by `PassengerDeletion` (by Starkku)

- `PassengerDeletion.Soylent` now correctly calculates refund value if removed passenger has no explicitly set `Soylent` value (by Starkku)

- Superweapon `Detonate.Weapon` & `Detonate.Warhead` now use the firing house to deal damage and apply Phobos warhead effects even if no firing building is found (by Starkku)

- `CreateUnit` now uses civilian house as owner instead if the intended owner house has been defeated (this is in-line with how `MakeInfantry` works) (by Starkku)

- `IsHouseColor` laser trails on techno now correctly change color when it changes owner (by Trsdy)

- Fixed `Layer.UseObjectLayer=true` to work correctly for all cases where object changes layer (by Starkku)

- Fixed `DetonateOnAllMapObjects.RequireVerses` not considering shield armor types (by Starkku)

- Fixed new Phobos script actions not picking team leader correctly based on `LeadershipRating` (by Starkku)

- Fixed an issue with `Gunner=true` vehicles not correctly using the first passenger's mode with multiple passengers inside (by Starkku)

- Used `MindControl.Anim` for buildings deployed from mind-controlled vehicles (by Trsdy)

- Optimized extension class implementation, should improve performance all around (by Otamaa & Starkku)

- Fixed `Interceptor` not resetting target if the intercepted projectile changes type to non-interceptable one afterwards (by Starkku)

- Fixed `PlacementPreview` setting for BuildingTypes not being parsed from INI (by Starkku)

- Fixed Phobos animation additions that support `CreateUnit.Owner` not also checking `MakeInfantryOwner` (by Starkku)

- Fixed `AutoDeath` to consider all conditions for objects in limbo (by Starkku)

- Shields will no longer take damage if the parent techno has `Immune=true` or has `TypeImmune=true` and the damage comes from instance of same TechnoType owned by same house (by Starkku)

- Fixed interceptors causing multiplayer games to desync (by Starkku)

- Optimized performance for map trigger retint action light source fix (by Starkku)

- Fixed a number of issues with Warhead Shield respawn / self heal rate modifiers like timers getting reset unnecessarily, the timer being adjusted wrong after the Warhead effect runs out etc. (by Starkku)

- Fixed a problem with disguise visibility logic that could cause game to crash on loading a map (by Starkku)

- Fixed owned `LimboDelivery` buildings not being saved correctly in savegames (by Starkku)

- Fixed a typo in weapon selector code causing issues with `NoAmmoWeapon` and related checks (by Starkku)

- Fixed `DetonateOnAllMapObjects` behaving erratically or potentially crashing if it destroys buildings using Ares' advanced rubble (by Starkku)

- Fixed game crashing on loading save games if the saved game state had active radiation sites (by Starkku)

- Fixed a desync error caused by air/top layer sorting (by Starkku)

- Fixed heal / repair weapons being unable to remove parasites from shielded targets if they were unable to heal / repair the parent unit (by Starkku)

- Fixed `Inviso=true` interceptor projectiles applying damage on interceptable, armor type-having projectiles twice (by Starkku)

- Fixed `AutoDeath` causing crashes when used to kill a parasite unit inside an another unit (by Starkku)

Fixes / interactions with other extensions:

- All forms of type conversion (including Ares') now correctly update `OpenTopped` state of passengers in transport that is converted (by Starkku)

- Fixed an issue introduced by Ares that caused `Grinding=true` building `ActiveAnim` to be incorrectly restored while `SpecialAnim` was playing and the building was sold, erased or destroyed (by Starkku)

4.2.2 0.3.0.1

New:

- Additional sync logging in case of desync errors occuring (by Starkku)

Phobos fixes:

- `AutoDeath` support for objects in limbo (by Trsdy)

- Buildings sold by `AutoDeath` no longer play a click sound effect (by Trsdy)

- Fixed shield animation being hidden while underground or in tunnels fix not working correctly (by Starkku)

- Restore the `MindClearedSound` when deploying a mind-controlled unit into a building loses the mind-control (by Trsdy)

- Fixed `RadSiteWarhead.Detonate` not detonating precisely on the affected object (thus requiring `CellSpread`) (by Starkku)

- Fixed script action 10103 'Load Into Transports' unintentionally skipping next action (by FS-21)

- Changed mission retry dialog button order to better match old order people are used to (by Trsdy)

- Allow PowerPlant Enhancer to be affected by EMP (by Trsdy)

- Animation `Weapon` with `Damage.DealtByInvoker=true` now uses the invoker's house to deal damage and apply Phobos warhead effects even if invoker is dead when weapon is fired (by Starkku)

- Fixed a crash when trying to create radiation outside map bounds (by Otamaa)

- Fixed new AI attack scripts not allowing zero damage weapons to pick targets (by Starkku)

- Fixed floating point value parsing precision to match the game (by Starkku)

- Power output / drain should now correctly be applied for buildings created via `LimboDelivery` in campaigns (by Starkku)

- Fixed shield health bar showing empty bar when shield is still on very low health instead of depleted (by Starkku)

- Fixed `CanTarget` not considering objects on bridges when checking if cell is empty (by Starkku)

- Fixed vehicle deploy weapons not working if the unit is cloaked and weapon has `DecloakToFire=true` (by NetsuNegi & Starkku)

- Fixed `IsAnimated` terrain not updating correctly in all circumstances (by Starkku)

- Fixed `CreateUnit` interaction with bridges (spawning under when shouldn't etc) (by Starkku)

- `CanTarget` now considers bridges as land like game's normal weapon selection does (by Starkku)

- `AreaFire.Target` now takes cells with bridges into consideration depending on firer's elevation (by Starkku)

4.2.3 0.3

New:

- LaserTrails initial implementation (by Kerbiter, ChrisLv_CN)
- Anim-to-Unit logic and ability to randomize DestroyAnim (by Otamaa)
- Shield modification warheads (by Starkku)
- Shield BreakWeapon & InitialStrength (by Starkku)
- Initial Strength for TechnoTypes (by Uranusian)
- Re-enable obsolete `JumpjetControls` for TechnoTypes' default Jumpjet properties (by Uranusian)
- Weapon targeting filter (by Uranusian, Starkku)
- Secondary weapon fallback customization (by Starkku)
- Burst-specific FLHs for TechnoTypes (by Starkku)
- Burst delays for weapons (by Starkku)
- AreaFire weapon target customization (by Starkku)
- Auto-firing TechnoType weapons (by Starkku)
- PowerPlant Enhancer (by secsome)
- Unlimited Global / Local Variables (by secsome)
- Adds a "Load Game" button to the retry dialog on mission failure (by secsome)
- Default disguise for individual InfantryTypes (by secsome)
- Quicksave hotkey command (by secsome)
- Save Game trigger action (by secsome)
- Numeric Variables (by secsome)
- TechnoType's tooltip would display it's build time now (by secsome)
- Customizable tooltip background color and opacity (by secsome)
- FrameByFrame & FrameStep hotkey command (by secsome)
- Allow `NotHuman=yes` infantry to use random `Death` anim sequence (by Otamaa)
- Ability for warheads to trigger specific `NotHuman=yes` infantry `Death` anim sequence (by Otamaa)
- XDrawOffset for animations (by Morton)
- Customizable OpenTopped properties (by Otamaa)
- Automatic Passenger Deletion (by FS-21)
- Script actions for new AI attacks (by FS-21)
- Script actions for modifying AI Trigger Current Weight (by FS-21)
- Script action for waiting & repeat the same new AI attack if no target was found (by FS-21)
- Script action that modifies the Team's Trigger Weight when ends the new attack action (by FS-21)
- Script action for picking a random script from a list (by FS-21)

- Script action for new AI movements towards certain objects (by FS-21)

- Script action that modify target distance in the new move actions (by FS-21)

- Script action that modify how ends the new move actions (by FS-21)

- Script action that un-register Team success (by FS-21)

- Script action to regroup temporarily around the Team Leader (by FS-21)

- Script action to randomly skip next action (by FS-21)

- Script action for timed script action jumps (by FS-21)

- ObjectInfo now shows current Target and AI Trigger data (by FS-21)

- Shield absorption and passthrough customization (by Morton)

- Limbo Delivery of buildings (by Morton)

- Ore stage threshold for `HideIfNoOre` (by Otamaa)

- Image reading in art rules for all TechnoTypes (by Morton)

- Attached animation layer customization (by Starkku)

- Jumpjet unit layer deviation customization (by Starkku)

- IsSimpleDeployer deploy direction & animation customizations (by Starkku)

- Customizable projectile gravity (by secsome)

- Gates can now link with walls correctly via `NSGates` or `EWGates` (by Uranusian)

- Per-warhead toggle for decloak of damaged targets (by Starkku)

- `DeployFireWeapon`=-1 now allows the deployed infantries using both weapons as undeployed (by Uranusian)

- Power delta (surplus) counter for sidebar (by Morton)

- Added Production and Money to Dump Object Info command (by FS-21)

- `EnemyUIName`= Now also works for other TechnoTypes (by Otamaa)

- `DestroyAnim` & `DestroySound` for TerrainTypes (by Otamaa)

- Weapons fired on warping in / out (by Starkku)

- `Storage.TiberiumIndex` for customizing resource storage in structures (by FS-21)

- Grinder improvements & customizations (by Starkku)

- Attached animation position customization (by Starkku)

- Trigger Action 505 for Firing SW at specified location (by FS-21)

- Trigger Action 506 for Firing SW at waypoint (by FS-21)

- New behaviors for objects' self-destruction under certain conditions (by Trsdy & FS-21)

- Slaves' ownership decision when corresponding slave miner is destroyed (by Trsdy)

- Customize buildings' selling sound and EVA voice (by Trsdy)

- `ForceWeapon.Naval.Decloacked` for overriding uncloaked underwater attack behavior (by FS-21)

- Shrapnel enhancement (by secsome)

- Shared Ammo for transports to passengers (by FS-21)

- Additional critical hit logic customizations (by Starkku)

- Laser trails for VoxelAnims (by Otamaa)

- Local warhead screen shaking (by Starkku)

- Feedback weapon (by Starkku)

- TerrainType & ore minimap color customization (by Starkku)

- Single-color weapon lasers (by Starkku)

- Customizable projectile trajectory (by secsome)

- Display damage numbers debug hotkey command (by Starkku)

- Toggleable display of TransactMoney amounts (by Starkku)

- Building-provided self-healing customization (by Starkku)

- Building placement preview (by Otamaa & Belonit)

- Passable & buildable-upon TerrainTypes (by Starkku)

- Toggle for passengers to automatically change owner if transport owner changes (by Starkku)

- Superweapon launch on warhead detonation (by Trsdy)

- Preserve IronCurtain status upon DeploysInto/UndeploysInto (by Trsdy)

- Correct owner house for Warhead Anim/SplashList & Play Animation trigger animations (by Starkku)

- Customizable FLH When Infantry Is Crouched Or Deployed (by FS-21)

- Enhanced projectile interception logic, including projectile strength & armor types (by Starkku)

- Initial Strength for Cloned Infantry (by FS-21)

- OpenTopped transport rangefinding & deactivated state customizations (by Starkku)

- Forbidding parallel AI queues by type (by NetsuNegi & Trsdy)

- Animation damage / weapon improvements (by Starkku)

- Warhead self-damaging toggle (by Starkku)

- Trailer animations inheriting owner (by Starkku)

- Warhead detonation on all objects on map (by Starkku)

- Implemented support for PCX images for campaign loading screen (by FlyStar)

- Implemented support for PCX images for observer loading screen (by Uranusian)

- Animated (non-tiberium spawning) TerrainTypes (by Starkku)

- Toggleable passenger killing for Explodes=true units (by Starkku)

- New condition for automatic self-destruction logic when TechnoTypes exist/don't exist (by FlyStar)

Vanilla fixes:

- Fixed laser drawing code to allow for thicker lasers in house color draw mode (by Kerbiter, ChrisLv_CN)

- Fixed DeathWeapon not detonating properly (by Uranusian)

- Fixed lasers & other effects drawing from wrong offset with weapons that use Burst (by Starkku)

- Fixed buildings with `Naval=yes` ignoring `WaterBound=no` to be forced to place onto water (by Uranusian)

- Fixed temporal weapon crash under certain conditions where stack dump starts with 0051BB7D (by secsome)

- Fixed the bug when retinting map lighting with a map action corrupted light sources (by secsome)

- Fixed the bug when reading a map which puts `Preview(Pack)` after `Map` lead to the game fail to draw the preview (by secsome)

- Fixed the bug that GameModeOptions are not correctly saved (by secsome)

- Fixed the bug that AITriggerTypes do not recognize building upgrades (by Uranusian)

- Fixed AI Aircraft docks bug when Ares tag `[GlobalControls]` > `AllowParallelAIQueues=no` is set (by FS-21)

- Fixed the bug when occupied building's `MuzzleFlashX` is drawn on the center of the building when `X` goes past 10 (by Otamaa)

- Fixed jumpjet units that are `Crashable` not crashing to ground properly if destroyed while being pulled by a `Locomotor` warhead (by Starkku)

- Fixed aircraft & jumpjet units not being affected by speed modifiers (by Starkku)

- Fixed vehicles (both voxel & SHP) to fully respect `Palette` (by Starkku)

- Fixed mind control indicator animations not reappearing on mind controlled objects that are cloaked and then uncloaked (by Starkku)

- Fixed Nuke carrier and payload weapons not respecting `Bright` setting on weapon (by Starkku)

- Fixed buildings not reverting to undamaged graphics when HP was restored above `[AudioVisual]`->`ConditionYellow` via `SelfHealing` (by Starkku)

- Fixed jumpjet units being unable to turn to the target when firing from a different direction (by Trsdy)

- Fixed turreted jumpjet units always facing bottom-right direction when stop moving (by Trsdy)

- Fixed jumpjet objects being unable to detect cloaked objects beneath (by Trsdy)

- Anim owner is now set for warhead AnimList/SplashList anims and Play Anim at Waypoint trigger animations (by Starkku)

- Fixed AI script action Deploy getting stuck with vehicles with `DeploysInto` if there was no space to deploy at initial location (by Starkku)

- Fixed `Foundation=0x0` causing crashes if used on TerrainTypes.

- Projectiles now remember the house of the firer even if the firer is destroyed before the projectile detonates. Does not currently apply to Ares-introduced Warhead effects (by Starkku)

- Buildings now correctly use laser parameters set for Secondary weapons instead of reading them from Primary weapon (by Starkku)

- Fixed an issue that caused vehicles killed by damage dealt by a known house but without a known source TechnoType (f.ex animation warhead damage) to not be recorded as killed correctly and thus not spring map trigger events etc. (by Starkku)

- Translucent RLE SHPs will now be drawn using a more precise and performant algorithm that has no green tint and banding (only applies to Z-aware drawing mode for now) (by Apollo)

- Fixed transports recursively put into each other not having a correct killer set after second transport when being killed by something (by Kerbiter)

- Fixed projectiles with `Inviso=true` suffering from potential inaccuracy problems if combined with `Airburst=yes` or Warhead with `EMEffect=true` (by Starkku)

- Fixed the bug when `MakeInfantry` logic on BombClass resulted in `Neutral` side infantry (by Otamaa)

- Fixed railgun particles being drawn to wrong coordinate against buildings with non-default `TargetCoordOffset` or when force-firing on bridges (by Starkku)

- Fixed building `TargetCoordOffset` not being taken into accord for several things like fire angle calculations and target lines (by Starkku)

- Allowed observers to see a selected building's radial indicator (by Trsdy)

Phobos fixes:

- Fixed shields being able to take damage when the parent TechnoType was under effects of a `Temporal` Warhead (by Starkku)

- Improved shield behavior for forced damage (by Uranusian)

- Fixed SplashList animations playing when a unit is hit on a bridge over water (by Uranusian)

- Fixed shielded objects not decloaking if shield takes damage (by Starkku)

- Fixed critical hit animation playing even if no critical hits were dealt due to `Crit.Affects` or `ImmuneToCrit` settings (by Starkku)

- Fixed `RemoveDisguise` not working on `PermaDisguise` infantry (by Starkku)

- Fixed single-color laser (IsHouseColor, IsSingleColor, LaserTrails) glow falloff to match the vanilla appearance (by Starkku)

- Fixed a potential cause of crashes concerning shield animations (such in conjunction with cloaking) (by Starkku)

- Fixed interceptors intercepting projectiles fired by friendly objects if the said object died after firing the projectile (by Starkku)

- Fixed interceptor weapons with `Inviso=true` projectiles detonating the projectile at wrong coordinates (by Starkku)

- Fixed some possible configuration reading issues when using Phobos with patches that rename `uimd.ini` (by Belonit)

- Fixed a game crash when using the Map Snapshot command (by Otamaa)

- Fixed issue with incorrect input in edit dialog element when using IME (by Belonit)

- Fixed an issue where tooltip text could be clipped by tooltip rectangle border if using `MaxWidth` > 0 (by Starkku)

- Fixed projectiles with `Trajectory=Straight` suffering from potential inaccuracy problems if combined with `Airburst=yes` or Warhead with `EMEffect=true` (by Starkku)

- Minor performance optimization related to shields (by Trsdy)

- Fixed teleporting miners (Chrono Miner) considered to be idle by harvester counter, improved related game performance (by Trsdy)

- Fixed negative damage weapons considering shield health when evaluating targets even if Warhead had `Shield.Penetrate` set to true (by Starkku)

- Fixed engineers considering shield health instead of building health when determining if they can repair or capture a building (by Starkku)

- Fixed shield animations (`IdleAnim`, `BreakAnim` and `HitAnim`) showing up even if the object shield is attached to is currently underground (by Starkku)

- Fixed shields not being removed from sinking units until they have fully finished sinking (by Starkku)

- Fixed techno-extdata update after type conversion (by Trsdy)

- Fixed Phobos Warhead effects (crits, new shield modifiers etc.) considering sinking units valid targets (by Starkku)

- Fixed an issue where `FireOnce=yes` deploy weapons on vehicles would still fire multiple times if deploy command is issued repeatedly or when not idle (by Starkku)

- Fixed a game crash when checking BuildLimit if Phobos is running without Ares (by Belonit)

- Corrected the misinterpretation in the definition of `DiskLaser.Radius` (by Trsdy)

Non-DLL:

- Implemented a tool (sed wrapper) to semi-automatically upgrade INIs to use latest Phobos tags (by Kerbiter)

4.2.4 0.2.2.2

Phobos fixes:

- Fixed shield type info not saving properly (by Uranusian)

- Fixed extended building upgrades logic not properly interacting with Ares' BuildLimit check (by Uranusian)

- Fix more random crashes for Cameo Priority (by Uranusian)

- Fix aircraft weapons causing game freeze when burst index was not correctly reset after firing (by Starkku)

4.2.5 0.2.2.1

Phobos fixes:

- Fixed random crashes about CameoPriority (by Uranusian)

- Fixed trigger action 125 not functioning properly (by Uranusian)

- Fixed area warhead detonation not falling back to firer house (by Otamaa)

- RadSite hook adjustment for `FootClass` to support Ares `RadImmune`; also various fixes to radiation / desolators (by Otamaa)

- Fixed `Crit.Affects` not functioning properly (by Uranusian)

- Fixed improper upgrade owner transfer which resulted in built ally / enemy building upgrades keeping the player who built them alive (by Kerbiter)

4.2.6 0.2.2

New:

- Customizable producing progress "bars" like CnC:Remastered did (by Uranusian)

- Customizable cameo sorting priority (by Uranusian)

- Customizable harvester ore gathering animation (by secsome, Uranusian)

- Allow making technos unable to be issued with movement order (by Uranusian)

Vanilla fixes:

- Fixed non-IME keyboard input to be working correctly for languages / keyboard layouts that use character ranges other than Basic Latin and Latin-1 Supplement (by Belonit)

Phobos fixes:

- Fixed the critical damage logic not functioning properly (by Uranusian)

- Fixed the bug when executing the stop command game crashes (by Uranusian)

4.2.7 0.2.1.1

Phobos fixes:

- Fixed occasional crashes introduced by `Speed=0` stationary vehicles code (by Starkku)

4.2.8 0.2.1

New:

- Setting VehicleType `Speed` to 0 now makes game treat them as stationary (by Starkku)

Vanilla fixes:

- Fixed the bug when after a failed placement the building/defence tab hotkeys won't trigger placement mode again (by Uranusian)

- Fixed the bug when building with `UndeployInto` plays `EVA_NewRallypointEstablished` while undeploying (by secsome)

Phobos fixes:

- Fixed the bug when trigger action `125 Build At...` wasn't actually producing a building when the target cells were occupied (by secsome)

4.2.9 0.2

New:

- Shield logic for TechnoTypes (by Uranusian, secsome, Belonit) with warhead additions (by Starkku)

- Custom Radiation Types (by AlexB, Otamaa, Belonit, Uranusian)

- New ScriptType actions `71 Timed Area Guard`, `72 Load Onto Transports`, `73 Wait until ammo is full` (by FS-21)

- Ore drills now have customizable ore type, range, ore growth stage and amount of cells generated (by Kerbiter)

- Basic projectile interception logic (by AutoGavy, ChrisLv_CN, Kerbiter, Erzoid/SukaHati)

- Customizable harvester active/total counter next to credits counter (by Uranusian)

- Select Next Idle Harvester hotkey command (by Kerbiter)

- Dump Object Info hotkey command (by secsome, FS-21)

- Remove Disguise and Remove Mind Control warhead effects (by secsome)

- Custom per-warhead SplashLists (by Uranusian)

- `AnimList.PickRandom` used to randomize `AnimList` with no side effects (by secsome)

- Chance-based critical damage system on warheads (by AutoGavy)

- Optional mind control range limit (by Uranusian)

- Multiple mind controllers can now release units on overload (by Uranusian, secsome)

- Spawns now can be killed on low power and have limited pursuing range (by FS-21)

- Spawns can now have the same exp. level as owner techno (by Uranusian)

- `TurretOffset` now accepts `F,L,H` and `F,L` values instead of just `F` value (by Kerbiter)

- ElectricBolt arc visuals can now be disabled per-arc (by Otamaa)

- Semantic locomotor aliases for modder convenience (by Belonit)

- Ability to specify amount of shots for strafing aircraft and burst simulation (by Starkku)

- Customizeable Teleport/Chrono Locomotor properties per TechnoType (by Otamaa)

- Maximum waypoints amount increased from 702 to 2147483647 (by secsome)

- Customizeable Missing Cameo file (by Uranusian)

Vanilla fixes:

- Map previews with zero size won't crash the game anymore (by Kerbiter, Belonit)

- Tileset 255+ bridge fix (by E1 Elite)

- Fixed fatal errors when `Blowfish.dll` couldn't be registered in the system properly due to missing admin rights (by Belonit)

- Fix to take Burst into account for aircraft weapon shots beyond the first one (by Starkku)

- Fixed the bug when units are already dead but still in map (for sinking, crashing, dying animation, etc.), they could die again (by Uranusian)

- Fixed the bug when cloaked Desolator was unable to fire his deploy weapon (by Otamaa)

- Fixed the bug when `InfiniteMindControl` with `Damage=1` will auto-release the victim to control new one (by Uranusian)

- Fixed the bug that script action `Move to cell` was still using leftover cell calculations from previous games (by secsome)

- Fixed the bug when trigger action `125 Build At...` didn't play buildup anim (by secsome)

- Fixed `DebrisMaximums` (spawned debris type amounts cannot go beyond specified maximums anymore) (by Otamaa)

- Fixes to `DeployFire` logic (`DeployFireWeapon`, `FireOnce`, stop command now work properly) (by Starkku)

Phobos fixes:

- Properly rewritten a fix for mind-controlled vehicles deploying into buildings (by FS-21)

- Properly rewritten `DeployToFire` fix, tag `Deployed.RememberTarget` is deprecated, now always on (by Kerbiter)

- New warheads now work with Ares' `GenericWarhead` superweapon (by Belonit)

4.2.10 0.1.1

Phobos fixes:

- Fixed an occasional crash when selecting units with a selection box

4.2.11 0.1

New:

- Full-color PCX graphics support (by Belonit)

- Support for PCX loading screens of any size (by Belonit)

- Extended sidebar tooltips with descriptions, recharge time and power consumption/generation (by Kerbiter, Belonit)

- Selection priority filtering for box selection (by Kerbiter)

- Shroud, reveal and money transact warheads (by Belonit)

- Custom game icon command line arg (by Belonit)

- Ability to disable black spawn position dots on map preview (by Belonit)

- Ability to specify applicable building owner for building upgrades (by Kerbiter)

- Customizable disk laser radius (by Belonit, Kerbiter)

- Ability to switch to GDI sidebar layout for any side (by Belonit)

Vanilla fixes:

- Deploying mind-controlled TechnoTypes won't make them permanently mind-controlled anymore (unfinished fix by DCoder)

- SHP debris hardcoded shadows now respect `Shadow=no` tag value (by Kerbiter)

- `DeployToFire` vehicles won't lose target on deploy anymore (unfinished fix by DCoder)

- Fixed QWER hotkey tab switching not hiding the displayed tooltip as it should (by Belonit)

- Sidebar tooltips now can go over sidebar bounds (by Belonit)

- Lifted stupidly small limit for tooltip character amount (by Belonit)

CONTRIBUTING

This page describes ways to help or contribute to Phobos and lists the contributing guidelines that are used in the project.

5.1 Guidelines for contributors

5.1.1 Project structure

Assuming you've successfully cloned and built the project before getting here, you should end up with the following project structure:

- `src/` - all the project's source code resides here.
    - `Commands/` - source code for new hotkey commands. Every command is a new class that inherits from `PhobosCommandClass` (defined in `Commands.h`) and is defined in a separate file with a few methods and then registered in `Commands.cpp`.
    - `New/` - source code for new ingame classes.
        * `Type/` - new enumerated types (types that are declared with a list section in an INI, for example, radiation types) implemented in the project. Every enumerated type class inherits `Enumerable<T>` (where `T` is an enum. type class) class that is defined in `Enumerable.h`.
        * `Entity/` - classes that represent ingame entities are located here.
    - `Ext/` - source code for vanilla engine class extensions. Each class extension is kept in a separate folder named after vanilla engine class name and contains the following:
        * `Body.h` and `Body.cpp` contain class and method definitions/declarations and common extension hooks. Each extension class must contain the following to work correctly:
            · `ExtData` - extension data class definition which inherits `Extension<T>` from `Container.h` (where `T` is the class that is being extended), which is the actual class that contains new data for vanilla classes;
            · `ExtContainer` - a definition of a special map class to store and look up `ExtData` instances for base class instances which inherits `Container<T>` from `Container.h` (where T is the extension data class);
            · `ExtMap` - a static instance of `ExtContainer` map;
            · constructor, destructor, serialization, deserialization and (for appropriate classes) INI reading hooks.
        * `Hooks.cpp` and `Hooks.*.cpp` contain non-common hooks to correctly patch in new custom logics.

- **ExtraHeaders/** - extra header files to interact with / describe types included in game binary that are not included in YRpp yet.

- **Misc/** - uncategorized source code, including hooks that don't belong to an extension class.

- **Utilities/** - common code that is used across the project.

- **Phobos.cpp/Phobos.h** - extension bootstrapping code.

- **Phobos.Ext.cpp** - contains common processing code new or extended classes. If you define a new or extended class you have to add your new class into **MassActions** global variable type declaration in this file.

- **YRpp/** - contains the header files to interact with / describe types included in game binary and also macros to write hooks using Syringe. Included as a submodule.

5.1.2 Code styleguide

We have established a couple of code style rules to keep things consistent. Some of the rules are enforced in .`editorconfig`, where applicable, so you can autoformat the code by pressing `Ctrl + K, D` hotkey chord in Visual studio. Still, it is advised to manually check the style before submitting the code.

- We use tabs instead of spaces to indent code.

- Curly braces are always to be placed on a new line (Allman indentation style). One of the reasons for this is to clearly separate the end of the code block head and body in case of multiline bodies:

```
if (SomeReallyLongCondition()
    || ThatSplitsIntoMultipleLines())
{
    DoSomethingHere();
    DoSomethingMore();
}
```

- Braceless code block bodies should be made only when both code block head and body are single line, statements split into multiple lines and nested braceless blocks are not allowed within braceless blocks:

```
// OK
if (Something())
    DoSomething();

// OK
if (SomeReallyLongCondition()
    || ThatSplitsIntoMultipleLines())
{
    DoSomething();
}

// OK
if (SomeCondition())
{
    if (SomeOtherCondition())
        DoSomething();
}

// OK
```

(continues on next page)

```
if (SomeCondition())
{
    return VeryLongExpression()
        || ThatSplitsIntoMultipleLines();
}
```

- Only empty curly brace blocks may be left on the same line for both opening and closing braces (if appropriate).

- If you use if-else you should either have all of the code blocks braced or braceless to keep things consistent.

- Big conditions which span multiple lines and are hard to read otherwise should be split into smaller logical parts to improve readability:

```
// Not OK
if (This() && That() && AlsoThat()
    || (OrOtherwiseThis && OtherwiseThat && WhateverElse))
{
    DoSomething();
}

// OK
bool firstCondition = This() && That() && AlsoThat();
bool secondCondition = OrOtherwiseThis && OtherwiseThat && WhateverElse;

if (firstCondition || secondCondition)
    DoSomething();
```

- Code should have empty lines to make it easier to read. Use an empty line to split code into logical parts. It's mandatory to have empty lines to separate:

  - `return` statements (except when there is only one line of code except that statement);

  - local variable assignments that are used in the further code (you shouldn't put an empty line after one-line local variable assignments that are used only in the following code block though);

  - code blocks (braceless or not) or anything using code blocks (function or hook definitions, classes, namespaces etc.);

  - hook register input/output.

```
// OK
auto localVar = Something();
if (SomeConditionUsing(localVar))
    ...

// OK
auto localVar = Something();
auto anotherLocalVar = OtherSomething();

if (SomeConditionUsing(localVar, anotherLocalVar))
    ...

// OK
auto localVar = Something();
```

```
if (SomeConditionUsing(localVar))
    ...

if (SomeOtherConditionUsing(localVar))
    ...

localVar = OtherSomething();

// OK
if (SomeCondition())
{
    Code();
    OtherCode();

    return;
}

// OK
if (SomeCondition())
{
    SmallCode();
    return;
}
```

- `auto` may be used to hide an unnecessary type declaration if it doesn't make the code harder to read. `auto` may not be used on primitive types.

- A space must be put between braces of empty curly brace blocks.

- To have less Git merge conflicts member initializer lists and other list-like syntax structures used in frequently modified places should be split per-item with item separation characters (commas, for example) placed *after newline character*:

```
ExtData(TerrainTypeClass* OwnerObject) : Extension<TerrainTypeClass>(OwnerObject)
    , SpawnsTiberium_Type(0)
    , SpawnsTiberium_Range(1)
    , SpawnsTiberium_GrowthStage({ 3, 0 })
    , SpawnsTiberium_CellsPerAnim({ 1, 0 })
{ }
```

- Local variables and function/method args are named in the `camelCase` (using a `p` prefix to denote pointer type for every pointer nesting level) and a descriptive name, like `pTechnoType` for a local `TechnoTypeClass*` variable.

- Classes, namespaces, class fields and members are always written in `PascalCase`.

- Class fields that can be set via INI tags should be named exactly like ini tags with dots replaced with underscores.

- Pointer type declarations always have pointer sign `*` attached to the type declaration.

- Non-static class extension methods faked by declaring a static method with `pThis` as a first argument are only to be placed in the extension class for the class instance of which `pThis` is.

  - If it's crucial to fake `__thiscall` you may use `__fastcall` and use `void*` or `void* _` as a second argument to discard value passed through `EDX` register. Such methods are to be used for call replacement.

- Hooks have to be named using a following scheme: `HookedFunction_HookPurpose`, or `ClassName_HookedMethod_HookPurpose`. Defined-again hooks are exempt from this scheme due to

impossibility to define different names for the same hook.

- Return addresses should use anonymous enums to make it clear what address means what, if applicable. The enum has to be placed right at the function start and include all addresses that are used in this hook:

```
DEFINE_HOOK(0x48381D, CellClass_SpreadTiberium_CellSpread, 0x6)
{
    enum { SpreadReturn = 0x4838CA, NoSpreadReturn = 0x4838B0 };

    ...
}
```

- Even if the hook doesn't use `return 0x0` to execute the overriden instructions, you still have to write correct hook size (last parameter of `DEFINE_HOOK` macro) to reduce potential issues if the person editing this hook decides to use `return 0x0`.

- New ingame "entity" classes are to be named with `Class` postfix (like `RadTypeClass`). Extension classes are to be named with `Ext` postfix instead (like `RadTypeExt`).

- Do not pollute the namespace.

- Avoid introducing unnecessary macros if they can be replaced by equivalent `constexpr` or `__forceinline` functions.

Note: The styleguide is not exhaustive and may be adjusted in the future.

5.1.3 Git branching model

Couple of notes regarding the Git practices. We use git-flow-like workflow:

- `master` is for stable releases, can have hotfixes pushed to it or branched off like a feature branch with the requirement of version increment and `master` being merged into `develop` after that;

- `develop` is the main development branch;

- `feature/`-prefixed branches (sometimes the prefix may be different if appropriate, like for big fixes or changes) are so called "feature branches" - those are branched off `develop` for every new feature to be introduced into it and then merged back. We use squash merge to merge them back in case of smaller branches and sometimes merge commit in case the branch is so big it would be viable to keep it as is.

- `hotfix/`-prefixed branches may be used in a same manner as `feature/`, but with `master` branch, with a requirement of `master` being merged into `develop` after `hotfix/` branch was squash merged into `master`.

- `release/`-prefixed branches are branched off `develop` when a new stable release is slated to allow working on features for a next release and stability improvements for this release. Those are merged with a merge commit into `master` and `develop` with a stable version number increase, after which the stable version is released.

- When you're working with your local & remote branches use **fast-forward** pulls to get the changes from remote branch to local, **don't merge remote branch into local and vice versa**, this creates junk commits and makes things unsquashable.

These commands will do the following for all repositories on your PC:

1. remove the automatic merge upon pull and replace it with a rebase;

2. highlight changes consisting of moving existing lines to another location with a different color.

```
git config --global pull.rebase true
git config --global branch.autoSetupRebase always
git config --global diff.colorMoved zebra
```

5.2 Ways to help

Engine modding is a complicated process which is pretty hard to pull off, but there are also easier parts which don't require mastering the art of reverse-engineering or becoming a dank magician in C++.

5.2.1 Research and reverse-engineering

You can observe how the stuff works by using the engine and note which other stuff influences the behavior, but sooner or later you would want to see the innards of that. This is usually done using such tools as disassemblers/decompilers (IDA, Ghidra) to decipher what is written in the binary (gamemd.exe in case of the binary) and debuggers (Cheat Engine's debugger is pretty good for that) to trace how the binary works.

Hint: Reverse-engineering is a complex task, but don't be discouraged, if you want to try your hands at it ask us in the Discord channel, we will gladly help

---

Note: Assembly language and C++ knowledge, understanding of computer architecture, memory structure, OOP and compiler theory would certainly help.

5.2.2 Development

When you found out how the engine works and where you need to extend the logic you'd need to develop the code to achieve what you want. This is done by declaring a *hook* - some code which would be executed after the program execution reaches the certain address in binary. All the development is done in C++ using YRpp (which provides a way to interact with YR code and inject code using Syringe) and usually Visual Studio 2017/2019 or newer.

Contributing changes to the project

To contribute a feature or some sort of a change you you would need a Git client (I recommend GitKraken personally). Fork, clone the repo, preferably make a new branch, then edit/add the code or whatever you want to contribute. Commit, push, start a pull request, wait for it to get reviewed, or merged.

If you contribute something, please make sure:

- you write documentation for the change;
- you mention the change in the changelog and migration sections in the *what's new page*;
- you mention your contribution in the *credits page*.

If your change does not fit in standard criteria or too small that it doesn't need the above - add `[Minor]` to your pull request's title, so the CI won't yell at you for no reason.

Hint: Every pull request push trigger a nightly build for the latest pushed commit, so you can check the build status at the bottom of PR page, press Show all checks, go to details of a build run and get the zip containing built DLL and PDB (for your testers, f. ex.), or download a build from an automatically posted comment.

Note: You'd benefit from C++ experience, knowledge of programming patterns, common techniques etc. Basic assembly knowledge would help to correctly write the interaction with the memory where you hook at. Basic understanding of Git and GitHub is also needed.

5.2.3 Testing

This is a job that any modder (and even sometimes player) can do. Look at a new feature or a change, try to think of all possible cases when it can work differently, try to think of any possible logic flaws, edge cases, unforeseen interactions or conditions etc., then test it according to your thoughts. Any bugs should be reported to issues section of this repo, if possible.

Warning: **General stability** can only be achieved by extensive play-testing of new changes, both offline and online. Most modders have beta testing teams, so please, if you want the extension to be stable - contribute to that by having your testers play with the new features! Also the check-list below can help you identify issues quicker.

Testing check-list

- **All possible valid use cases covered**. Try to check all of the valid feature use cases you can think of and verify that they work as intended with the feature.

- **Correct saving and loading**. Most of the additions like new INI tags require storing them in saved object info. Sometimes this is not done correctly, especially on complex stuff (like radiation types). Please, ensure all the improvements work **identically** before and after being saved and loaded (on the same version of Phobos, of course).

- **Interaction with other features**. Try to use the feature chained or interacting with other features from vanilla or other libs (for example, mind control removal warhead initially was crashing when trying to remove mind control from a permanently mind-controlled unit).

- **Overlapping features not working correctly** (including those from third-party libs like Ares, HAres, CnCNet spawner DLL). Think of what features' code could overlap (in a technical sense; means they modify the same code) with what you're currently testing. Due to the nature of the project some features from other libs could happen to not work as expected if they are overlapping (for example, when implementing mass selection filtering Ares' GroupAs was initially broken and units using it weren't being type selected properly).

- **Edge cases**. Those are the cases of some specific cases usually induced by some extreme parameter values (for example, vanilla game crashes on zero-size PreviewPack instead of not drawing it).

- **Corner cases**. Those are similar to edge cases but are hard to reproduce and are usually induced by a combination of extreme parameter values.

Note: Knowledge on how to mod YR and having an inquisitive mind, being attentive to details would help.

5.2.4 Writing docs

No explanation needed. If you fully understand how some stuff in Phobos works you can help by writing a detailed description in these docs, or you can just improve the pieces of docs you think are not detailed enough.

The docs are written in Markdown (which is dead simple, learn MD in 60 seconds; if you need help on extended syntax have a look at MyST parser reference). We use Sphinx to build docs, Read the Docs to host.

Hint: You don't need to install Python, Sphinx and modules to see changes - every pull request you make is being built and served by Read the Docs automatically. Just like the nightly builds, scroll to the bottom, press `Show all checks` and see the built documentation in the details of a build run.

There are two ways to edit the docs.

- **Edit from your PC**. Pretty much the same like what's described in *contributing changes section*; the docs are located in the `docs` folder.

- **Edit via online editor**. Navigate to the doc piece that you want to edit, press the button on the top right - and it will take you to the file at GitHub which you would need to edit (look for the pencil icon to the top right). Press it - the fork will be created and you'll edit the docs in your version of the repo (fork). You can commit those changes (preferably to a new branch) and make them into a pull request to main repo.

Note: OK English grammar and understanding of docs structure would be enough. You would also need a GitHub account.

5.2.5 Providing media to showcase features

Those would be used in docs and with a link to the respective mod as a bonus for the mod author. To record GIFs you can use such apps as, for example, GifCam.

Note: Please, provide screenshots, GIFs and videos in their natural size and without excess stuff or length.

5.2.6 Promoting the work

You can always help us by spreading the word about the project among people, whether you're an influential youtuber, a C&C related community leader or just an average player.

CREDITS

This page lists all the individual contributions to the project by their author.

- **Belonit (Gluk-v48)**:
    - Disable empty spawn positions
    - `gamemd.exe` icon customization
    - Full-color non-paletted PCX support
    - Initial SpySat, BigGap, TransactMoney warheads
    - PCX Loading Screen support
    - Custom DiskLaser radius
    - Extended tooltips
    - Building upgrades enhancement
    - Option to hide health bar
    - Sidebar.GDIPosition
    - Help with CellSpread
    - Blowfish.dll-related errors fix
    - Zero size map previews fix
    - Semantic locomotor aliases
    - Shield logic
    - Non-ASCII input fix
    - Building Placement Preview Adjustment
    - Check for Changelog/Documentation/Credits in Pull Requests
    - Fix position and layer of info tip and reveal production cameo on selected building
    - Fix a glitch related to incorrect target setting for missiles
    - Ability to disable shadow for debris & meteor animations
- **Kerbiter (Metadorius)**:
    - Building upgrades enhancement
    - Extended tooltips
    - Selection priority filtering

- – `TurretOffset` enhancement

- – Customizable ore spawners

- – Select next idle harvester hotkey

- – Interceptor enhancement

- – Zero size map previews fix

- – LaserTrails port and rework

- – Laser graphics fixes

- – Recursive transport killer fix

- – Custom locomotors example implementation and piggybacking test warheads

- – Jumpjet initial facing fix

- – Migration utility

- – GitHub Actions setup

- – Official docs

- – VSCode configs

- – Code style

- – Customizable ElectricBolt Arcs

- – Ability to disable shadow for debris & meteor animations

- **Uranusian (Thrifinesma)**:

  - – Mind Control enhancement

  - – Custom warhead splash list

  - – Harvester counter

  - – Spawns promotion

  - – Shield logic

  - – Multiple death fix

  - – Customizable missing cameo

  - – Cameo sorting priority

  - – Tab hotkey placement fix

  - – Producing progress indicators

  - – Custom ore gathering anim

  - – `NoManualMove`

  - – Weapon target house filtering

  - – `DeathWeapon` fix

  - – Re-enable obsolete `JumpjetControls`

  - – `AITrigger` Building Upgrades support

  - – Wall-Gate links

  - – Ability for deployed infantry to use both weapons

- Observer PCX loading screen
- Official CN docs

- **secsome (SEC-SOME)**:
    - Debug info dump hotkey
    - Refactoring & porting of Ares helper code
    - Disguise removal warhead
    - Mind Control removal warhead
    - Mind Control enhancement
    - Shields logic help
    - `AnimList.PickRandom`
    - `MoveToCell` fix
    - Unlimited waypoints
    - `Build At` trigger action buildup anim fix
    - Undeploy building into a unit plays `EVA_NewRallyPointEstablished` fix
    - Custom ore gathering anim
    - `TemporalClass` related crash
    - Retry dialog on mission failure
    - Default disguise for individual InfantryTypes
    - PowerPlant Enhancer
    - SaveGame Trigger Action
    - QuickSave command
    - Numeric variables
    - Custom gravity for projectiles
    - Retint map actions bugfix
    - Sharpnel enhancement
    - Vanilla map preview reading bugfix
    - Customizable tooltip background
    - Parts of Ares calling code

- **Otamaa (Fahroni, BoredEXE)**:
    - Help with CellSpread
    - Ported and fixed custom RadType code
    - Togglable ElectricBolt bolts
    - Customizable Chrono Locomotor properties per TechnoClass
    - Building Placement Preview
    - `DebrisMaximums` fixes
    - Anim-to-Unit

- – `NotHuman` anim sequences improvements

- – Customizable `OpenTopped` Properties

- – Hooks for ScriptType Actions 92 & 93

- – Ore stage threshold for `HideIfNoOre`

- – Occupied building `MuzzleFlashX` bugfix

- – `EnemyUIName=` for other TechnoTypes

- – TerrainType `DestroyAnim` & `DestroySound`

- – Laser trails for VoxelAnims

- – MakeInfantry logic on BombClass bugfix

- – Debris & meteor impact behaviour settings

- – Upgrade logic to allow altering of SpySat status

- – Ares detection and integration

- – Help with custom locomotors

- – Extension class optimization

- **FS-21**:

  - – Dump Object Info enhancements

  - – `Powered.KillSpawns`

  - – `Spawner.LimitRange`

  - – Majority of ScriptType actions

  - – MC deployer fixes

  - – Help with docs

  - – Automatic Passenger Deletion logic

  - – `Fire SW At Location/Waypoint` Trigger Action

  - – Kill Object Automatically logic prototype

  - – Customizable resource storage

  - – Override uncloaked underwater attack behavior

  - – AI Aircraft docks fix

  - – Shared ammo logic

  - – Customizable FLH when infantry is prone or deployed

  - – Initial strength for cloned infantry

- **Starkku**:

  - – Misc. minor bugfixes & improvements

  - – AI script actions:

    - ∗ Chronoshift to Enemy Base

  - – Warhead shield penetration & breaking

  - – Strafing aircraft weapon customization

- – Vehicle `DeployFire` fixes/improvements
- – Stationary VehicleTypes
- – Burst logic improvements
- – TechnoType auto-firing weapons
- – Secondary weapon fallback customization
- – Weapon target type filtering
- – `AreaFire` targeting customization
- – `CreateUnit` improvements
- – Attached animation & jumpjet unit layer customization
- – `IsSimpleDeployer` improvements
- – Shield modification warheads
- – Warhead decloaking toggle
- – Warp(In/Out)Weapon
- – Grinder improvements / additions
- – Attached animation position customization
- – Critical hit logic additions
- – Aircraft & jumpjet speed modifiers fix
- – Local warhead screen shaking
- – Vehicle custom palette fix
- – Feedback weapon
- – TerrainType & ore minimap color customization
- – Laser fixes & improvements
- – Mind control indicator animation cloak fix
- – Warhead / Play animation trigger animation owner fix
- – Nuke carrier & payload Bright fix
- – Display damage numbers hotkey command
- – TransactMoney.Display
- – Building-provided self-heal customization
- – AI deploy script DeploysInto fix
- – Passable & buildable-upon TerrainTypes
- – Automatic passenger owner change toggle
- – Interceptor improvements
- – OpenTopped transport behaviour customizations
- – Animation damage / weapon improvements
- – Warhead self-damaging toggle
- – Trailer animation owner inheritance

- Warhead detonation on all objects on map

- Animated TerrainTypes extension

- Exploding unit passenger killing customization

- Railgun particle target coordinate fix

- Building target coordinate offset fix

- Warhead / weapon detonation at superweapon target cell

- Cloaked & disguised objects displaying to observers

- Building airstrike target eligibility customization

- IvanBomb detonation & image display centered on buildings

- Customizable ROF random delay

- BibShape drawing during buildup fix

- Spawner spawn delay customization

- Cluster scatter distance customization

- FlakScatter distance customization

- Debris & meteor impact behaviour settings

- Custom warhead debris animations

- Attached particle system for animations

- Removal of hardcoded AA & Gattling weapon selection restrictions

- Projectile obstacle logic additions

- `AnimList` on zero damage Warheads toggle

- Additions to automatic passenger deletion

- Buildings considered as vehicles

- TechnoType target evaluation map zone check behaviour customization

- CanC4 damage rounding fix & toggle

- Option to center pause menu background

- Disguise logic improvements

- Custom insignias

- `ZShapePointMove` buildup toggle

- `UndeploysInto` building selling buildup sequence length customization

- AI naval vehicle production fix

- Crushing tilt and slowdown customization

- Extra warhead detonations on weapons

- Chrono sparkle animation display customization and improvements

- PipScale pip size & ammo pip frame customization

- Extension class optimization

- Additional sync logging

- – `Arcing` elevation inaccuracy fix
- – `EMPulseCannon` projectile gravity fix
- – Custom palette support for wall overlays
- – Warhead animation improvements
- – Reloading ammo in transports
- – Straight projectile trajectory additions
- – Airstrike & spy plane fixed spawn distance & height
- – Negative damage `Verses/PercentAtMax` toggle
- – Misc. singleplayer mission improvements
- – Weapon effect obstacle interaction fix
- – Fire particle rotation coordinate adjust toggle
- – `AmbientDamage` warhead & main target ignore customization
- – Projectile return weapon
- – Aircraft landing / docking direction

- **Morton (MortonPL)**:
  - – `XDrawOffset` for animations
  - – Shield passthrough & absorption
  - – Building `LimboDelivery` logic
  - – Fix for `Image` in art rules
  - – Power delta counter
  - – Super Weapons launching other Super Weapons
  - – SpyEffects expansion, launching Super Weapons on building infiltration
  - – Real time timers
  - – Default campaign game speed override and custom campaign game speed FPS
  - – Including INI files and inheriting INI sections
  - – Ares detection and integration
  - – TechnoType conversion warhead & superweapon
  - – Unlimited skirmish colors
  - – Show designator & inhibitor range
  - – Dump variables to file on scenario end / hotkey
  - – "House owns TechnoType" and "House doesn't own TechnoType" trigger events
  - – Help with docs

- **ChrisLv_CN** (work relicensed under following permission):
  - – General assistance
  - – Interceptor logic prototype
  - – LaserTrails prototype

- – Laser fixes prototype

- **Trsdy**

  - – Preserve IronCurtain status upon DeploysInto/UndeploysInto

  - – Several jumpjet fixes:

    - * Facing towards target even if not omni-firing

    - * Turret direction in idle state fix

    - * Sensor fix

    - * Allow to tilt regardless of TiltCrashJumpjet

    - * Forbid firing when crashing

  - – OmniFire.TurnToTarget

  - – Object Self-destruction logic

  - – Misc vanilla suicidal behavior fix

  - – Post-type-conversion update

  - – Units retaining orders after changing ownership bugfix

  - – Several fixes and dehardcode related to building selling/undeploying:

    - * Building `EVA_StructureSold` and `SellSound` dehardcode

    - * Restore `EVA_StructureSold` for buildings with `UndeploysInto`

    - * Redeployable MCV in campaigns

    - * Allow buildings with `UndeploysInto` to be sold if `Unsellable=no` even if not conyard

    - * Trigger actions that allow/forbid MCV to redeploy in game

  - – `AlternateFLH` of vehicles in `OpenTopped` transport.

  - – Slaves' house customization when owner is killed

  - – Trigger Action spawned team IFV/Opentopped logic fix

  - – Singleplayer Campaign AI's base node/SW-delivered/trigger action 125-delivered structures' auto-repairability dehardcode

  - – Power delta counter : blackout indication mark

  - – Harvester counter

  - – Income money string indication upon ore dump

  - – Warhead superweapon launch logic

  - – TechnoType conversion placeholder

  - – "Shield is broken" trigger event

  - – RadialIndicator observer visibility

  - – Cloaked objects from allies displaying to player in singleplayer campaigns

  - – Skip `NaturalParticleSystem` displaying from in-map pre-placed structures

  - – Random crate generation limited to land option, optimization for crates' random sampling

  - – `ImmuneToCrit` for shields

- Forbidding parallel AI queues by type

- The option to allow DieSound/VoiceDie being played when grinding

- Allow iron-curtain effects on infantries

- Break the mindcontrol link when capturing a mind-controlled building with engineer

- Remove sound events when mind-controlled vehicles deploy into buildings or when buildings considered as vehicles get captured

- Building LightSource tint S/L fix

- Permanent healthbar display on units targeted by temporal weapons fix

- Powered anims on buildings cease playing upon capture by different house fix

- TechnoType conversion placeholder

- TechnoType conversion upon ownership change

- EIP 00529A14 crash fix on Linux

- Teleport timer reset after load game fix

- Teleport, Tunnel and Fly loco visual tilt fix

- Turret/Barrel/NoSpawnAlt/Multi-section voxel shadow, dynamic voxel shadow

- Skip units' turret rotation and jumpjets' wobbling under EMP

- Droppod properties dehardcode

- Waypoint entering building together with engineer/agent bug fix

- Skippable game save on scenario start

- Misc code refactor & maintenance, CN doc fixes, bugfixes

- **FlyStar**

  - Campaign load screen PCX support

  - New condition for automatic self-destruction logic when TechnoTypes exist/don't exist

- **NetsuNegi**

  - Forbidding parallel AI queues by type

  - Jumpjet crash speed fix when crashing onto building

- **Apollo** - Translucent SHP drawing patches

- **ststl**

  - Customizable ShowTimer priority of superweapons

  - Iron Curtain effects customization on infantries and organic units

  - Use `CustomPalette` for animations with `Tiled=yes`

  - Unlimited `AlternateFLH` entries

- **TwinkleStar**

  - Custom slaves free sound

  - Jumpjet crash rotation control

  - Vehicle voxel turret shadows & body multi-section shadows

- – `TurretOffset` support for SHP vehicles
- **Fryone**
    - – Customizable ElectricBolt Arcs
    - – Sound entry on unit's creation
    - – Auto-deploy/Deploy block on ammo change
    - – Flashing Technos on selecting
- **ZivDero**
    - – Allow giving ownership of buildings to players in Skirmish and MP using <Player @ A-H>
    - – Re-enable the Veinhole Monster and Weeds from TS
    - – Recreate the weed-charging of SWs like the TS Chemical Missile
    - – Allow to change the speed of gas particles
- **Ares developers**
    - – YRpp and Syringe which are used, save/load, project foundation and generally useful code from Ares
    - – unfinished RadTypes code
    - – prototype deployer fixes
    - – Superweapon launch site & availability code
    - – AI vehicle production update code
    - – parts of TechnoType conversion placeholder code
- **ststl, FlyStar, Saigyouji, JunJacobYoung** - Digital Display
- **SukaHati (Erzoid)** - Minimum interceptor guard range
- **E1 Elite** - TileSet 255 and above bridge repair fix
- **AutoGavy** - interceptor logic, Warhead critical hit logic
- **Chasheen (Chasheenburg)** - CN docs help
- **tomsons26** - all-around help, assistance and guidance in reverse-engineering, YR binary mappings
- **CCHyper** - all-around help, current project logo, assistance and guidance in reverse-engineering, YR binary mappings, custom locomotors example implementation
- **AlexB** - Original FlyingStrings implementation
- **Joshy** - Original FlyingStrings implementation
- **CnCVK** - Original custom locomotors experiment
- **ZPHYUS** - win/lose themes code
- **Neargye (Daniil Goncharov)** - nameof library (MIT)
- **ayylmao** - help with docs, extensive and thorough testing
- **SMxReaver** - help with docs, extensive and thorough testing
- **4SG** - help with docs
- **thomassneddon** - general assistance
- **Xkein** - general assistance, YRpp edits

- **mevitar** - honorary shield tester *triple* award

- **Damfoos** - extensive and thorough testing

- **Dmitry Volkov** - extensive and thorough testing

- **Rise of the East community** - extensive playtesting of in-dev features

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NEW / ENHANCED LOGICS

This page describes all the engine features that are either new and introduced by Phobos or significantly extended or expanded.

8.1 New types / ingame entities

8.1.1 Custom Radiation Types
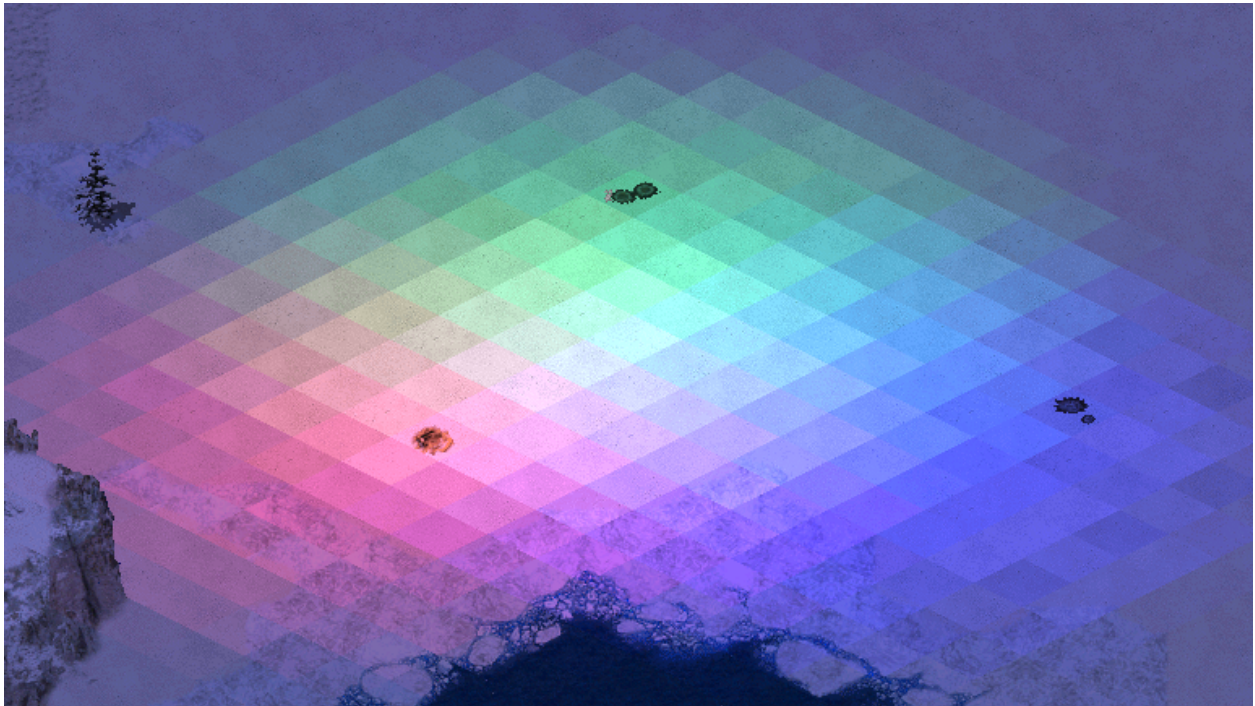
Mixing different radiation types

- Any weapon can now have a custom radiation type. More details on radiation here.

- There are several new properties available to all radiation types.

  - `RadApplicationDelay.Building` can be set to value higher than 0 to allow radiation to damage buildings.

  - `RadSiteWarhead.Detonate` can be set to make `RadSiteWarhead` detonate on affected objects rather than only be used to dealt direct damage. This enables most Warhead effects, display of animations etc.

- **RadHasOwner**, if set to true, makes damage dealt by the radiation count as having been dealt by the house that fired the projectile that created the radiation field. This means that Warhead controls such as **AffectsAllies** will be respected and any units killed will count towards that player's destroyed units count.

- **RadHasInvoker**, if set to true, makes the damage dealt by the radiation count as having been dealt by the TechnoType (the 'invoker') that fired the projectile that created the radiation field. In addition to the effects of **RadHasOwner**, this will also grant experience from units killed by the radiation to the invoker. Note that if the invoker dies at any point during the radiation's lifetime it continues to behave as if not having an invoker.

- By default **UseGlobalRadApplicationDelay** is set to true. This makes game always use **RadApplicationDelay** and **RadApplicationDelay.Building** from **[Radiation]** rather than specific radiation types. This is a performance-optimizing measure that should be disabled if a radiation type declares different application delay.

In `rulesmd.ini`:

```
[RadiationTypes]
0=SOMERADTYPE

[Radiation]
UseGlobalRadApplicationDelay=true   ; boolean

[SOMEWEAPON]                         ; WeaponType
RadType=Radiation                    ; RadType to use instead of default of [Radiation]

[SOMERADTYPE]                        ; RadType
RadDurationMultiple=1                ; integer
RadApplicationDelay=16               ; integer
RadApplicationDelay.Building=0       ; integer
RadLevelMax=500                      ; integer
RadLevelDelay=90                     ; integer
RadLightDelay=90                     ; integer
RadLevelFactor=0.2                   ; floating point value
RadLightFactor=0.1                   ; floating point value
RadTintFactor=1.0                    ; floating point value
RadColor=0,255,0                     ; integer - Red,Green,Blue
RadSiteWarhead=RadSite               ; WarheadType
RadSiteWarhead.Detonate=false        ; boolean
RadHasOwner=false                    ; boolean
RadHasInvoker=false                  ; boolean
```

8.1.2 Laser Trails

Laser trails used in Rise of the East

- Technos, Projectiles, and VoxelAnims can now have colorful trails of different transparency, thickness and color, which are drawn via laser drawing code.

- Technos, Projectiles, and VoxelAnims can have multiple laser trails. For technos each trail can have custom laser trail type and FLH offset relative to turret and body.

> **Warning:** Laser trails are very resource intensive! Due to the game not utilizing GPU having a lot of trails can quickly drop the FPS on even good machines. To reduce that effect:
>
> - don't put too many laser trails on units and projectiles;
>
> - make sure you set as high `SegmentLength` value as possible without trails being too jagged;
>
> - try to keep the length of the trail minimal (can be achieved with smaller `FadeDuration` durations).

In `artmd.ini`:

```
[LaserTrailTypes]
0=SOMETRAIL

[SOMETRAIL]                   ; LaserTrailType name
IsHouseColor=false           ; boolean
Color=255,0,0                ; integer - Red,Green,Blue
FadeDuration=64              ; integer
Thickness=4                  ; integer
SegmentLength=128            ; integer, minimal length of each trail segment
IgnoreVertical=false         ; boolean, whether the trail won't be drawn on vertical␣
↪movement
IsIntense=false              ; boolean, whether the laser is "supported" (AKA prism␣
↪forwarding)
CloakVisible=false           ; boolean, whether the laser is visible when the attached␣
↪unit is cloaked

[SOMEPROJECTILE]             ; BulletType Image
LaserTrail.Types=SOMETRAIL   ; list of LaserTrailTypes

[SOMETECHNO]                 ; TechnoType Image
LaserTrailN.Type=SOMETRAIL   ; LaserTrailType
LaserTrailN.FLH=0,0,0        ; integer - Forward,Lateral,Height
LaserTrailN.IsOnTurret=false ; boolean, whether the trail origin is turret
; where N = 0, 1, 2, ...
```

In `rulesmd.ini`:

```
[SOMEVOXELANIM]              ; VoxelAnim
LaserTrail.Types=SOMETRAIL   ; list of LaserTrailTypes
```

8.1.3 Shields

Buildings, Infantries and Vehicles with Shield in Fantasy ADVENTURE

In `rulesmd.ini`:

```
[AudioVisual]
Shield.ConditionYellow=                        ; floating point value, percents or absolute
Shield.ConditionRed=                           ; floating point value, percents or absolute
Pips.Shield=-1,-1,-1                           ; integer, frames of pips.shp (zero-based)␣
↪for Green, Yellow, Red
Pips.Shield.Building=-1,-1,-1                  ; integer, frames of pips.shp (zero-based)␣
↪for Green, Yellow, Red
```

(continues on next page)

```ini
Pips.Shield.Background=PIPBRD.SHP           ; filename - including the .shp/.pcx␣
→extension
Pips.Shield.Building.Empty=0                ; integer, frame of pips.shp (zero-based)␣
→for empty building pip


[ShieldTypes]
0=SOMESHIELDTYPE


[SOMESHIELDTYPE]                            ; ShieldType name
Strength=0                                  ; integer
InitialStrength=0                           ; integer
ConditionYellow=                            ; floating point value, percents or absolute
ConditionRed=                               ; floating point value, percents or absolute
Armor=none                                  ; ArmorType
InheritArmorFromTechno=false                ; boolean
Powered=false                               ; boolean
AbsorbOverDamage=false                      ; boolean
SelfHealing=0.0                             ; floating point value, percents or absolute
SelfHealing.Rate=0.0                        ; floating point value, ingame minutes
SelfHealing.RestartInCombat=true            ; boolean
SelfHealing.RestartInCombatDelay=0          ; integer, game frames
Respawn=0.0                                 ; floating point value, percents or absolute
Respawn.Rate=0.0                            ; floating point value, ingame minutes
BracketDelta=0                              ; integer - pixels
Pips=-1,-1,-1                               ; integer, frames of pips.shp (zero-based)␣
→for Green, Yellow, Red
Pips.Building=-1,-1,-1                       ; integer, frames of pips.shp (zero-based)␣
→for Green, Yellow, Red
Pips.Background=                            ; filename - including the .shp/.pcx␣
→extension
Pips.Building.Empty=                        ; integer, frame of pips.shp (zero-based)␣
→for empty building pip
IdleAnim=                                   ; Animation
IdleAnim.ConditionYellow=                   ; Animation
IdleAnim.ConditionRed=                      ; Animation
IdleAnimDamaged=                            ; Animation
IdleAnimDamaged.ConditionYellow=            ; Animation
IdleAnimDamaged.ConditionRed=               ; Animation
IdleAnim.OfflineAction=Hides                ; AttachedAnimFlag (None, Hides, Temporal,␣
→Paused or PausedTemporal)
IdleAnim.TemporalAction=Hides               ; AttachedAnimFlag (None, Hides, Temporal,␣
→Paused or PausedTemporal)
BreakAnim=                                  ; Animation
HitAnim=                                    ; Animation
BreakWeapon=                                ; WeaponType
AbsorbPercent=1.0                           ; floating point value
PassPercent=0.0                             ; floating point value
ReceivedDamage.Minimum=-2147483648          ; integer
ReceivedDamage.Maximum=2147483647           ; integer
AllowTransfer=                              ; boolean
ImmuneToBerserk=no                          ; boolean
ImmuneToCrit=no                             ; boolean
```

```
[SOMETECHNO]                                  ; TechnoType
ShieldType=SOMESHIELDTYPE                      ; ShieldType; none by default

[SOMEWARHEAD]                                  ; WarheadType
Shield.Penetrate=false                         ; boolean
Shield.Break=false                             ; boolean
Shield.BreakAnim=                              ; Animation
Shield.HitAnim=                                ; Animation
Shield.BreakWeapon=                            ; WeaponType
Shield.AbsorbPercent=                          ; floating point value
Shield.PassPercent=                            ; floating point value
Shield.ReceivedDamage.Minimum=                 ; integer
Shield.ReceivedDamage.Maximum=                 ; integer
Shield.Respawn.Duration=0                      ; integer, game frames
Shield.Respawn.Amount=0.0                      ; floating point value, percents or absolute
Shield.Respawn.Rate=-1.0                       ; floating point value, ingame minutes
Shield.Respawn.RestartTimer=false              ; boolean
Shield.SelfHealing.Duration=0                  ; integer, game frames
Shield.SelfHealing.Amount=0.0                  ; floating point value, percents or absolute
Shield.SelfHealing.Rate=-1.0                   ; floating point value, ingame minutes
Shield.SelfHealing.RestartInCombat=            ; boolean
Shield.SelfHealing.RestartInCombatDelay=-1     ; integer, game frames
Shield.SelfHealing.RestartTimer=false          ; boolean
Shield.AffectTypes=                            ; List of ShieldType names
Shield.Penetrate.Types=                        ; List of ShieldType names
Shield.Break.Types=                            ; List of ShieldType names
Shield.Respawn.Types=                          ; List of ShieldType names
Shield.SelfHealing.Types=                      ; List of ShieldType names
Shield.AttachTypes=                            ; List of ShieldType names
Shield.RemoveTypes=                            ; List of ShieldType names
Shield.ReplaceOnly=false                       ; boolean
Shield.ReplaceNonRespawning=false              ; boolean
Shield.MinimumReplaceDelay=0                   ; integer, game frames
Shield.InheritStateOnReplace=false             ; boolean
```

- Now you can have a shield for any TechnoType. It serves as a second health pool with independent `Armor` and `Strength` values.

    - Shield will not take damage if the TechnoType is under effects of `Temporal` warhead, is Iron Curtained / Force Shielded, has `Immune=true` or if it has `TypeImmune=true` and the damage source is another instance of same TechnoType belonging to same house.

    - Negative damage will recover shield, unless shield has been broken. If shield isn't full, all negative damage will be absorbed by shield.

        * Negative damage weapons will consider targets with active, but not at full health shields in need of healing / repairing unless the Warhead has `Shield.Penetrate=true`, in which case only object health is considered.

    - When a TechnoType has an unbroken shield, `[ShieldType]->Armor` will replace `[TechnoType]->Armor` for targeting and damage calculation purposes.

        * `InheritArmorFromTechno` can be set to true to override this so that `[TechnoType]->Armor` is used even if shield is active and `[ShieldType]->Armor` is ignored.

- **InitialStrength** can be used to set a different initial strength value from maximum.

- **ConditionYellow** and **ConditionRed** can be used to set the thresholds for shield damage states, defaulting to `[AudioVisual] -> Shield.ConditionYellow` & `Shield.ConditionRed` respectively which in turn default to just `ConditionYellow` & `ConditionRed`.

- When executing `DeploysInto` or `UndeploysInto`, if both of the TechnoTypes have shields, the transformed unit/building would keep relative shield health (in percents), same as with `Strength`. If one of the TechnoTypes doesn't have shields, it's shield's state on conversion will be preserved until converted back.

  - This also works with Ares' `Convert.*`.

- `Powered` controls whether or not the shield is active when a unit is running low on power or it is affected by EMP.

  - Attention, if TechnoType itself is not `Powered`, then the shield won't be offline when low power.

- `AbsorbOverDamage` controls whether or not the shield absorbs damage dealt beyond shield's current strength when the shield breaks.

- `SelfHealing` and `Respawn` respect the following settings: 0.0 disables the feature, 1%-100% recovers/respawns the shield strength in percentage, other number recovers/respawns the shield strength directly. Specially, `SelfHealing` with a negative number deducts the shield strength.

  - If you want shield recovers/respawns 1 HP per time, currently you need to set tag value to any number between 1 and 2, like `1.1`.

  - If `SelfHealing.RestartInCombat` is set, self-healing timer pauses and then resumes after `SelfHealing.RestartInCombatDelay` frames have passed when the shield gets damaged.

- `SelfHealing.Rate` and `Respawn.Rate` respect the following settings: 0.0 instantly recovers the shield, other values determine the frequency of shield recovers/respawns in ingame minutes.

- `IdleAnim`, if set, will be played while the shield is intact. This animation is automatically set to loop indefinitely.

  - `IdleAnim.ConditionYellow` and `IdleAnim.ConditionRed` can be used to set different animations for when shield health is at or below the percentage defined in `[AudioVisual]->ConditionYellow/ConditionRed`, respectively. If `IdleAnim.ConditionRed` is not set it falls back to `IdleAnim.ConditionYellow`, which in turn falls back to `IdleAnim`.

  - `IdleAnimDamaged`, `IdleAnimDamaged.ConditionYellow` and `IdleAnimDamaged.ConditionRed` are used in an identical manner, but only when health of the object the shield is attached to is at or below `[AudioVisual]->ConditionYellow`. Follows similar fallback sequence to regular `IdleAnim` variants and if none are set, falls back to the regular `IdleAnim` or variants thereof.

  - `Bouncer=true` and `IsMeteor=true` animations can exhibit irregular behaviour when used as `IdleAnim` and should be avoided.

- `IdleAnim.OfflineAction` indicates what happens to the animation when the shield is in a low power state.

- `IdleAnim.TemporalAction` indicates what happens to the animation when the shield is attacked by temporal weapons.

- `BreakAnim`, if set, will be played when the shield has been broken.

- `HitAnim`, if set, will be played when the shield is attacked, similar to `WeaponNullifyAnim` for Iron Curtain.

- `BreakWeapon`, if set, will be fired at the TechnoType once the shield breaks.

- `AbsorbPercent` controls the percentage of damage that will be absorbed by the shield. Defaults to 1.0, meaning full damage absorption.

- `PassPercent` controls the percentage of damage that will *not* be absorbed by the shield, and will be dealt to the unit directly even if the shield is active. Defaults to 0.0 - no penetration.

- `ReceivedDamage.Minimum` & `ReceivedDamage.Maximum` control the minimum and maximum amount of damage that can be dealt to shield in a single hit. This is applied after armor type and `AbsorbPercent` adjustments. If `AbsorbOverDamage=false`, the residual damage dealt to the TechnoType is still based on the original damage before the clamping to the range.

- `AllowTransfer` controls whether or not the shield can be transferred if the TechnoType changes (such as `(Un)DeploysInto` or Ares type conversion). If not set, defaults to true if shield was attached via `Shield.AttachTypes`, otherwise false.

- `ImmuneToBerserk` gives the immunity against `Psychedelic=yes` warhead. Otherwise the berserk effect penetrates shields by default. Note that this shouldn't prevent the unit from targeting at the shielded object. `Versus.shieldArmor=0%` is still required in this case.

- A TechnoType with a shield will show its shield Strength. An empty shield strength bar will be left after destroyed if it is respawnable. Several customizations are available for the shield strength pips.

  - By default, buildings use the 6th frame of `pips.shp` to display the shield strength while others use the 17th frame.

  - `Pips.Shield` can be used to specify which pip frame should be used as shield strength. If only 1 digit is set, then it will always display that frame, or if 3 digits are set, it will use those if shield's current strength is at or below `ConditionYellow` and `ConditionRed`, respectively. `Pips.Shield.Building` is used for BuildingTypes. -1 as value will use the default frame, whether it is fallback to first value or the aforementioned hardcoded defaults.

  - `Pips.Shield.Background` can be used to set the background or 'frame' for non-building pips, which defaults to `pipbrd.shp`. 4th frame is used to display an infantry's shield strength and the 3th frame for other units, or 2nd and 1st respectively if not enough frames are available.

  - `Pips.Shield.Building.Empty` can be used to set the frame of `pips.shp` displayed for empty building strength pips, defaults to 1st frame of `pips.shp`.

  - The above customizations are also available on per ShieldType basis, e.g `[ShieldType]->Pips` instead of `[AudioVisual]->Pips.Shield` and so on. ShieldType settings take precedence over the global ones, but will fall back to them if not set.

  - `BracketDelta` can be used as additional vertical offset (negative shifts it up) for shield strength bar. Much like `PixelSelectionBracketDelta`, it is not applied on buildings.

- Warheads have new options that interact with shields.

  - `Shield.Penetrate` allows the warhead ignore the shield and always deal full damage to the TechnoType itself. It also allows targeting the TechnoType as if shield doesn't exist.

  - `Shield.Break` allows the warhead to always break shields of TechnoTypes. This is done before damage is dealt.

  - `Shield.BreakAnim` will be displayed instead of ShieldType `BreakAnim` if the shield is broken by the Warhead, either through damage or `Shield.Break`.

  - `Shield.HitAnim` will be displayed instead of ShieldType `HitAnim` if set when Warhead hits the shield.

  - `Shield.BreakWeapon` will be fired instead of ShieldType `BreakWeapon` if the shield is broken by the Warhead, either through damage or `Shield.Break`.

  - `Shield.AbsorbPercent` overrides the `AbsorbPercent` value set in the ShieldType that is being damaged.

  - `Shield.PassPercent` overrides the `PassPercent` value set in the ShieldType that is being damaged.

  - `Shield.ReceivedDamage.Minimum` & `Shield.ReceivedDamage.Maximum` override the values set in in the ShieldType that is being damaged.

- Shield.Respawn.Rate & Shield.Respawn.Amount override ShieldType Respawn.Rate and Respawn.Amount for duration of Shield.Respawn.Duration amount of frames. Negative rate & zero or lower amount default to ShieldType values. If Shield.Respawn.RestartTimer is set, currently running shield respawn timer is reset, otherwise the timer's duration is adjusted in proportion to the new Shield.Respawn.Rate (e.g timer will be same percentage through before and after) without restarting the timer. If the effect expires while respawn timer is running, remaining time is adjusted to proportionally match ShieldType Respawn.Rate. Re-applying the effect resets the duration to Shield.Respawn.Duration

- Shield.SelfHealing.Rate & Shield.SelfHealing.Amount override ShieldType SelfHealing.Rate and SelfHealing.Amount for duration of Shield.SelfHealing.Duration amount of frames. Negative rate & zero or lower amount default to ShieldType values. If Shield.SelfHealing.RestartTimer is set, currently running self-healing timer is restarted, otherwise timer's duration is adjusted in proportion to the new Shield.SelfHealing.Rate (e.g timer will be same percentage through before and after) without restarting the timer. If the effect expires while self-healing timer is running, remaining time is adjusted to proportionally match ShieldType SelfHealing.Rate. Re-applying the effect resets the duration to Shield.SelfHealing.Duration.

  * Additionally Shield.SelfHealing.RestartInCombat & Shield.SelfHealing.RestartInCombatDelay can be used to override ShieldType settings.

- Shield.AffectTypes allows listing which ShieldTypes can be affected by any of the effects listed above. If none are listed, all ShieldTypes are affected.

  * Shield.AffectTypes can be overriden for specific shield interactions by using keys Shield.Penetrate.Types, Shield.Break.Types, Shield.Respawn.Types and Shield.SelfHealing.Types respectively.

- Shield.AttachTypes & Shield.RemoveTypes allows listing ShieldTypes that are attached or removed, respectively from any targets affected by the warhead (positive Verses values). Normally only first listed ShieldType in Shield.AttachTypes is applied.

  * If Shield.ReplaceOnly is set, shields from Shield.AttachTypes are only applied to affected targets from which shields were simultaneously removed, matching the order listed in Shield.RemoveTypes. If Shield.AttachTypes contains less items than Shield.RemoveTypes, last item from the former is used for any remaining removed shields.

  * If Shield.ReplaceNonRespawning is set, shield from Shield.AttachTypes replaces existing shields that have been broken and cannot respawn on their own.

  * Shield.MinimumReplaceDelay can be used to control how long after the shield has been broken (in game frames) can it be replaced. If not enough frames have passed, it won't be replaced.

  * If Shield.InheritStateOnReplace is set, shields replaced via Shield.ReplaceOnly inherit the current strength (relative to ShieldType Strength) of the previous shield and whether or not the shield was currently broken. Self-healing and respawn timers are always reset.

8.2 Animations

8.2.1 Anim-to-Unit

- Animations can now create (or "convert" to) vehicles when they end via CreateUnit.

  - CreateUnit.Owner determines which house will own the created VehicleType. This only works as expected if the animation has owner set.

* Vehicle *destroy animations*, animations from Warhead `AnimList`/`SplashList` and map trigger action `41 Play Anim At` will have the owner set correctly.

* `CreateUnit.RemapAnim`, if set to true, will cause the animation to be drawn in unit palette and remappable to owner's team color.

- `CreateUnit.Mission` determines the initial mission of the created VehicleType.

- `CreateUnit.Facing` determines the initial facing of created VehicleType.

  * `CreateUnit.RandomFacing`, if set to true, makes it so that a random facing is picked instead.

  * `CreateUnit.InheritFacings` and `CreateUnit.InheritTurretFacings` inherit facings for vehicle body and turret respectively from the destroyed vehicle if the animation is a vehicle destroy animation. `InheritTurretFacings` does not work with jumpjet vehicles due to technical constraints.

- `CreateUnit.AlwaysSpawnOnGround`, if set to true, ensures the vehicle will be created on the cell at ground level even if animation is in air.

- `CreateUnit.ConsiderPathfinding`, if set to true, will consider whether or not the cell where the animation is located is occupied by other objects or impassable to the vehicle being created and will attempt to find a nearby cell that is not. Otherwise the vehicle will be created at the animation's location despite these obstacles if possible.

- `CreateUnit.SpawnAnim` can be used to play another animation at created unit's location after it has appeared. This animation has same owner and invoker as the parent animation.

In `artmd.ini`:

```
[SOMEANIM]                              ; AnimationType
CreateUnit=                             ; VehicleType
CreateUnit.Owner=Victim                 ; Owner house kind, Invoker/Killer/Victim/
→Civilian/Special/Neutral/Random
CreateUnit.RemapAnim=false              ; boolean
CreateUnit.Mission=Guard                ; MissionType
CreateUnit.Facing=0                     ; Direction type (integers from 0-255)
CreateUnit.RandomFacing=true            ; boolean
CreateUnit.InheritFacings=false         ; boolean
CreateUnit.InheritTurretFacings=false   ; boolean
CreateUnit.AlwaysSpawnOnGround=false    ; boolean
CreateUnit.ConsiderPathfinding=false    ; boolean
CreateUnit.SpawnAnim=                   ; Animation
```

Note: Due to technical constraints, infantry death animations including Ares' `InfDeathAnim` cannot have `CreateUnit.Owner` correctly applied to them. You can use Ares' `MakeInfantryOwner` as a workaround instead, which should function for this use-case even without `MakeInfantry` set.

8.2.2 Attached particle system

- It is now possible to attach a particle system to an animation. Only particle systems with `BehavesLike=Smoke` are supported. This works similarly to the identically named key on `VoxelAnims`.

  - On animations with `Next`, the particle system will be deleted when the next animation starts playing and new one created in its stead if the `Next` animation defines a different particle system.

In `artmd.ini`:

```
[SOMEANIM]        ; AnimationType
AttachedSystem=   ; ParticleSystem
```

8.2.3 Play sound as a detached sound event

- It is now possible for animation to play a sound that is not attached to an audio event handler by using `DetachedReport`. By default animation `Report/StartSound` is played by an audio event handler, which allows the sound to loop and play at correct location even if it changes after its initial creation. This can also cause issues with animations that chain different types through `Next`, as the audio event handler resets when the animation restarts.

In `artmd.ini`:

```
[SOMEANIM]        ; AnimationType
DetachedReport=   ; sound entry
```

8.3 Buildings

8.3.1 Extended building upgrades

Upgrading own and allied Power Plants in CnC: Final War

Note: Due to technical limitations, with Ares, upgrades placed through `PowersUp.Buildings` instead of `PowersUpBuilding` (note that internally `PowersUpBuilding` is set to first entry of `PowersUp.Buildings` if former is not set but latter is) **DO NOT** satisfy prerequisites. Suggested workaround is to use the upgrades to provide Superweapons that spawn in buildings via *LimboDelivery* logic to function as prerequisites, which are destroyed by another SW that becomes available if parent building is gone and so on.

- Building upgrades now can be placed on own buildings, on allied buildings and/or on enemy buildings. These three owners can be specified by `PowersUp.Owner`. When upgrade is placed on building, it automatically changes it's owner to match the building's owner.

- One upgrade can now be applied to multiple different types of buildings specified by `PowersUp.Buildings`.

  - Ares-introduced build limit for building upgrades works with this feature.

In `rulesmd.ini`:

```
[UPGRADENAME]          ; BuildingType
PowersUp.Owner=Self ; list of Affected House Enumeration (none|owner/self|allies/
↪ally|team|enemies/enemy|all)
PowersUp.Buildings= ; list of BuildingTypes
```

8.3.2 Power plant enhancer

- When it exists, it can increase the power amount generated by the power plants.

  - When enchancing structures are sold or destroyed, the power amount returns to normal.

In `rulesmd.ini`:

```
[SOMEBUILDING]                      ; BuildingType
PowerPlantEnhancer.PowerPlants=     ; list of BuildingTypes
PowerPlantEnhancer.Amount=0         ; integer
PowerPlantEnhancer.Factor=1.0       ; floating point value
```

8.3.3 Spy Effects

- Additional espionage bonuses can be toggled with `SpyEffect.Custom`.

  - `SpyEffect.VictimSuperWeapon` instantly launches a Super Weapon for the owner of the infiltrated building at building's coordinates.

  - `SpyEffect.InfiltratorSuperWeapon` behaves the same as above, with the Super Weapon's owner being the owner of the spying unit.

In `rulesmd.ini`:

```
[SOMEBUILDING]                       ; BuildingType
SpyEffect.Custom=false           ; boolean
SpyEffect.VictimSuperWeapon=     ; SuperWeaponType
SpyEffect.InfiltratorSuperWeapon= ; SuperWeaponType
```

8.4 Infantry

8.4.1 Customizable FLH When Infantry Is Prone Or Deployed

- Now infantry can override `PrimaryFireFLH` and `SecondaryFireFLH` if is prone (crawling) or deployed. Also works in conjunction with *burst-index specific firing offsets*.

In `artmd.ini`:

```
[SOMEINFANTRY]            ; InfantryType
PronePrimaryFireFLH=      ; integer - Forward,Lateral,Height
ProneSecondaryFireFLH=    ; integer - Forward,Lateral,Height
DeployedPrimaryFireFLH=   ; integer - Forward,Lateral,Height
DeployedSecondaryFireFLH= ; integer - Forward,Lateral,Height
```

8.4.2 Default disguise for individual InfantryTypes

- Infantry can now have its `DefaultDisguise` overridden per-type.
  - This tag's priority is higher than Ares' per-side `DefaultDisguise`.

In `rulesmd.ini`:

```
[SOMEINFANTRY]       ; InfantryType
DefaultDisguise=E2   ; InfantryType
```

8.4.3 Random death animaton for NotHuman Infantry

- Infantry with `NotHuman=yes` can now play random death anim sequence between `Die1` to `Die5` instead of the hardcoded `Die1`.
  - Do not forget to tweak infantry anim sequences before enabling this feature, otherwise it will play invisible anim sequence.

In `rulesmd.ini`:

```
[SOMEINFANTRY]                   ; InfantryType
NotHuman.RandomDeathSequence=yes ; boolean
```

8.4.4 Shared Ammo

- Transports with `OpenTopped=yes` and `Ammo.Shared=yes` will transfer ammo to passengers that have `Ammo.Shared=yes`. In addition, a transport can filter who will receive ammo if passengers have the same value in `Ammo.Shared.Group=<integer>` of the transport, ignoring other passengers with different groups values.

- Transports with `Ammo.Shared.Group=-1` will transfer ammo to any passenger with `Ammo.Shared=yes` ignoring the group.

- Transports must have ammo and should be able to reload ammo.

In `rulesmd.ini`:

```
[SOMETECHNO1]          ; TechnoType, transport with OpenTopped=yes
Ammo.Shared=no         ; boolean
Ammo.Shared.Group=-1   ; integer

[SOMETECHNO2]          ; TechnoType, passenger
Ammo.Shared=no         ; boolean
Ammo.Shared.Group=-1   ; integer
```

8.4.5 Slaves' house decision customization when owner is killed

- You can now decide the slaves' house when the corresponding slave miner is killed using `Slaved.OwnerWhenMasterKilled`:

    - `suicide`: Kill each slave if the slave miner is killed.

    - `master`: Free the slaves but keep the house of the slave unchanged.

    - `neutral`: The slaves belong to civilian house.

    - `killer`: Free the slaves and give them to the house of the slave miner's killer. (vanilla behavior)

In `rulesmd.ini`

```
[SOMEINFANTRY]                          ; Slave type
Slaved=yes
Slaved.OwnerWhenMasterKilled=killer   ; enumeration (suicide | master | killer | neutral)
```

8.4.6 Customizable `SlavesFreeSound`

- `SlavesFreeSound` is now dehardcoded from `AudioVisual` and can be set individually for each enslavable infantry type.

In `rulesmd.ini`

```
[SOMEINFANTRY]  ; Slave type
SlavesFreeSound=      ; sound entry
```

8.5 Projectiles

8.5.1 Projectile interception logic

Interception logic used in Tiberium Crisis mod

- Projectiles can now be made interceptable by certain TechnoTypes by setting `Interceptable=true` on them. The TechnoType scans for interceptable projectiles within a range if it has no other target and will use one of its weapons to shoot at them. Projectiles can define `Armor` and `Strength`. Weapons that cannot target the projectile's armor type will not attempt to intercept it. On interception, if the projectile has `Armor` set, an amount equaling to the intercepting weapon's `Damage` adjusted by Warhead `Verses` and the TechnoType's firepower multipliers is deducted from the projectile's current strength. Regardless of if the current projectile strength was reduced or not, if it sits at 0 or below after interception, the projectile is detonated.

    - `Interceptor.Weapon` determines the weapon (0 = `Primary`, 1 = `Secondary`) to be used for intercepting projectiles.

* The interceptor weapon may need `AG` and/or `AA` set to true on its projectile to be able to target projectiles depending on their elevation from ground. If you don't set those then the weapon won't be able to target low-flying or high-flying projectiles respectively.

- `Interceptor.CanTargetHouses` controls which houses the projectiles (or rather their firers) can belong to be eligible for interception.

- `Interceptor.GuardRange` (and `Interceptor.(Rookie|Veteran|EliteGuardRange)`) is maximum range of the unit to intercept projectile. The unit weapon range will limit the unit interception range though.

- `Interceptor.MinimumGuardRange` (and `Interceptor.(Rookie|Veteran|EliteMinimumGuardRange)`) is the minimum range of the unit to intercept projectile. Any projectile under this range will not be intercepted.

- `Interceptable.DeleteOnIntercept` determines whether or not the projectile will simply be deleted on detonation upon interception, or if it will properly detonate. Will be overridden by `Interceptor.DeleteOnIntercept` setting on the interceptor.

- `Interceptable.WeaponOverride` can be set to a WeaponType that will be used to override characteristics such as `Damage` and `Warhead` of the current projectile for detonation after interception. Will be overridden by `Interceptor.WeaponOverride` setting on the interceptor.

  * On interceptors, `Interceptor.WeaponReplaceProjectile` can be set to true to make `Interceptor.WeaponOverride` also replace the intercepted projectile's type (including `Image` and other projectile characteristics) and `Speed` with its own. Does not replace particle systems (`AttachedSystem`, *Ares feature*).

  * On interceptors, `Interceptor.WeaponCumulativeDamage` can be set to true to make `Damage` from `Interceptor.WeaponOverride` weapon be added on the projectile's damage rather than override it.

- `Interceptor.KeepIntact` can be set to true to allow intercepted projectiles to continue traveling as if they were not intercepted, but effects such as `Interceptor.WeaponOverride` will still be applied.

In `rulesmd.ini`:

```
[SOMETECHNO]                                  ; TechnoType
Interceptor=false                             ; boolean
Interceptor.Weapon=0                          ; integer, weapon slot index (0 or 1)
Interceptor.CanTargetHouses=enemies           ; Affected House Enumeration (none|owner/
→self|allies|ally|team|enemies|enemy|all)
Interceptor.GuardRange=0.0                    ; floating point value
Interceptor.VeteranGuardRange=                ; floating point value
Interceptor.EliteGuardRange=                  ; floating point value
Interceptor.MinimumGuardRange=0.0             ; floating point value
Interceptor.VeteranMinimumGuardRange=         ; floating point value
Interceptor.EliteMinimumGuardRange=           ; floating point value
Interceptor.DeleteOnIntercept=false           ; boolean
Interceptor.WeaponOverride=                   ; WeaponType
Interceptor.WeaponReplaceProjectile=false     ; boolean
Interceptor.WeaponCumulativeDamage=false      ; boolean
Interceptor.KeepIntact=false                  ; boolean


[SOMEPROJECTILE] ; Projectile
Interceptable=false                       ; boolean
Interceptable.DeleteOnIntercept=false     ; boolean
Interceptable.WeaponOverride=             ; WeaponType
Strength=0                                ; integer
Armor=                                    ; ArmorType
```

Note: Currently interceptor weapons with projectiles that do not have `Inviso=true` will be unable to intercept projectiles if the firer of the interceptor weapon dies before the interceptor weapon projectile reaches its target. This may change in future.

8.5.2 Projectile trajectories

- Projectiles can now have customizable trajectories.

    - `Trajectory` should not be combined with original game's projectile trajectory logics (`Arcing`, `ROT`, `Vertical` or `Inviso`). Attempt to do so will result in the other logics being disabled and a warning being written to log file.

    - Initial speed of the projectile is defined by `Trajectory.Speed`, which unlike `Speed` used by ROT > 0 projectiles is defined on projectile not weapon.

    In `rulesmd.ini`:

```
[SOMEPROJECTILE]          ; Projectile
Trajectory.Speed=100.0  ; floating point value
```

Straight trajectory

Straight trajectory used to make blasters in a private mod by @brsajo#9745

- Self-explanatory, is a straight-shot trajectory.

    - `Trajectory.Straight.DetonationDistance` controls the maximum distance in cells from intended target (checked at start of each game frame, before the projectile moves) at which the projectile will be forced to detonate. Set to 0 to disable forced detonation (note that this can cause the projectile to overshoot the target).

    - `Trajectory.Straight.TargetSnapDistance` controls the maximum distance in cells from intended target the projectile can be at moment of detonation to make the projectile 'snap' on the intended target. Set to 0 to disable snapping.

    - `Trajectory.Straight.PassThrough` enables special case logic where the projectile does not detonate in contact with the target but ínstead travels up to a distance defined by `Trajectory.Straight.DetonationDistance`. Note that the firing angle of the projectile is adjusted with this in mind, making it fire straight ahead if the target is on same elevation.

In `rulesmd.ini`:

```
[SOMEPROJECTILE]                          ; Projectile
Trajectory=Straight                       ; Trajectory type
Trajectory.Straight.DetonationDistance=0.4  ; floating point value
Trajectory.Straight.TargetSnapDistance=0.5  ; floating point value
Trajectory.Straight.PassThrough=false       ; boolean
```

Bombard trajectory

- Similar trajectory to `Straight`, but targets a coordinate above the intended target (height determined by `Trajectory.Bombard.Height`). When the projectile approaches that coordinate, it will free fall and explodes when it hits the target or ground.

In `rulesmd.ini`:

```
[SOMEPROJECTILE]                ; Projectile
Trajectory=Bombard              ; Trajectory type
Trajectory.Bombard.Height=0.0   ; double
```

8.5.3 Shrapnel enhancement

Shrapnel appearing against ground & buildings (Project Phantom)

- Shrapnel behavior can be triggered on the ground and buildings.

In `rulesmd.ini`:

```
[SOMEPROJECTILE]                ; Projectile
Shrapnel.AffectsGround=false    ; boolean
Shrapnel.AffectsBuildings=false ; boolean
```

8.5.4 Projectiles blocked by land or water

- It is now possible to make projectiles consider either land or water as obstacles that block their path by setting `SubjectToLand/Water` to true, respectively. Weapons firing such projectiles will consider targets blocked by such obstacles as out of range and will attempt to reposition themselves so they can fire without being blocked by the said obstacles before firing and if `SubjectToLand/Water.Detonate` is set to true, the projectiles will detonate if they somehow manage to collide with the said obstacles.

  - `Level=true` projectiles detonate on tiles belonging to non-water tilesets by default, but will not consider such tiles as true obstacles. This behaviour can be overridden by setting these keys.

In `rulesmd.ini`:

```
[SOMEPROJECTILE]                ; Projectile
SubjectToLand=                  ; boolean
SubjectToLand.Detonate=true     ; boolean
SubjectToWater=                 ; boolean
SubjectToWater.Detonate=true    ; boolean
```

8.5.5 Return weapon

- It is now possible to make another weapon & projectile go off from a detonated projectile (in somewhat similar manner to `AirburstWeapon` or `ShrapnelWeapon`) straight back to the firer by setting `ReturnWeapon`. If the firer perishes before the initial projectile detonates, `ReturnWeapon` is not fired off.

In `rulesmd.ini`:

```
[SOMEPROJECTILE]  ; Projectile
ReturnWeapon=     ; WeaponType
```

Note: This currently has same limitations as `AirburstWeapon` in that it does not properly support `Arcing=true` projectiles.

8.6 Super Weapons

8.6.1 Convert TechnoType

- Warheads can now change TechnoTypes of affected units to other Types in the same category (infantry to infantry, vehicles to vehicles, aircraft to aircraft).

    - `ConvertN.From` (where N is 0, 1, 2. . .) specifies which TechnoTypes are valid for conversion. This entry can have many types listed, meanging that many types will be converted at once. When no types are included, conversion will affect all valid targets.

    - `ConvertN.To` specifies the TechnoType which is the result of conversion.

    - `ConvertN.AffectedHouses` specifies whose units can be converted.

    - `Convert.From`, `Convert.To` and `Convert.AffectedHouses` (without numbers) are a valid alternative to `Convert0.From`, `Convert0.To` and `Convert0.AffectedHouses` if only one pair is specified.

    - Conversion affects *all* existing units of set TechnoTypes, this includes units in: transports, occupied buildings, buildings with `InfantryAbsorb=yes` or `UnitAbsorb=yes`, buildings with `Bunker=yes`.

In example, this superweapon would convert all owned and friendly `SOLDIERA` and `SOLDIERB` to `NEWSOLDIER`:

```
[SOMESW]
Convert.From=SOLDIERA,SOLDIERB
Convert.To=NEWSOLDIER
Convert.AffectedHouses=team
```

Warning: This feature has the same limitations as Ares' Type Conversion. This feature does not support BuildingTypes.

Warning: This feature requires Ares 3.0 or higher to function! When Ares 3.0+ is not detected, not all properties of a unit may be updated.

In `rulesmd.ini`:

```
[SOMESW]                          ; SuperWeapon
ConvertN.From=                    ; list of TechnoTypes
ConvertN.To=                      ; TechnoType
ConvertN.AffectedHouses=owner     ; list of Affected House Enumeration (none|owner/
→self|allies/ally|team|enemies/enemy|all)
; where N = 0, 1, 2, ...
; or
Convert.From=                     ; list of TechnoTypes
Convert.To=                       ; TechnoType
Convert.AffectedHouses=owner      ; list of Affected House Enumeration (none|owner/
→self|allies/ally|team|enemies/enemy|all)
```

8.6.2 LimboDelivery

- Superweapons can now deliver off-map buildings that act as if they were on the field.

    - `LimboDelivery.Types` is the list of BuildingTypes that will be created when the Superweapons fire. Superweapon `Type` and coordinates do not matter.

    - `LimboDelivery.IDs` is the list of numeric IDs that will be assigned to buildings. Necessary for LimboKill to work.

- Created buildings are not affected by any on-map threats. The only way to remove them from the game is by using a Superweapon with `LimboKill.IDs` set.

    - `LimboKill.Affected` sets which houses are affected by this feature.

    - `LimboKill.IDs` lists IDs that will be targeted. Buildings with these IDs will be removed from the game instantly.

- Delivery can be made random with these optional tags. The game will randomly choose only a single building from the list for each roll chance provided.

    - `LimboDelivery.RollChances` lists chances of each "dice roll" happening. Valid values range from 0% (never happens) to 100% (always happens). Defaults to a single sure roll.

    - `LimboDelivery.RandomWeightsN` lists the weights for each "dice roll" that increase the probability of picking a specific building. Valid values are 0 (don't pick) and above (the higher value, the bigger the likelyhood). `RandomWeights` are a valid alias for `RandomWeights0`. If a roll attempt doesn't have weights specified, the last weights will be used.

Note: This feature might not support every building flag. Flags that are confirmed to work correctly are listed below:

- FactoryPlant

- OrePurifier

- SpySat

- KeepAlive (Ares 3.0)

- Prerequisite, PrerequisiteOverride, Prerequisite.List# (Ares 0.1), Prerequisite.Negative (Ares 0.1), GenericPrerequisites (Ares 0.1)

- SuperWeapon, SuperWeapon2, SuperWeapons (Ares 0.9), SW.AuxBuildings (Ares 0.9), SW.NegBuildings (Ares 0.9)

Note: In order for this feature to work with AITriggerTypes conditions ("Owning house owns ???" and "Enemy house owns ???"), `LegalTarget` must be set to true.

> **Warning:** Remember that Limbo Delivered buildings don't exist physically! This means they should never have enabled machanics that require interaction with the game world (i.e. factories, cloning vats, service depots, helipads). They also **should have either `KeepAlive=no` set or be killable with LimboKill** - otherwise the game might never end.

In `rulesmd.ini`:

```
[SOMESW]                       ; Superweapon
LimboDelivery.Types=           ; List of BuildingTypes
LimboDelivery.IDs=             ; List of numeric IDs. -1 cannot be used.
LimboDelivery.RollChances=     ; List of percentages.
LimboDelivery.RandomWeightsN=  ; List of integers.
LimboKill.Affected=self        ; Affected House Enumeration (none|owner|self|allies/
→ally|team|enemies|enemy|all)
LimboKill.IDs=                 ; List of numeric IDs.
```

8.6.3 Next

Superweapons can now launch other superweapons at the same target. Launched types can be additionally randomized using the same rules as with LimboDelivery (see above).

- `SW.Next.RealLaunch` controls whether the owner who fired the initial superweapon must own all listed superweapons and sufficient funds to support `Money.Amout`. Otherwise they will be launched forcibly.

- `SW.Next.IgnoreInhibitors` ignores `SW.Inhibitors`/`SW.AnyInhibitor` of each superweapon, otherwise only non-inhibited superweapons are launched.

- `SW.Next.IgnoreDesignators` ignores `SW.Designators`/`SW.AnyDesignator` respectively.

In `rulesmd.ini`:

```
[SOMESW]                       ; Super Weapon
SW.Next=                       ; List of Superweapons
SW.Next.RealLaunch=true        ; boolean
SW.Next.IgnoreInhibitors=false ; boolean
SW.Next.IgnoreDesignators=true ; boolean
SW.Next.RollChances=           ; List of percentages.
SW.Next.RandomWeightsN=        ; List of integers.
```

8.6.4 Warhead or Weapon detonation at target cell

- Any superweapon can now detonate a Warhead or a weapon at superweapon's target cell.

    - If both `Detonate.Warhead` and `Detonate.Weapon` are set, latter takes precedence.

    - `Detonate.Damage`, if not set, defaults to weapon `Damage` for `Detonate.Weapon` and 0 for `Detonate.Warhead`.

    - Both the weapon and Warhead behave as if fired by whatever building fired the Superweapon. This respects controls like `SW.RangeMinimum`/`Maximum` (similar to Ares' GenericWarhead superweapon in this regard). If firing building could not be found, the house the Superweapon belonged to is still used to deal damage and apply Phobos-introduced Warhead effects.

    - If `Detonate.AtFirer` is set to true, the weapon or Warhead is detonated at the firing building instead of the superweapon's target cell. If there is no firer, no detonation will occur.

In `rulesmd.ini`:

```
[SOMESW]                ; Super Weapon
Detonate.Warhead=       ; WarheadType
Detonate.Weapon=        ; WeaponType
```

```
Detonate.Damage=           ; integer
Detonate.AtFirer=false  ; boolean
```

8.7 Technos

8.7.1 Automatic passenger deletion

- Transports can erase passengers over time. Passengers are deleted in order of entering the transport, from first to last.

  - `PassengerDeletion.Rate` determines the interval in game frames that it takes to erase a single passenger.

    * If `PassengerDeletion.Rate.SizeMultiply` is set to true, this time interval is multiplied by the passenger's `Size`.

  - `PassengerDeletion.UseCostAsRate`, if set to true, changes the time interval for erasing a passenger to be based on the passenger's `Cost`. This does not factor in modifiers like `FactoryPlant`.

    * `PassengerDeletion.CostMultiplier` can be used to modify the cost-based time interval.

    * `PassengerDeletion.CostRateCap` can be used to set a cap to the cost-based time interval.

  - `PassengerDeletion.AllowedHouses` determines which houses passengers can belong to be eligible for deletion.

  - `PassengerDeletion.DontScore`, if set to true, makes it so that the deleted passengers are not counted as having been killed by the transport (no experience, not recorded towards owning house's score etc).

  - If `PassengerDeletion.Soylent` is set to true, an amount of credits is refunded to the owner of the transport. The exact amount refunded is determined by the passengers `Soylent`, or if not set, its `Cost` (this is affected by modifiers such as `FactoryPlant`).

    * `PassengerDeletion.SoylentMultiplier` is a direct multiplier applied to the refunded amount of credits.

    * `PassengerDeletion.SoylentAllowedHouses` determines which houses passengers can belong to be eligible for refunding.

    * `PassengerDeletion.DisplaySoylent` can be set to true to display the amount of credits refunded on the transport. `PassengerDeletion.DisplaySoylentToHouses` determines which houses can see this and `PassengerDeletion.DisplaySoylentOffset` can be used to adjust the display offset.

  - `PassengerDeletion.ReportSound` and `PassengerDeletion.Anim` can be used to specify a sound and animation to play when a passenger is erased, respectively.

In `rulesmd.ini`:

```
[SOMETECHNO]                                 ; TechnoType
PassengerDeletion.Rate=0                      ; integer, game frames
PassengerDeletion.Rate.SizeMultiply=true      ; boolean
PassengerDeletion.UseCostAsRate=false         ; boolean
PassengerDeletion.CostMultiplier=1.0          ; floating point value, percents or␣
↪absolute
PassengerDeletion.CostRateCap=                ; integer, game frames
PassengerDeletion.AllowedHouses=all           ; Affected House Enumeration (none|owner/
↪self|allies/ally|team|enemies/enemy|all)
```

```
PassengerDeletion.DontScore=false                  ; boolean
PassengerDeletion.Soylent=false                    ; boolean
PassengerDeletion.SoylentMultiplier=1.0            ; float, percents or absolute
PassengerDeletion.SoylentAllowedHouses=enemies     ; Affected House Enumeration (none|owner/
↪self|allies|ally|team|enemies|enemy|all)
PassengerDeletion.DisplaySoylent=false             ; boolean
PassengerDeletion.DisplaySoylentToHouses=All       ; Affected House Enumeration (none|owner/
↪self|allies|ally|team|enemies|enemy|all)
PassengerDeletion.DisplaySoylentOffset=0,0         ; X,Y, pixels relative to default
PassengerDeletion.ReportSound=                     ; Sound
PassengerDeletion.Anim=                            ; Animation
```

8.7.2 Automatic passenger owner change to match transport owner

- Transports with `Passengers.SyncOwner` set to true will have the owner of their passengers changed to match the transport if transport's owner changes.

    - On `OpenTopped=true` transports this will also disable checks that prevent target acquisition by passengers when the transport is temporarily mind controlled.

    - `Passengers.SyncOwner.RevertOnExit`, if set to true (which is the default), changes the passengers' owner back to whatever it was originally when they entered the transport when they are ejected.

    - Does not work on passengers acquired through use of `Abductor=true` weapon *(Ares feature)*.

In `rulesmd.ini`:

```
[SOMETECHNO]                               ; TechnoType
Passengers.SyncOwner=false                 ; boolean
Passengers.SyncOwner.RevertOnExit=true     ; boolean
```

8.7.3 Automatically firing weapons

- You can now make TechnoType automatically fire its weapon(s) without having to scan for suitable targets by setting `AutoFire`, on either its base cell (in which case the weapon that is used for force-firing is used) or itself (in which case normal targeting and weapon selection rules and are respected) depending on if `AutoFire.TargetSelf` is set or not.

In `rulesmd.ini`:

```
[SOMETECHNO]               ; TechnoType
AutoFire=false             ; boolean
AutoFire.TargetSelf=false  ; boolean
```

8.7.4 Customizable OpenTopped properties

- You can now override global `OpenTopped` transport properties per TechnoType.

- `OpenTopped.IgnoreRangefinding` can be used to disable `OpenTopped` transport rangefinding behaviour where smallest weapon range between transport and all passengers is used when approaching targets that are out of range and when scanning for potential targets.

- `OpenTopped.AllowFiringIfDeactivated` can be used to customize whether or not passengers can fire out when the transport is deactivated (EMP, powered unit etc).

- `OpenTopped.ShareTransportTarget` controls whether or not the current target of the transport itself is passed to the passengers as well.

```
[SOMETECHNO]                              ; TechnoType
OpenTopped.RangeBonus=                    ; integer, override of the global default
OpenTopped.DamageMultiplier=              ; floating point value, override of the global
→default
OpenTopped.WarpDistance=                  ; integer, override of the global default
OpenTopped.IgnoreRangefinding=false       ; boolean
OpenTopped.AllowFiringIfDeactivated=true  ; boolean
OpenTopped.ShareTransportTarget=true      ; boolean
```

8.7.5 Disabling fallback to (Elite)Secondary weapon

- It is now possible to disable the fallback to `(Elite)Secondary` weapon from `(Elite)Primary` weapon if it cannot fire at the chosen target by setting `NoSecondaryWeaponFallback` to true (defaults to false). `NoSecondaryWeaponFallback.AllowAA` controls whether or not fallback because of projectile `AA` setting and target being in air is still allowed. This does not apply to special cases where `(Elite)Secondary` weapon is always chosen, including but not necessarily limited to the following:

  - `OpenTransportWeapon=1` on an unit firing from inside `OpenTopped=true` transport.

  - `NoAmmoWeapon=1` on an unit with `Ammo` value higher than 0 and current ammo count lower or equal to `NoAmmoAmount`.

  - Deployed `IsSimpleDeployer=true` units with`DeployFireWeapon=1` set or omitted.

  - `DrainWeapon=true` weapons against enemy `Drainable=yes` buildings.

  - Units with `IsLocomotor=true` set on `Warhead` of `(Elite)Primary` weapon against buildings.

  - Weapons with `ElectricAssault=true` set on `Warhead` against `Overpowerable=true` buildings belonging to owner or allies.

  - `Overpowerable=true` buildings that are currently overpowered.

  - Any system using `(Elite)WeaponX`, f.ex `Gunner=true` or `IsGattling=true` is also wholly exempt.

In `rulesmd.ini`:

```
[SOMETECHNO]                              ; TechnoType
NoSecondaryWeaponFallback=false           ; boolean
NoSecondaryWeaponFallback.AllowAA=false   ; boolean
```

8.7.6 Disguise logic additions (disguise-based movement speed, disguise blinking visibility)

- `DisguiseBlinkingVisibility` can be used to customize which players can see disguises blinking on units. This does not affect targeting but does affect veterancy insignia visibility - blinking disguise means the original unit's insignia is visible always instead of disguise's.

- `UseDisguiseMovementSpeed`, if set, makes disguised unit adjust its movement speed to match that of the disguise, if applicable. Note that this applies even when the disguise is revealed, as long as it has not been removed.

In `rulesmd.ini`:

```
[General]
DisguiseBlinkingVisibility=owner  ; list of Affected House Enumeration (none|owner/
→self|allies|ally|team|enemies|enemy|all)

[SOMETECHNO]                       ; TechnoType
UseDisguiseMovementSpeed=false     ; boolean
```

8.7.7 Firing offsets for specific Burst shots

- You can now specify separate firing offsets for each of the shots fired by weapon with `Burst` via using `(Elite)(Prone/Deployed)PrimaryFire|SecondaryFire|WeaponX|FLH.BurstN` keys, depending on which weapons your TechnoType makes use of. *N* in `BurstN` is zero-based burst shot index, and the values are parsed sequentially until no value for either regular or elite weapon is present, with elite weapon defaulting to regular weapon FLH if only it is missing. If no burst-index specific value is available, value from the base key (f.ex `PrimaryFireFLH`) is used.

- Burst-index specific firing offsets are absolute firing offsets and the lateral shifting based on burst index that occurs with the base firing offsets is not applied.

In `artmd.ini`:

```
[SOMETECHNO]    ; TechnoType Image
FLHKEY.BurstN=  ; integer - Forward,Lateral,Height. FLHKey refers to weapon-specific FLH
→key name and N is zero-based burst shot index.
```

8.7.8 Forcing specific weapon against certain targets

Naval underwater target behavior with `ForceWeapon.Naval.Decloaked` *in* *C&C: Reloaded*

- Can be used to override normal weapon selection logic to force specific weapons to use against certain targets. If multiple are set and target satisfies the conditions, the first one in listed order satisfied takes effect.

  - `ForceWeapon.Naval.Decloaked` forces specified weapon to be used against uncloaked naval targets. Useful if your naval unit has one weapon only for underwater and another weapon for surface targets.

  - `ForceWeapon.Cloaked` forces specified weapon to be used against any cloaked targets.

  - `ForceWeapon.Disguised` forces specified weapon to be used against any disguised targets.

In `rulesmd.ini`:

```
[SOMETECHNO]                    ; TechnoType
ForceWeapon.Naval.Decloaked=-1  ; integer. 0 for primary weapon, 1 for secondary weapon,␣
↪-1 to disable
ForceWeapon.Cloaked=-1          ; integer. 0 for primary weapon, 1 for secondary weapon,␣
↪-1 to disable
ForceWeapon.Disguised=-1        ; integer. 0 for primary weapon, 1 for secondary weapon,␣
↪-1 to disable
```

8.7.9 Make units try turning to target when firing with `OmniFire=yes`

- The unit will try to turn the body to target even firing with `OmniFire=yes`
    - Jumpjets are recommended to have the same value of body `ROT` and `JumpjetTurnRate`

In `rulesmd.ini`:

```
[SOMEWEAPONTYPE]           ; WeaponType
OmniFire=yes
OmniFire.TurnToTarget=no   ; boolean
```

8.7.10 Initial strength for TechnoTypes and cloned infantry
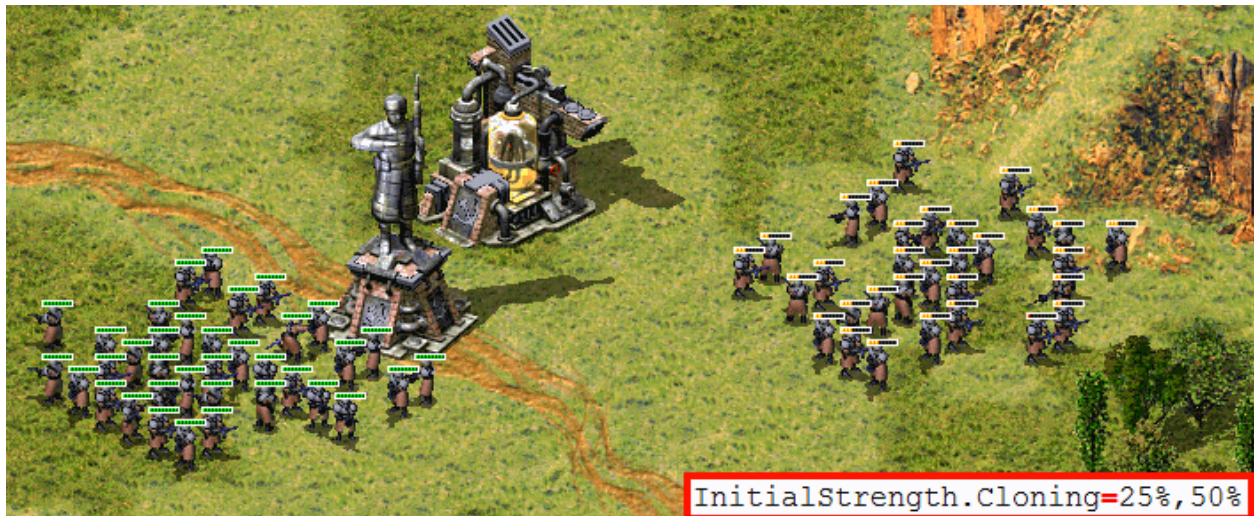
Initial strength for cloned infantry example in C&C: Reloaded

- `InitialStrength` can be used to set how many hitpoints a TechnoType starts with.

- `InitialStrength.Cloning` can be used to specify a percentage of hitpoints (single value or a range from which a random value is picked) cloned infantry produced by `Cloning=true` building start with.

In `rulesmd.ini`:

```
[SOMETECHNO]               ; TechnoType
InitialStrength=           ; integer

[SOMEBUILDING]             ; BuildingType
InitialStrength.Cloning=  ; floating point value - single or comma-sep. range␣
↪(percentages)
```

Note: Both `InitialStrength` and `InitialStrength.Cloning` never surpass the type's `Strength`, even if your values are bigger than it.

8.7.11 Kill Object Automatically

- Objects can be destroyed automatically if *any* of these conditions is met:

  - `OnAmmoDepletion`: The object will die if the remaining ammo reaches 0.

  - `AfterDelay`: The object will die if the countdown (in frames) reaches 0.

  - `TechnosExist` / `TechnosDontExist`: The object will die if TechnoTypes exist or do not exist, respectively.

    * `Technos(Dont)Exist.Any` controls whether or not a single listed TechnoType is enough to satisfy the requirement or if all are required.

    * `Technos(Dont)Exist.AllowLimboed` controls whether or not limboed TechnoTypes (f.ex those in transports) are counted.

    * `Technos(Dont)Exist.Houses` controls which houses are checked.

- The auto-death behavior can be chosen from the following:

  - `kill`: The object will be destroyed normally.

  - `vanish`: The object will be directly removed from the game peacefully instead of actually getting killed.

  - `sell`: If the object is a **building** with buildup, it will be sold instead of destroyed.

If this option is not set, the self-destruction logic will not be enabled. `AutoDeath.VanishAnimation` can be set to animation to play at object's location if `vanish` behaviour is chosen.

Note: Please notice that if the object is a unit which carries passengers, they will not be released even with the `kill` option **if you are not using Ares 3.0+**.

This logic also supports buildings delivered by LimboDelivery. However in this case, all `AutoDeath.Behavior` values produce identical result where the building is simply deleted.

In `rulesmd.ini`:

```
[SOMETECHNO]                                      ; TechnoType
AutoDeath.Behavior=                               ; enumeration (kill | vanish | sell),␣
↪default not set
AutoDeath.VanishAnimation                         ; Animation
AutoDeath.OnAmmoDepletion=no                      ; boolean
AutoDeath.AfterDelay=0                            ; positive integer
AutoDeath.TechnosDontExist=                       ; list of TechnoType names
AutoDeath.TechnosDontExist.Any=false              ; boolean
AutoDeath.TechnosDontExist.AllowLimboed=false     ; boolean
AutoDeath.TechnosDontExist.Houses=owner           ; Affected House Enumeration (none|owner/
↪self|allies|ally|team|enemies|enemy|all)
AutoDeath.TechnosExist=                           ; list of TechnoType names
AutoDeath.TechnosExist.Any=true                   ; boolean
```

```
AutoDeath.TechnosExist.AllowLimboed=false      ; boolean
AutoDeath.TechnosExist.Houses=owner            ; Affected House Enumeration (none|owner/
→self|allies|ally|team|enemies|enemy|all)
```

8.7.12 Mind Control enhancement

Mind Control Range Limit used in Fantasy ADVENTURE Multiple Mind Control unit auto-releases the first victim in Fantasy ADVENTURE

- Mind controllers now can have the upper limit of the control distance. Tag values greater than 0 will activate this feature.

- Mind controllers with multiple controlling slots can now release the first controlled unit when they have reached the control limit and are ordered to control a new target.

- Allows Warheads to play custom `MindControl.Anim` which defaults to `ControlledAnimationType`.

In `rulesmd.ini`:

```
[SOMETECHNO]                          ; TechnoType
MindControlRangeLimit=-1.0            ; floating point value
MultiMindControl.ReleaseVictim=false  ; boolean

[SOMEWARHEAD]                         ; Warhead
MindControl.Anim=                     ; Animation, defaults to ControlledAnimationType
```

8.7.13 No Manual Move

- You can now specify whether a TechnoType is unable to receive move command.

```
[SOMETECHNO]          ; TechnoType
NoManualMove=false  ; boolean
```

8.7.14 Promoted Spawns

Promoted Spawns in Fantasy ADVENTURE

- The spawned units will promote as their owner's veterancy.

In `rulesmd.ini`:

```
[SOMETECHNO]                   ; TechnoType
Promote.IncludeSpawns=false  ; boolean
```

8.7.15 Spawner pursuit range & spawn delay customization

Limited pursue range for spawns in Fantasy ADVENTURE

- If `Spawner.LimitRange` is set, the spawned units will abort their pursuit if the enemy is out of the range of the largest weapon `Range` of a `Spawner=true` weapon of the spawner.

    - `Spawner.ExtraLimitRange` adds extra pursuit range on top of the weapon range.

- `Spawner.DelayFrames` can be used to set the minimum number of game frames in between each spawn ejecting from the spawner. By default this is 9 frames for missiles and 20 for everything else.

In `rulesmd.ini`:

```
[SOMETECHNO]                 ; TechnoType
Spawner.LimitRange=false    ; boolean
Spawner.ExtraLimitRange=0   ; integer, range in cells
Spawner.DelayFrames=        ; integer, game frames
```

8.7.16 Weapons fired on warping in / out

- It is now possible to add weapons that are fired on a teleporting TechnoType when it warps in or out. They are at the same time as the appropriate animations (`WarpIn` / `WarpOut`) are displayed.

    - `WarpInMinRangeWeapon` is used instead of `WarpInWeapon` if the distance traveled (in leptons) was less than `ChronoRangeMinimum`. This works regardless of if `ChronoTrigger` is set or not. If `WarpInMinRangeWeapon` is not set, it defaults to `WarpInWeapon`.

    - If `WarpInWeapon.UseDistanceAsDamage` is set, `Damage` of `WarpIn(MinRange)Weapon` is overriden by the number of whole cells teleported across.

In `rulesmd.ini`:

```
[SOMETECHNO]                              ; TechnoType
WarpInWeapon=                             ; WeaponType
WarpInMinRangeWeapon=                     ; WeaponType
WarpInWeapon.UseDistanceAsDamage=false   ; boolean
WarpOutWeapon=                            ; WeaponType
```

8.7.17 Customize EVA voice and `SellSound` when selling units

- When a building or a unit is sold, a sell sound as well as an EVA is played to the owner. These configurations have been deglobalized.

    - `EVA.Sold` is used to customize the EVA voice when selling, default to `EVA_StructureSold` for buildings and `EVA_UnitSold` for vehicles.

    - `SellSound` is used to customize the report sound when selling, default to `[AudioVisual]->SellSound`. Note that vanilla game played vehicles' SellSound globally. This has been changed in consistency with buildings' SellSound.

In `rulesmd.ini`:

```
[SOMETECHNO]     ; BuildingType or UnitType
EVA.Sold=        ; EVA entry
SellSound=       ; sound entry
```

8.7.18 Sound entry on unit's creation

- When a unit is created, sound specified in `VoiceCreated` will be played for the unit owner.

- If `IsVoiceCreatedGlobal` is set to true, `VoiceCreated` will be played globally instead of `EVA_UnitReady`.

In `rulesmd.ini`:

```ini
[AudioVisual]
IsVoiceCreatedGlobal=false   ; boolean

[SOMETECHNO]                 ; UnitType
VoiceCreated=                ; sound entry
```

8.7.19 Convert TechnoType on owner house change

- You can now change a unit's type when changing ownership from human to computer or from computer to human.

In `rulesmd.ini`:

```ini
[SOMETECHNO]
Convert.HumanToComputer =   ; TechnoType
Convert.ComputerToHuman =   ; TechnoType
```

8.8 Terrain

8.8.1 Destroy animation & sound

- You can now specify a destroy animation and sound for a TerrainType that are played when it is destroyed.

In `rulesmd.ini`:

```ini
[SOMETERRAINTYPE]  ; TerrainType
DestroyAnim=       ; Animation
DestroySound=      ; Sound
```

8.9 Warheads

Hint: All new warhead effects

- can be used with CellSpread and Ares' GenericWarhead superweapon where applicable.

- cannot be used with `MindControl.Permanent=yes` of Ares.

8.9.1 Break Mind Control on impact

Mind control break warhead being utilized (RA2: Reboot)

- Warheads can now break mind control (doesn't apply to perma-MC-ed objects).

In `rulesmd.ini`:

```
[SOMEWARHEAD]              ; Warhead
RemoveMindControl=false   ; boolean
```

8.9.2 Chance-based extra damage or Warhead detonation / 'critical hits'

- Warheads can now apply additional chance-based damage or Warhead detonation ('critical hits') with the ability to customize chance, damage, affected targets, affected target HP threshold and animations of critical hit.
    - `Crit.Chance` determines chance for a critical hit to occur. By default this is checked once when the Warhead is detonated and every target that is susceptible to critical hits will be affected. If `Crit.ApplyChancePerTarget` is set, then whether or not the chance roll is successful is determined individually for each target.
    - `Crit.ExtraDamage` determines the damage dealt by the critical hit. If `Crit.Warhead` is set, the damage is used to detonate the specified Warhead on each affected target, otherwise the damage is directly dealt based on current Warhead's `Verses` settings.
    - `Crit.Affects` can be used to customize types of targets that this Warhead can deal critical hits against. Critical hits cannot affect empty cells or cells containing only TerrainTypes, overlays etc.
    - `Crit.AffectsHouses` can be used to customize houses that this Warhead can deal critical hits against.
    - `Crit.AffectBelowPercent` can be used to set minimum percentage of their maximum `Strength` that targets must have left to be affected by a critical hit.
    - `Crit.AnimList` can be used to set a list of animations used instead of Warhead's `AnimList` if Warhead deals a critical hit to even one target. If `Crit.AnimList.PickRandom` is set (defaults to `AnimList.PickRandom`) then the animation is chosen randomly from the list.
        * `Crit.AnimOnAffectedTargets`, if set, makes the animation(s) from `Crit.AnimList` play on each affected target *in addition* to animation from Warhead's `AnimList` playing as normal instead of replacing `AnimList` animation.
    - `Crit.SuppressWhenIntercepted`, if set, prevents critical hits from occuring at all if the warhead was detonated from a *projectile that was intercepted*.
    - `ImmuneToCrit` can be set on TechnoTypes and ShieldTypes to make them immune to critical hits.

In `rulesmd.ini`:

```
[SOMEWARHEAD]                            ; Warhead
Crit.Chance=0.0                          ; floating point value, percents or absolute (0.0-1.
→0)
Crit.ApplyChancePerTarget=false    ; boolean
Crit.ExtraDamage=0                       ; integer
Crit.Warhead=                            ; Warhead
Crit.Affects=all                         ; list of Affected Target Enumeration␣
→(none|land|water|infantry|units|buildings|all)
Crit.AffectsHouses=all               ; list of Affected House Enumeration (none|owner/
→self|allies|ally|team|enemies|enemy|all)
```

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```
Crit.AffectBelowPercent=1.0          ; floating point value, percents or absolute (0.0-1.
↪0)
Crit.AnimList=                       ; list of animations
Crit.AnimList.PickRandom=            ; boolean
Crit.AnimOnAffectedTargets=false     ; boolean
Crit.SuppressWhenIntercepted=false   ; boolean


[SOMETECHNO]                         ; TechnoType
ImmuneToCrit=no                      ; boolean
```

Warning: If you set `Crit.Warhead` to the same Warhead it is defined on, or create a chain of Warheads with it that loops back to the first one there is a possibility for the game to get stuck in a loop and freeze or crash afterwards.

8.9.3 Convert TechnoType on impact

- Warheads can now change TechnoTypes of affected units to other Types in the same category (infantry to infantry, vehicles to vehicles, aircraft to aircraft).

    - `ConvertN.From` (where N is 0, 1, 2. . .) specifies which TechnoTypes are valid for conversion. This entry can have many types listed, meanging that many types will be converted at once. When no types are included, conversion will affect all valid targets.

    - `ConvertN.To` specifies the TechnoType which is the result of conversion.

    - `ConvertN.AffectedHouses` specifies whose units can be converted.

    - `Convert.From`, `Convert.To` and `Convert.AffectedHouses` (without numbers) are a valid alternative to `Convert0.From`, `Convert0.To` and `Convert0.AffectedHouses` if only one pair is specified.

In example, this warhead would convert all affected owned and friendly `SOLDIERA` and `SOLDIERB` to `NEWSOLDIER`:

```
[SOMEWARHEAD]
Convert.From=SOLDIERA,SOLDIERB
Convert.To=NEWSOLDIER
Convert.AffectedHouses=team
```

Warning: This feature has the same limitations as Ares' Type Conversion. This feature does not support BuildingTypes.

Warning: This feature requires Ares 3.0 or higher to function! When Ares 3.0+ is not detected, not all properties of a unit may be updated.

In `rulesmd.ini`:

```
[SOMEWARHEAD]                        ; Warhead
ConvertN.From=                       ; list of TechnoTypes
ConvertN.To=                         ; TechnoType
ConvertN.AffectedHouses=all          ; list of Affected House Enumeration (none|owner/
↪self|allies/ally|team|enemies/enemy|all)
```

```
; where N = 0, 1, 2, ...
; or
Convert.From=                    ; list of TechnoTypes
Convert.To=                      ; TechnoType
Convert.AffectedHouses=all       ; list of Affected House Enumeration (none|owner/
↪self|allies/ally|team|enemies/enemy|all)
```

8.9.4 Custom 'SplashList' on Warheads

- Allows Warheads to play custom water splash animations. See vanilla's Conventional system here. `SplashList.PickRandom` can be set to true to pick a random animation to play from the list.

In `rulesmd.ini`:

```
[SOMEWARHEAD]                    ; Warhead
SplashList=<none>                ; list of animations
SplashList.PickRandom=false      ; boolean
```

8.9.5 Detonate Warhead on all objects on map

> **Warning:** While this feature can provide better performance than a large `CellSpread` value, it still has potential to slow down the game, especially if used in conjunction with things like animations, alpha lights etc. Modder discretion and use of the filter keys (`AffectTargets/Houses/Types` etc.) is advised.

- Setting `DetonateOnAllMapObjects` to true allows a Warhead that is detonated by a projectile (for an example, this excludes things like animation `Warhead` and Ares' GenericWarhead superweapon but includes `Crit.Warhead` and animation `Weapon`) and consequently any `Airburst/ShrapnelWeapon` that may follow to detonate on each object currently alive and existing on the map regardless of its actual target, with optional filters. Note that this is done immediately prior Warhead detonation so after `PreImpactAnim` *(Ares feature)* has been displayed.
  - `DetonateOnAllMapObjects.AffectTargets` is used to filter which types of targets (TechnoTypes) are considered valid and must be set to a valid value other than `none` for this feature to work. Only `none`, `all`, `aircraft`, `buildings`, `infantry` and `units` are valid values. This is set to `none` by default as inclusion of all object types can be performance-heavy.
  - `DetonateOnAllMapObjects.AffectHouses` is used to filter which houses targets can belong to be considered valid and must be set to a valid value other than `none` for this feature to work. Only applicable if the house that fired the projectile is known. This is set to `none` by default as inclusion of all houses can be performance-heavy.
  - `DetonateOnAllMapObjects.AffectTypes` can be used to list specific TechnoTypes to be considered as valid targets. If any valid TechnoTypes are listed, then only matching objects will be targeted. Note that `DetonateOnAllMapObjects.AffectTargets` and `DetonateOnAllMapObjects.AffectHouses` take priority over this setting.
  - `DetonateOnAllMapObjects.IgnoreTypes` can be used to list specific TechnoTypes to be never considered as valid targets.

– `DetonateOnAllMapObjects.RequireVerses`, if set to true, only considers targets whose armor type the warhead has non-zero `Verses` value against as valid. On targets with active shields, shield's armor type is used unless the Warhead has `Shield.Penetrate=true`. This is checked after all other filters listed above.

In `rulesmd.ini`:

```
[SOMEWARHEAD]                             ; Warhead
DetonateOnAllMapObjects=false             ; boolean
DetonateOnAllMapObjects.AffectTargets=none   ; list of Affected Target Enumeration
→(none|aircraft|buildings|infantry|units|all)
DetonateOnAllMapObjects.AffectHouses=none    ; list of Affected House Enumeration
→(none|owner/self|allies/ally|team|enemies/enemy|all)
DetonateOnAllMapObjects.AffectTypes=         ; list of TechnoType names
DetonateOnAllMapObjects.IgnoreTypes=         ; list of TechnoType names
DetonateOnAllMapObjects.RequireVerses=false  ; boolean
```

8.9.6 Generate credits on impact

`TransactMoney` *used in* *Rise of the East* *mod*

- Warheads can now give credits to its owner at impact.

  – `TransactMoney.Display` can be set to display the amount of credits given or deducted. The number is displayed in green if given, red if deducted and will move upwards after appearing.

    ∗ `TransactMoney.Display.AtFirer` if set, makes the credits display appear on firer instead of target. If set and firer is not known, it will display at target regardless.

    ∗ `TransactMoney.Display.Houses` determines which houses can see the credits display.

    ∗ `TransactMoney.Display.Offset` is additional pixel offset for the center of the credits display, by default (0,0) at target's/firer's center.

In `rulesmd.ini`:

```
[SOMEWARHEAD]                          ; Warhead
TransactMoney=0                        ; integer - credits added or subtracted
TransactMoney.Display=false            ; boolean
TransactMoney.Display.AtFirer=false    ; boolean
TransactMoney.Display.Houses=All       ; Affected House Enumeration (none|owner/
→self|allies/ally|team|enemies/enemy|all)
TransactMoney.Display.Offset=0,0       ; X,Y, pixels relative to default
```

8.9.7 Launch superweapons on impact

- Superweapons can now be launched when a warhead is detonated.

  – `LaunchSW` specifies the superweapons to launch when the warhead is detonated. If superweapon has negative `Money.Amount`, the firing house must have enough credits in order for it to be fired.

  – `LaunchSW.RealLaunch` controls whether the owner who fired the warhead must own all listed superweapons. Otherwise they will be launched out of nowhere.

  – `LaunchSW.IgnoreInhibitors` ignores `SW.Inhibitors`/`SW.AnyInhibitor` of each superweapon, otherwise only non-inhibited superweapons are launched.

  – `LaunchSW.IgnoreDesignators` ignores `SW.Designators`/`SW.AnyDesignator` respectively.

- LaunchSW.DisplayMoney can be set to display the amount of credits given or deducted by the launched superweapon by Money.Amount. The number is displayed in green if given, red if deducted and will move upwards after appearing.

  * LaunchSW.DisplayMoney.Houses determines which houses can see the credits display.

  * LaunchSW.DisplayMoney.Offset is additional pixel offset for the center of the credits display, by default (0,0) at superweapon's target cell.

Note:

- For animation warheads/weapons to take effect, Damage.DealtByInvoker must be set.

- Due to the nature of some superweapon types, not all superweapons are suitable for launch. **Please use with caution!**

- The superweapons are launched on the *cell* where the warhead is detonated, instead of being click-fired.

In rulesmd.ini:

```
[SOMEWARHEAD]                        ; Warhead
LaunchSW=                            ; list of superweapons
LaunchSW.RealLaunch=true             ; boolean
LaunchSW.IgnoreInhibitors=false      ; boolean
LaunchSW.IgnoreDesignators=true      ; boolean
LaunchSW.DisplayMoney=false          ; boolean
LaunchSW.DisplayMoney.Houses=all     ; Affected House Enumeration (none|owner/self|allies/
↪ally|team|enemies/enemy|all)
LaunchSW.DisplayMoney.Offset=0,0     ; X,Y, pixels relative to default
```

8.9.8 Remove disguise on impact

- Warheads can now remove disguise from disguised infantry such as spies. This will work even if the disguised was acquired by default through PermaDisguise.

In rulesmd.ini:

```
[SOMEWARHEAD]           ; Warhead
RemoveDisguise=false    ; boolean
```

8.9.9 Reveal map for owner on impact

- Warheads can now reveal the entire map on impact.

  - Reveal only applies to the owner of the warhead.

In rulesmd.ini:

```
[SOMEWARHEAD]   ; Warhead
SpySat=false    ; boolean
```

8.9.10 Shroud map for enemies on impact

- Warheads can now shroud the entire map on impact.

- Shroud only applies to enemies of the warhead owner.

In `rulesmd.ini`:

```
[SOMEWARHEAD]   ; Warhead
BigGap=false    ; boolean
```

8.9.11 Trigger specific NotHuman infantry Death anim sequence

- Warheads are now able to trigger specific `NotHuman=yes` infantry `Death` anim sequence using the corresponding tag. It's value represents sequences from `Die1` to `Die5`.

In `rulesmd.ini`:

```
[SOMEWARHEAD]              ; Warhead
NotHuman.DeathSequence=  ; integer (1 to 5)
```

8.10 Weapons

8.10.1 AreaFire target customization

- You can now specify how AreaFire weapon picks its target. By default it targets the base cell the firer is currently on, but this can now be changed to fire on the firer itself or at a random cell within the radius of the weapon's `Range` by setting `AreaFire.Target` to `self` or `random` respectively.

- `AreaFire.Target=self` respects normal targeting rules (Warhead Verses etc.) against the firer itself.

- `AreaFire.Target=random` ignores cells that are ineligible or contain ineligible objects based on listed values in weapon's `CanTarget` & `CanTargetHouses`.

In `rulesmd.ini`:

```
[SOMEWEAPON]          ; WeaponType
AreaFire.Target=base ; AreaFire Target Enumeration (base|self|random)
```

8.10.2 Burst delay customizations

- `Burst.Delays` allows specifying weapon-specific burst shot delays. Takes precedence over the old `BurstDelayX` logic available on VehicleTypes, functions with Infantry & BuildingType weapons (AircraftTypes are not supported due to their weapon firing system being completely different) and allows every shot of `Burst` to have a separate delay instead of only first four shots.

  - If no delay is defined for a shot, it falls back to last delay value defined (f.ex `Burst=3` and `Burst. Delays=10` would use 10 as delay for all shots).

  - Using `-1` as delay reverts back to old logic (`BurstDelay0-3` for VehicleTypes if available or random value between 3-5 otherwise) for that shot.

- `Burst.FireWithinSequence` is only used if the weapon is fired by InfantryTypes, and setting it to true allows infantry to fire multiple `Burst` shots within same firing sequence.

- First shot is always fired at sequence frame determined by firing frame controls on InfantryType image (`FireUp` et al).

- Following shots come at intervals determined by `Burst.Delays` (with minimum delay of 1 frame) or random delay between 3 to 5 frames if not defined. Note that if next shot would be fired at a frame that is beyond the firing sequence's length, burst shot count is reset and weapon starts reloading.

- Burst shot counter is not immediately reset if firing is ceased mid-sequence after at least one shot, but the frame at which each burst shot is fired will not be influenced by this (in other words, resuming firing afterward without weapon reload taking place would restart firing sequence but no firing will take place until the frame at which next burst shot should be fired is hit).

In `rulesmd.ini`:

```
[SOMEWEAPON]                       ; WeaponType
Burst.Delays=-1                    ; integer - burst delays (comma-separated) for shots in
→order from first to last.
Burst.FireWithinSequence=false  ; boolean
```

8.10.3 Extra warhead detonations

- It is now possible to have same weapon detonate multiple Warheads on impact by listing `ExtraWarheads`. The warheads are detonated at same location as the main one, after it in listed order. This only works in cases where a projectile has been fired by a weapon and still remembers it when it is detonated (due to currently existing technical limitations, this excludes `AirburstWeapon`).

  - `ExtraWarheads.DamageOverrides` can be used to override the weapon's `Damage` for the extra Warhead detonations. Value from position matching the position from `ExtraWarheads` is used if found, or last listed value if not found. If list is empty, WeaponType `Damage` is used.

  - `ExtraWarheads.DetonationChances` can be used to customize the chance of each extra Warhead detonation occuring. Value from position matching the position from `ExtraWarheads` is used if found, or last listed value if not found. If list is empty, every extra Warhead detonation is guaranteed to occur.

In `rulesmd.ini`:

```
[SOMEWEAPON]                       ; WeaponType
ExtraWarheads=                     ; list of WarheadTypes
ExtraWarheads.DamageOverrides=     ; list of integers
ExtraWarheads.DetonationChances=  ; list of floating-point values (percentage or
→absolute)
```

8.10.4 Feedback weapon

FeedbackWeapon used to apply healing aura upon firing a weapon (Project Phantom)

- You can now specify an auxiliary weapon to be fired on the firer itself when a weapon is fired.

  - `FireInTransport` setting of the feedback weapon is respected to determine if it can be fired when the original weapon is fired from inside `OpenTopped=true` transport. If feedback weapon is fired, it is fired on the transport. `OpenToppedDamageMultiplier` is not applied on feedback weapons.

In `rulesmd.ini`:

```
[SOMEWEAPON]      ; WeaponType
FeedbackWeapon=  ; WeaponType
```

8.10.5 Radiation enhancements

- In addition to allowing custom radiation types, several enhancements are also available to the default radiation type defined in `[Radiation]`, such as ability to set owner & invoker or deal damage against buildings. See *Custom Radiation Types* for more details.

8.10.6 Strafing aircraft weapon customization

Strafing aircraft weapon customization in Project Phantom

- Some of the behavior of strafing aircraft weapons (weapon projectile has `ROT` below 2) can now be customized.

  - `Strafing.Shots` controls the number of times the weapon is fired during a single strafe run. `Ammo` is only deducted at the end of the strafe run, regardless of the number of shots fired. Valid values range from 1 to 5, any values smaller or larger are effectively treated same as either 1 or 5, respectively. Defaults to 5.

  - `Strafing.SimulateBurst` controls whether or not the shots fired during strafing simulate behavior of `Burst`, allowing for alternating firing offset. Only takes effect if weapon has `Burst` set to 1 or undefined. Defaults to false.

In `rulesmd.ini`:

```
[SOMEWEAPON]                  ; WeaponType
Strafing.Shots=5              ; integer
Strafing.SimulateBurst=false  ; boolean
```

8.10.7 Weapon targeting filter

`*Weapon target filter - different weapon used against enemies & allies as well as units & buildings* (Project Phantom)

- You can now specify which targets or houses a weapon can fire at. This also affects weapon selection, other than certain special cases where the selection is fixed.

  - Note that `CanTarget` explicitly requires either `all` or `empty` to be listed for the weapon to be able to fire at cells containing no TechnoTypes.

In `rulesmd.ini`:

```
[SOMEWEAPON]         ; WeaponType
CanTarget=all        ; list of Affected Target Enumeration␣
→(none|land|water|empty|infantry|units|buildings|all)
CanTargetHouses=all  ; list of Affected House Enumeration (none|owner/self|allies/
→ally|team|enemies/enemy|all)
```

FIXED / IMPROVED LOGICS

This page describes all ingame logics that are fixed or improved in Phobos without adding anything significant.

9.1 Bugfixes and miscellaneous

- Fixed the bug that GameModeOptions are not correctly saved. For example, `BuildOffAlly` is corrupted after load a save.

- Fixed the bug that light tint created by buildings can never be removed (light tint persists even if the building is destroyed/sold) after loading a game

- Fixed the bug when reading a map which puts `Preview(Pack)` after `Map` lead to the game fail to draw the preview

- Fixed the bug when retinting map lighting with a map action corrupted light sources.

- Fixed the bug when deploying mindcontrolled vehicle into a building permanently transferred the control to the house which mindcontrolled it.

- Fixed the bug when capturing a mind-controlled building with an engineer fail to break the mind-control link.

- Removed the EVA_BuildingCaptured event when capturing a building considered as a vehicle.

- Fixed the bug when units are already dead but still in map (for sinking, crashing, dying animation, etc.), they could die again.

- Fixed the bug when cloaked Desolator was unable to fire his deploy weapon.

- Fixed the bug that temporaryed unit cannot be erased correctly and no longer raise an error.

- Fixed `DebrisMaximums` (spawned debris type amounts cannot go beyond specified maximums anymore). Only applied when `DebrisMaximums` values amount is more than 1 for compatibility reasons.

- Fixed building and defense tab hotkeys not enabling the placement mode after `Cannot build here.` triggered and the placement mode cancelled.

- Fixed buildings with `UndeployInto` playing `EVA_NewRallypointEstablished` on undeploying.

- Fixed buildings with `Naval=yes` ignoring `WaterBound=no` to be forced to place onto water.

- Fixed AI Aircraft docks bug when Ares tag `[GlobalControls] > AllowParallelAIQueues=no` is set.

- Fixed laser drawing code to allow for thicker lasers in house color draw mode.

- Fixed `DeathWeapon` not detonating properly.

    - Some settings are still ignored like `PreImpactAnim` *(Ares feature)*, this might change in future.

- Fixed the bug when occupied building's `MuzzleFlashX` is drawn on the center of the building when `X` goes past 10.

- Fixed jumpjet units that are `Crashable` not crashing to ground properly if destroyed while being pulled by a `Locomotor` warhead.

- Fixed jumpjet units being unable to turn to the target when firing from a different direction.

- Fixed jumpjet units being able to continue firing at enemy target when crashing.

Jumpjet turning to target applied in Robot Storm X

- Fixed turreted jumpjet units always facing bottom-right direction when motion stops.

- Fixed jumpjet objects being unable to use `Sensors`.

- Fixed interaction of `UnitAbsorb` & `InfantryAbsorb` with `Grinding` buildings. The keys will now make the building only accept appropriate types of objects.

- Fixed missing 'no enter' cursor for VehicleTypes being unable to enter a `Grinding` building.

- Fixed Engineers being able to enter `Grinding` buildings even when they shouldn't (such as ally building at full HP).

- Allowed usage of `AlternateFLH` of vehicles in `OpenTopped` transport.

- Improved the statistic distribution of the spawned crates over the visible area of the map so that they will no longer have a higher chance to show up near the edges.

- Allowed usage of TileSet of 255 and above without making NE-SW broken bridges unrepairable.

- Added a "Load Game" button to the retry dialog on mission failure.

Side offset voxel turret in Breaking Blue project

- `TurretOffset` tag for voxel turreted TechnoTypes now accepts FLH (forward, lateral, height) values like `TurretOffset=F,L` or `TurretOffset=F,L,H`, which means turret location can be adjusted in all three axes.

- `TurretOffset` is now supported for SHP vehicles.

- `InfiniteMindControl` with `Damage=1` can now control more than 1 unit.

- Aircraft with `Fighter` set to false or those using strafing pattern (weapon projectile ROT is below 2) now take weapon's `Burst` into accord for all shots instead of just the first one.

- Vehicles using `DeployFire` will now use `DeployFireWeapon` for firing the deploy weapon if explicitly set, if not it behaves like previously (`Primary` if can fire, `Secondary` if not) and respect `FireOnce` setting on weapon and any stop commands issued during firing. If `FireOnce` is set to true the unit won't accept further deploy commands for number of frames that is equal to whichever is smaller between weapon ROF and [Unload] -> `Rate` times 900.

- Infantry with `DeployFireWeapon=-1` can now fire both weapons (decided by its target), regardless of deployed or not.

Nod arty keeping target on attack order in [C&C: Reloaded](#)

- Vehicle to building deployers now keep their target when deploying with `DeployToFire`.

- Effects like lasers are no longer drawn from wrong firing offset on weapons that use Burst.

- Animations can now be offset on the X axis with `XDrawOffset`.

- `IsSimpleDeployer` units now only play `DeploySound` and `UndeploySound` once, when done with (un)deploying instead of repeating it over duration of turning and/or `DeployingAnim`.

- AITrigger can now recognize Building Upgrades as legal condition.

- `EWGates` and `NSGates` now will link walls like `xxGateOne` and `xxGateTwo` do.

- Fixed interaction of `UnitAbsorb` & `InfantryAbsorb` with `Grinding` buildings. The keys will now make the building only accept appropriate types of objects.

- Fixed missing 'no enter' cursor for VehicleTypes being unable to enter a `Grinding` building.

- Fixed Engineers being able to enter `Grinding` buildings even when they shouldn't (such as ally building at full HP).

- Aircraft & jumpjet units are now affected by speed modifiers such as `SpeedAircraft/Infantry/UnitsMult` on `Countries`, `VeteranSpeed` and Crates / AttachEffect (Ares feature).

- Both voxel and SHP vehicle units should now correctly respect custom palette set through `Palette`.

- Weapons fired by EMPulse superweapons without `EMPulse.TargetSelf=true` *(Ares feature)* can now create radiation.

- Setting `RadarInvisible` to true on TerrainTypes now hides them from minimap display.

- Mind control indicator animations will now correctly restore on mind controlled objects when uncloaked.

- Animations from Warhead `AnimList` & `SplashList` etc. as well as animations created through map trigger 41 `Play Anim At` now have the appropriate house set as owner of the animation by default.

- Nuke carrier & payload weapons now respect `Bright` setting on the weapons always when appropriate (previously only payload did and only if Superweapon had `Nuke.SiloLaunch=false` *(Ares feature)*).

- Self-healing pips from `InfantryGainSelfHeal` & `UnitsGainSelfHeal` now respect unit's `PixelSelectionBracketDelta` like health bar pips do.

- Fixed the bug where the health bar of a unit being attacked by temporal weapons would not disappear after mouse hover, causing it to remain visible even when the mouse moved away.

- Buildings using `SelfHealing` will now correctly revert to undamaged graphics if their health is restored back by self-healing.

- Allow use of `Foundation=0x0` on TerrainTypes without crashing for similar results as for buildings.

- Projectiles now remember the house of the firer even if the firer is destroyed before the projectile detonates. Does not currently apply to some Ares-introduced Warhead effects like EMP.

- `OpenTopped` transports now take `OpenTransportWeapon` setting of passengers into consideration when determining weapon range used for threat scanning and approaching targets.

- Trailer animations now inherit the owner of the object (animation, projectile or aircraft) they are attached to.

- Buildings now correctly use laser parameters set for Secondary weapons instead of reading them from Primary weapon.

- Fixed an issue that caused vehicles killed by damage dealt by a known house but without a known source TechnoType (f.ex animation warhead damage) to not be recorded as killed correctly and thus not spring map trigger events etc.

Animated trees used in Ion Shock

- `IsAnimated`, `AnimationRate` and `AnimationProbability` now work on TerrainTypes without `SpawnsTiberium` set to true. Note that this might impact performance.

- Fixed transports recursively put into each other not having a correct killer set after second transport when being killed by something.
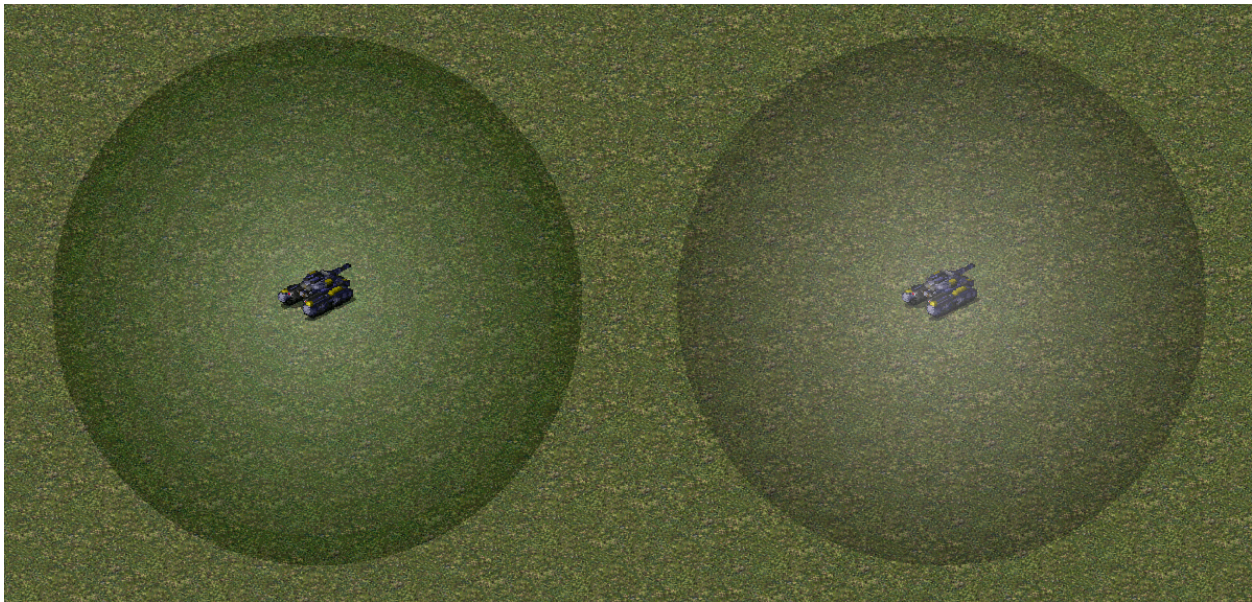
Example gradient SHP drawing with 75% translucency, before and after

- Translucent RLE SHPs will now be drawn using a more precise and performant algorithm that has no green tint and banding. Can be disabled with `rulesmd.ini->[General]->FixTransparencyBlitters=no`.

  - Only applies to Z-aware drawing mode for now.

- Fixed projectiles with `Inviso=true` suffering from potential inaccuracy problems if combined with `Airburst=yes` or Warhead with `EMEffect=true`.

- Fixed the bug when `MakeInfantry` logic on BombClass resulted in `Neutral` side infantry.

- Fixed railgun particles being drawn to wrong coordinate against buildings with non-default `TargetCoordOffset` or when force-firing on bridges.

- Fixed building `TargetCoordOffset` not being taken into accord for several things like fire angle calculations and target lines.

- In singleplayer missions, the player can now see cloaked objects owned by allied houses.

- IvanBomb images now display and the bombs detonate at center of buildings instead of in top-leftmost cell of the building foundation.

- Fixed BibShape drawing for a couple of frames during buildup for buildings with long buildup animations.

- Animation with `Tiled=yes` now supports `CustomPalette`.

- Attempted to avoid units from retaining previous orders (attack,grind,garrison,etc) after changing ownership (mind-control,abduction,etc).

- Fixed buildings' `NaturalParticleSystem` being created for in-map pre-placed structures.

- Fixed jumpjet units being unable to visually tilt or be flipped if `TiltCrashJumpjet=no`.

- Unlimited (more than 5) `AlternateFLH` entries for units.

- Warheads spawning debris now use `MaxDebris` as an actual cap for number of debris to spawn instead of `MaxDebris` - 1. If both `Primary` and `Secondary` weapons can fire at air targets (projectile has `AA=true`), `Primary` can now be picked instead of always forcing `Secondary`. Also applies to `IsGattling=true`, with odd-numbered and even-numbered `WeaponX` slots instead of `Primary` and `Secondary`, respectively.

- `IsGattling=true` can now fall back to secondary weapon slot (even-numbered `WeaponX` slots) if primary one (odd-numbered) cannot fire at current target (armor type, `CanTarget(Houses)`, shield etc).

- Fixed `LandTargeting=1` not preventing from targeting TerrainTypes (trees etc.) on land.

- Fixed `NavalTargeting=6` not preventing from targeting empty water cells or TerrainTypes (trees etc.) on water.

- Fixed `NavalTargeting=7` and/or `LandTargeting=2` resulting in still targeting TerrainTypes (trees etc.) on land with `Primary` weapon.

- Fixed infantry without `C4=true` being killed in water if paradropped, chronoshifted etc. even if they can normally enter water.

- Allowed MCV to redeploy in campaigns using a new toggle different from `[MultiplayerDialogSettings]->MCVRedeploys`.

- Fixed buildings with `UndeploysInto` but `Unsellable=no` & `ConstructionYard=no` unable to be sold normally. Restored `EVA_StructureSold` for buildings with `UndeploysInto` when being selled.

- Fixed `WaterBound=true` buildings with `UndeploysInto` not correctly setting the location for the vehicle to move into when undeployed.

- Buildings with `CanC4=false` used to take 1 point of damage if hit by damage below 1 (calculated after `Verses` are applied but before veterancy, crate and AttachEffect modifiers). This no longer applies to negative damage under any conditions and can be disabled for zero damage by setting `CanC4.AllowZeroDamage` to true.

- Buildings with primary weapon that has `AG=false` projectile now have attack cursor when selected.

- Weapons with `AA=true` projectiles can now be set to fire exclusively at air targets by setting `AAOnly=true`, regardless of other conditions. This is useful because `AG=false` only prevents targeting ground cells (and cannot be changed without breaking existing behaviour) and for cases where `LandTargeting` cannot be used.

- Transports with `OpenTopped=true` and weapon that has `Burst` above 1 and passengers firing out no longer have the passenger firing offset shift lateral position based on burst index.

- Fixed disguised infantry not using custom palette for drawing the disguise when needed.

- Disguised infantry now show appropriate insignia when disguise is visible, based on the disguise type and house. Original unit's insignia is always shown to observers and if disguise blinking is enabled for the current player by `[General]->DisguiseBlinkingVisibility`.

- Buildings with superweapons no longer display `SuperAnimThree` at beginning of match if pre-placed on the map.

- `SpySat=yes` can now be applied using building upgrades.

- AI players can now build `Naval=true` and `Naval=false` vehicles concurrently like human players do.

- Fixed the bug when jumpjets were snapping into facing bottom-right when starting movement (observable when the starting unit is a jumpjet and is ordered to move).

- Objects with `Palette` set now have their color tint adjusted accordingly by superweapons, map retint actions etc. if they belong to a house using any color scheme instead of only those from the first half of `[Colors]` list.

- Animations using `AltPalette` are now remapped to their owner's color scheme instead of first listed color scheme and no longer draw over shroud. Color scheme from `[AudioVisual]` -> `AnimRemapDefaultColorScheme` is used if anim has no owner, which defaults to first listed color scheme from `[Colors]` still.

  - They can also have map lighting apply on them if `AltPalette.ApplyLighting` is set to true.

- Fixed `DeployToFire` not considering building placement rules for `DeploysInto` buildings and as a result not working properly with `WaterBound` buildings.

- Fixed `DeployToFire` not recalculating firer's position on land if it cannot currently deploy.

- `Arcing=true` projectile elevation inaccuracy can now be fixed by setting `Arcing.AllowElevationInaccuracy=false`.

- `EMPulseCannon=yes` building weapons now respect `Floater` and Phobos-added `Gravity` setting.

- You can now specify houses named <Player @ A> through <Player @ H> as the owner of TechnoTypes pre-placed on the map in the editor, and they will be correctly given to players starting on points 1-8. Originally, it was only possible to use these house names in events, actions and teams.

- Wall overlays are now drawn with the custom palette defined in `Palette` in `artmd.ini` if possible.

- `Secondary` will now be used against walls if `Primary` weapon Warhead has `Wall=false`, `Secondary` has `Wall=true` and the firer does not have `NoSecondaryWeaponFallback` set to true.

- Setting `ReloadInTransport` to true on units with `Ammo` will allow the ammo to be reloaded according to `Reload` or `EmptyReload` timers even while the unit is inside a transport.

- It is now possible to enable `Verses` and `PercentAtMax` to be applied on negative damage by setting `ApplyModifiersOnNegativeDamage` to true on the Warhead.

- Attached animations on flying units now have their layer updated immediately after the parent unit, if on same layer they always draw above the parent.

- Fixed the issue where the powered anims of `Powered/PoweredSpecial` buildings cease to update when being captured by enemies.

- Fix a glitch related to incorrect target setting for missiles.

- Fix EIP 00529A14 when attempting to read `[Header]` section of campaign maps.

- Units will no longer rotate its turret under EMP.

- Jumpjets will no longer wobble under EMP.

- Removed jumpjet units' deceleration when crashing onto buildings.

- Fixed `AmbientDamage` when used with `IsRailgun=yes` being cut off by elevation changes.

- Fixed railgun and fire particles being cut off by elevation changes.

- Fixed teleport units' (for example CLEG) frozen-still timer being cleared after load game.

- Fixed teleport units being unable to visually tilt on slopes.

- Fixed rockets' shadow location.

- Fixed units with Teleport, Tunnel or Fly locomotor being unable to be visually flipped like other locomotors do.

- Aircraft docking on buildings now respect `[AudioVisual]->PoseDir` as the default setting and do not always land facing north or in case of pre-placed buildings, the building's direction.

- Spawned aircraft now align with the spawner's facing when landing.

- Fixed the bug that waypointing unarmed infantries with agent/engineer/occupier to a spyable/capturable/occupiable building triggers EnteredBy event by executing capture mission.

- `PowerUpN` building animations can now use `Powered` & `PoweredLight/Effect/Special` keys.

9.2 Fixes / interactions with other extensions

- All forms of type conversion (including Ares') now correctly update `OpenTopped` state of passengers in transport that is converted.

- Fixed an issue introduced by Ares that caused `Grinding=true` building `ActiveAnim` to be incorrectly restored while `SpecialAnim` was playing and the building was sold, erased or destroyed.

9.3 Aircraft

9.3.1 Carryall pickup voice

- It is now possible to override `VoiceMove` for `Carryall=true` aircraft for when commanding it to pick up vehicles by setting `VoicePickup`.

In `rulesmd.ini`:

```
[SOMEAIRCRAFT]  ; AircraftType
VoicePickup=    ; Sound
```

9.3.2 Fixed spawn distance & spawn height for airstrike / SpyPlane aircraft

- It is now possible to have aircraft spawned from `(Elite)AirstrikeTeamType` or `Type=SpyPlane` super-weapons to be created at fixed distance from their intended target/destination instead of from edge of the map by setting `SpawnDistanceFromTarget`.

- `SpawnHeight` can also be used to override the initial height of the aircraft, which defaults to `FlightLevel`, or if not set then `[General] -> FlightLevel`.

In `rulesmd.ini`:

```
[SOMEAIRCRAFT]             ; AircraftType
SpawnDistanceFromTarget=   ; floating point value, distance in cells
SpawnHeight=               ; integer, height in leptons
```

9.3.3 Landing direction

- By default aircraft land facing the direction specified by `[AudioVisual]->PoseDir`. This can now be customized per AircraftType via `LandingDir`, defaults to `[AudioVisual]->PoseDir`. If the building the aircraft is docking to has *aircraft docking direction* set, that setting takes priority over this.

  - Negative values are allowed as a special case for `AirportBound=false` aircraft which makes them land facing their current direction.

In `rulesmd.ini`:

```
[SOMEAIRCRAFT]  ; AircraftType
LandingDir=      ; Direction type (integers from 0-255). Accepts negative values as a
→special case.
```

9.4 Animations

9.4.1 Animation weapon and damage settings

- `Weapon` can be set to a WeaponType, to create a projectile and immediately detonate it instead of simply dealing `Damage` by `Warhead`. This allows weapon effects to be applied.

- `Damage.Delay` determines delay between two applications of `Damage`. Requires `Damage` to be set to 1.0 or above. Value of 0 disables the delay. Keep in mind that this is measured in animation frames, not game frames. Depending on `Rate`, animation may or may not advance animation frames on every game frame.

- `Damage.DealtByInvoker`, if set to true, makes any `Damage` dealt to be considered as coming from the animation's invoker (f.ex, firer of the weapon if it is Warhead `AnimList`/`SplashList` animation, the destroyed vehicle if it is `DestroyAnim` animation or the object the animation is attached to). If invoker has died or does not exist, the house the invoker belonged to is still used to deal damage and apply Phobos-introduced Warhead effects. Does not affect which house the `Damage` dealt by `Warhead` is dealt by.

- `Damage.ApplyOncePerLoop`, if set to true, makes `Damage` be dealt only once per animation loop (on single loop animations, only once, period) instead of on every frame or intervals defined by `Damage.Delay`. The frame on which it is dealt is determined by `Damage.Delay`, defaulting to after the first animation frame.

In `artmd.ini`:

```
[SOMEANIM]                        ; AnimationType
Weapon=                           ; WeaponType
Damage.Delay=0                    ; integer, animation frames
Damage.DealtByInvoker=false       ; boolean
Damage.ApplyOncePerLoop=false     ; boolean
```

Note: `Weapon` and `Damage.Delay`, beyond the other additions, should function similarly to the equivalent features introduced by Ares and take precedence over them if Phobos is used together with Ares.

9.4.2 Attached animation position customization

- You can now customize whether or not animations attached to objects are centered at the object's actual center rather than the bottom of their top-leftmost cell (cell #0).

In `artmd.ini`:

```
[SOMEANIM]                          ; AnimationType
UseCenterCoordsIfAttached=false  ; boolean
```

9.4.3 Customizable debris & meteor impact and warhead detonation behaviour

- `ExplodeOnWater` can be set to true to make the animation explode on impact with water. `ExpireAnim` will be played and `Warhead` is detonated or used to deal damage / generate light flash.

- `Warhead.Detonate`, if set to true, makes the `Warhead` fully detonate instead of simply being used to deal damage and generate light flash if it has `Bright=true`.

- `WakeAnim` contains a wake animation to play if `ExplodeOnWater` is not set and the animation impacts with water. Defaults to `[General]` -> `Wake` if `IsMeteor` is not set to true, otherwise no animation.

- `SplashAnims` contains list of splash animations used if `ExplodeOnWater` is not set and the animation impacts with water. Defaults to `[CombatDamage]` -> `SplashList`.

  - If `SplashAnims.PickRandom` is set to true, picks a random animation from `SplashAnims` to use on each impact with water. Otherwise last listed animation from `SplashAnims` is used.

- `ExtraShadow` can be set to false to disable the display of shadows on the ground.

In `artmd.ini`:

```
[SOMEANIM]                      ; AnimationType
ExplodeOnWater=false            ; boolean
Warhead.Detonate=false          ; boolean
WakeAnim=                       ; Animation
SplashAnims=                    ; list of animations
SplashAnims.PickRandom=false  ; boolean
ExtraShadow=true                ; boolean
```

9.4.4 Layer on animations attached to objects

- You can now customize whether or not animations attached to objects follow the object's layer or respect their own `Layer` setting. If this is unset, attached animations use `ground` layer.

In `artmd.ini`:

```
[SOMEANIM]              ; AnimationType
Layer.UseObjectLayer=  ; boolean
```

9.4.5 Ore stage threshold for `HideIfNoOre`

- You can now customize which growth stage should an ore/tiberium cell have to have animation with `HideIfNoOre` displayed. Cells with growth stage less than specified value won't allow the anim to display.

In `artmd.ini`:

```
[SOMEANIM]                ; AnimationType
HideIfNoOre.Threshold=0   ; integer, minimal ore growth stage
```

9.5 Buildings

9.5.1 Aircraft docking direction

- It is now possible to customize the landing direction for docking aircraft via `AircraftDockingDir(N)` (N optionally replaced by 0-based index for each `DockingOffset` separately, `AircraftDockingDir` and `AircraftDockingDir0` are synonymous and will be used if direction is not set for a specific offset) on the dock building. This overrides the aircraft's own *landing direction* setting and defaults to `[AudioVisual] -> PoseDir`.

In `rulesmd.ini`:

```
[SOMEBUILDING]          ; BuildingType
AircraftDockingDir(N)=  ; Direction type (integers from 0-255)
```

9.5.2 Airstrike target eligibility

- By default whether or not a building can be targeted by airstrikes depends on value of `CanC4`, which also affects other things. This can now be changed independently by setting `AllowAirstrike`. If not set, defaults to value of `CanC4`.

In `rulesmd.ini`:

```
[SOMEBUILDING]   ; BuildingType
AllowAirstrike=  ; boolean
```

9.5.3 Apply ZShapePointMove during buildups

- By default buildings do not apply `ZShapePointMove` (which offsets the 'z shape' applied on buildings which is used to adjust them in depth buffer and is used to fix issues related to that such as corners of buildings getting cut off when drawn) when buildup is being displayed. This behaviour can now be toggled by setting `ZShapePointMove.OnBuildup`.

In `artmd.ini`:

```
[SOMEBUILDING]                      ; BuildingType
ZShapePointMove.OnBuildup=false     ; boolean
```

9.5.4 Buildings considered as vehicles

- By default game considers buildings with both `UndeploysInto` set and `Foundation` equaling `1x1` as vehicles, in a manner of speaking. This behaviour can now be toggled individually of these conditions by setting `ConsideredVehicle`. These buildings are counted as vehicles for unit count tracking, are not considered as base under attack when damaged and can be mass selected by default, for an example.

- When capturing such "buildings", the player won't be notified by EVA capture event.

In `rulesmd.ini`:

```
[SOMEBUILDING]        ; BuildingType
ConsideredVehicle=    ; boolean
```

9.5.5 Customizable & new grinder properties

Using ally grinder, restricting to vehicles only and refund display (Project Phantom)

- You can now customize which types of objects a building with `Grinding` set can grind as well as the grinding sound.

    - `Grinding.AllowAllies` changes whether or not to allow units to enter allies' buildings.

    - `Grinding.AllowOwner` changes whether or not to allow units to enter your own buildings.

    - `Grinding.AllowTypes` can be used to define InfantryTypes and VehicleTypes that can be grinded by the building. Listing any will disable grinding for all types except those listed.

    - `Grinding.DisallowTypes` can be used to exclude InfantryTypes or VehicleTypes from being able to enter the grinder building.

    - `Grinding.PlayDieSound` controls if the units' `DieSound` and `VoiceDie` are played when entering the grinder. Default to `yes`.

    - `Grinding.Sound` is a sound played by when object is grinded by the building. If not set, defaults to `[AudioVisual]->EnterGrinderSound`.

    - `Grinding.Weapon` is a weapon fired at the building & by the building when it grinds an object. Will only be fired if at least weapon's `ROF` amount of frames have passed since it was last fired.

        * `Grinding.Weapon.RequiredCredits` can be set to have the weapon require accumulated credits from grinding to fire. Accumulated credits for this purpose are reset every time when the weapon fires.

- For money string indication upon grinding, please refer to `DisplayIncome`.

In `rulesmd.ini`:

```
[SOMEBUILDING]                      ; BuildingType
Grinding.AllowAllies=false          ; boolean
Grinding.AllowOwner=true            ; boolean
Grinding.AllowTypes=                ; List of InfantryTypes / VehicleTypes
Grinding.DisallowTypes=             ; List of InfantryTypes / VehicleTypes
Grinding.PlayDieSound=true          ; boolean
Grinding.Sound=                     ; Sound
Grinding.Weapon=                    ; WeaponType
Grinding.Weapon.RequiredCredits=0   ; integer
```

9.5.6 Customizable selling buildup sequence length for buildings that can undeploy

- By default buildings with `UndeploysInto` will only play 23 frames of their buildup sequence (in reverse starting from last frame) when being sold as opposed to being undeployed. This can now be customized via `SellBuildupLength`.

In `rulesmd.ini`:

```
[SOMEBUILDING]        ; BuildingType
SellBuildupLength=23  ; integer, number of buildup frames to play
```

9.6 Particle systems

9.6.1 Fire particle target coordinate adjustment when firer rotates

- By default particle systems with `BehavesLike=Fire` shift their target coordinates if the object that created the particle system (e.g firer of a weapon) is rotating. This behavior can now be disabled per particle system type.

In `rulesmd.ini`:

```
[SOMEPARTICLESYSTEM]              ; ParticleSystemType
AdjustTargetCoordsOnRotation=true ; boolean
```

9.7 Particles

9.7.1 Customizable gas particle speed

- Gas particles can now drift at a custom speed.

In `rulesmd.ini`:

```
[GASPARTICLE]          ; Particle with BehavesLike=Gas
Gas.MaxDriftSpeed=2    ; integer (TS default is 5)
```

9.8 Projectiles

9.8.1 Cluster scatter distance customization

- `ClusterScatter.Min` and `ClusterScatter.Max` can be used to set minimum and maximum distance, respectively, in cells from the original detonation coordinate any additional detonations if `Cluster` is set to value higher than 1 can appear at.

In `rulesmd.ini`:

```
[SOMEPROJECTILE]        ; Projectile
ClusterScatter.Min=1.0  ; float, distance in cells
ClusterScatter.Max=2.0  ; float, distance in cells
```

9.8.2 Customizable projectile gravity

- You can now specify individual projectile gravity.

  - Setting `Gravity=0` is not recommended as it will cause the projectile to fly backwards and be unable to hit the target which is not at the same height. We suggest to use `Straight` Trajectory instead. See *here*.

In `rulesmd.ini`:

```
[SOMEPROJECTILE]        ; Projectile
Gravity=6.0             ; floating point value
```

9.8.3 FlakScatter distance customization

- By default `FlakScatter=true` makes `Inviso=true` projectiles scatter by random distance (in cells) from 0 to `[CombatDamage] -> BallisticScatter`. This distance range can now be customized by setting `BallisticScatter.Min` & `BallisticScatter.Max` on the projectile. If not set, the default values are used.

In `rulesmd.ini`:

```
[SOMEPROJECTILE]      ; Projectile
BallisticScatter.Min= ; float, distance in cells
BallisticScatter.Max= ; float, distance in cells
```

9.9 Technos

9.9.1 Building-provided self-healing customization

- It is now possible to set a global cap for the effects of `InfantryGainSelfHeal` and `UnitsGainSelfHeal` by setting `InfantryGainSelfHealCap` & `UnitsGainSelfHealCap` under `[General]`, respectively.

- Whether or not `MultiplayPassive=true` houses benefit from these effects can be controlled via `GainSelfHealAllowMultiplayPassive`.

- It is also possible to change the pip frames displayed from `pips.shp` individually for infantry, units and buildings by setting the frames for infantry & unit self-healing on `Pips.SelfHeal.Infantry/Units/Buildings` under `[AudioVisual]`, respectively.

  - `Pips.SelfHeal.Infantry/Units/Buildings.Offset` can be used to customize the pixel offsets for the displayed pips, individually for infantry, units and buildings.

- Whether or not a TechnoType benefits from effects of `InfantryGainSelfHeal` or `UnitsGainSelfHeal` buildings or neither can now be controlled by setting `SelfHealGainType`.

  - If `SelfHealGainType` is not set, InfantryTypes and VehicleTypes with `Organic` set to true gain self-healing from `InfantryGainSelfHeal`, other VehicleTypes from `UnitsGainSelfHeal` and Aircraft-Types & BuildingTypes never gain self-healing.

In `rulesmd.ini`:

```
[General]
InfantryGainSelfHealCap=            ; integer, maximum amount of␣
↪InfantryGainSelfHeal that can be in effect at once, must be 1 or higher
UnitsGainSelfHealCap=               ; integer, maximum amount of UnitsGainSelfHeal␣
↪that can be in effect at once, must be 1 or higher
```

(continues on next page)

```
GainSelfHealAllowMultiplayPassive=true  ; boolean

[AudioVisual]
Pips.SelfHeal.Infantry=13,20           ; integer, frames of pips.shp for infantry &
↪unit-self healing pips, respectively
Pips.SelfHeal.Units=13,20              ; integer, frames of pips.shp for infantry &
↪unit-self healing pips, respectively
Pips.SelfHeal.Buildings=13,20          ; integer, frames of pips.shp for infantry &
↪unit-self healing pips, respectively
Pips.SelfHeal.Infantry.Offset=25,-35   ; X,Y, pixels relative to default
Pips.SelfHeal.Units.Offset=33,-32      ; X,Y, pixels relative to default
Pips.SelfHeal.Buildings.Offset=15,10   ; X,Y, pixels relative to default


[SOMETECHNO]                           ; TechnoType
SelfHealGainType=                      ; Self-Heal Gain Type Enumeration
↪(none|infantry|units)
```

9.9.2 Chrono sparkle animation customization & improvements

- It is now possible to customize the frame delay between instances of `[General]` -> `ChronoSparkle1` animations created on objects being warped by setting `[General]` -> `ChronoSparkleDisplayDelay`.

- By default on buildings with `MaxOccupants` higher than 0, chrono sparkle animation would be shown at each of the `MuzzleFlashN` coordinates. This behaviour is now customizable, and supports `MuzzleFlashN` indices higher than 10.

  - `[General]` -> `ChronoSparkleBuildingDisplayPositions` can be set to show the sparkle animation on the building (`building`), muzzle flash coordinates of current occupants (`occupants`), muzzle flash coordinates of all occupant slots (`occupantslots`) or any combination of these.

    * If `occupants` or `occupantslots` is listed without `building`, a single chrono sparkle animation is still displayed on building if it doesn't have any occupants or it has `MaxOccupants` value less than 1, respectively.

- The chrono sparkle animation that is displayed on building itself is also now displayed at the center of it rather than at center of its topmost cell.

In `rulesmd.ini`:

```
[General]
ChronoSparkleDisplayDelay=24                          ; integer, game frames
ChronoSparkleBuildingDisplayPositions=occupantslots  ; list of chrono sparkle position
↪enum (building | occupants | occupantslots | all)
```

9.9.3 Customizable veterancy insignias

- You can now customize veterancy insignia of TechnoTypes.

  - `Insignia.(Rookie|Veteran|Elite)` can be used to set a custom insignia file, optionally for each veterancy stage. Like the original / default file, `pips.shp`, they are drawn using `palette.pal` as palette.

  - `InsigniaFrame(.Rookie|Veteran|Elite)` can be used to set (zero-based) frame index of the insignia to display, optionally for each veterancy stage. Using -1 uses the default setting. Default settings are -1 (none) for rookie, 14 for veteran and 15 for elite.

    * A shorthand `InsigniaFrames` can be used to list them in order from rookie, veteran and elite instead as well. `InsigniaFrame(.Rookie|Veteran|Elite)` takes priority over this.

  - Normal insignia can be overridden for specific weapon modes of `Gunner=true` units by setting `Insignia(.Frame/.Frames).WeaponN` where `N` stands for 1-based weapon mode index. If not set, defaults to non-mode specific insignia settings.

  - `Insignia.ShowEnemy` controls whether or not the insignia is shown to enemy players. Defaults to `[General] -> EnemyInsignia`, which in turn defaults to true.

In `rulesmd.ini`:

```
[General]
EnemyInsignia=true                    ; boolean

[SOMETECHNO]                          ; TechnoType
Insignia=                             ; filename - excluding the .shp extension
Insignia.Rookie=                      ; filename - excluding the .shp extension
Insignia.Veteran=                     ; filename - excluding the .shp extension
Insignia.Elite=                       ; filename - excluding the .shp extension
InsigniaFrame=-1                      ; int, frame of insignia shp (zero-based) or -1 for␣
↪default
InsigniaFrame.Rookie=-1               ; int, frame of insignia shp (zero-based) or -1 for␣
↪default
InsigniaFrame.Veteran=-1              ; int, frame of insignia shp (zero-based) or -1 for␣
↪default
InsigniaFrame.Elite=-1                ; int, frame of insignia shp (zero-based) or -1 for␣
↪default
InsigniaFrames=-1,-1,-1               ; int, frames of insignia shp (zero-based) or -1 for␣
↪default
Insignia.WeaponN=                     ; filename - excluding the .shp extension
Insignia.WeaponN.Rookie=              ; filename - excluding the .shp extension
Insignia.WeaponN.Veteran=             ; filename - excluding the .shp extension
Insignia.WeaponN.Elite=               ; filename - excluding the .shp extension
InsigniaFrame.WeaponN=-1              ; int, frame of insignia shp (zero-based) or -1 for␣
↪default
InsigniaFrame.WeaponN.Rookie=-1       ; int, frame of insignia shp (zero-based) or -1 for␣
↪default
InsigniaFrame.WeaponN.Veteran=-1      ; int, frame of insignia shp (zero-based) or -1 for␣
↪default
InsigniaFrame.WeaponN.Elite=-1        ; int, frame of insignia shp (zero-based) or -1 for␣
↪default
InsigniaFrames.WeaponN=-1,-1,-1       ; int, frames of insignia shp (zero-based) or -1 for␣
↪default
Insignia.ShowEnemy=                   ; boolean
```

Note: Insignia customization besides the `InsigniaFrames` shorthand should function similarly to the equivalent feature introduced by Ares and takes precedence over it if Phobos is used together with Ares.

9.9.4 Customizable harvester ore gathering animation

Custom ore gathering anims in Project Phantom

- You can now specify which anim should be drawn when a harvester of specified type is gathering specified type of ore.

In `rulesmd.ini`:

```
[SOMETECHNO]                    ; TechnoType
OreGathering.Anims=             ; list of animations
OreGathering.FramesPerDir=15    ; list of integers
OreGathering.Tiberiums=0        ; list of Tiberium IDs
```

9.9.5 Customizable Teleport/Chrono Locomotor settings per TechnoType

Chrono Legionnaire and Ronco using different teleportation settings in YR: New War

- You can now specify Teleport/Chrono Locomotor settings per TechnoType to override default rules values. Unfilled values default to values in `[General]`.

- Only applicable to Techno that have Teleport/Chrono Locomotor attached.

In `rulesmd.ini`:

```
[SOMETECHNO]            ; TechnoType
WarpOut=                ; Anim (played when Techno warping out), default to [General]␣
↪WarpOut
WarpIn=                 ; Anim (played when Techno warping in), default to [General]␣
↪WarpIn
WarpAway=               ; Anim (played when Techno chronowarped by chronosphere),␣
↪default to [General] WarpOut
ChronoTrigger=          ; boolean, if yes then delay varies by distance, if no it is a␣
↪constant
ChronoDistanceFactor=   ; integer, amount to divide the distance to destination by to␣
↪get the warped out delay
ChronoMinimumDelay=     ; integer, the minimum delay for teleporting, no matter how␣
↪short the distance
ChronoRangeMinimum=     ; integer, can be used to set a small range within which the␣
↪delay is constant
ChronoDelay=            ; integer, delay after teleport for chronosphere
```

9.9.6 Customizable target evaluation map zone check behaviour

- By default, any non-AircraftType units seeking targets via ScriptType team mission (action) `0 Attack Target Type` or any attack team missions introduced in Phobos check if the potential target is in same map zone as the attacking unit to be able to pick it as a target. This can now be customized to allow objects from any map zone with no constraints (`TargetZoneScanType=any`) or only if they are within weapon range (`TargetZoneScanType=inrange`).

In `rulesmd.ini`:

```
[SOMETECHNO]              ; TechnoType
TargetZoneScanType=same   ; target zone scan enumeration (same|any|inrange)
```

9.9.7 Customizable unit image in art

- `Image` tag in art INI is no longer limited to AnimationTypes and BuildingTypes, and can be applied to all TechnoTypes (InfantryTypes, VehicleTypes, AircraftTypes, BuildingTypes).

- The tag specifies **only** the file name (without extension) of the asset that replaces TechnoType's graphics. If the name in `Image` is also an entry in the art INI, **no tags will be read from it**.

- **By default this feature is disabled** to remain compatible with YR. To use this feature, enable it in rules with `ArtImageSwap=true`.

- This feature supports SHP images for InfantryTypes, SHP and VXL images for VehicleTypes and VXL images for AircraftTypes.

In `rulesmd.ini`:

```
[General]
ArtImageSwap=false  ; disabled by default
```

In `artmd.ini`:

```
[SOMETECHNO]
Image=                 ; name of the file that will be used as image, without extension
```

9.9.8 Customize resource storage

- Now Ares `Storage` feature can set which Tiberium type from `[Tiberiums]` list should be used for storing resources in structures with `Refinery.UseStorage=yes` and `Storage > 0`.

- This tag can not be used without Ares.

In `rulesmd.ini`:

```
[General]
Storage.TiberiumIndex=-1  ; integer, [Tiberiums] list index
```

9.9.9 Exploding object customizations

- By default `Explodes=true` TechnoTypes have all of their passengers killed when they are destroyed. This behaviour can now be disabled by setting `Explodes.KillPassengers=false`.

- BuildingTypes with `Explodes=true` can by default explode even when they are still being built or sold. This can be disabled by setting `Explodes.DuringBuildup` to false. This causes them to behave as if `Explodes` was set to false while being built up or sold.

In `rulesmd.ini`:

```
[SOMETECHNO]                  ; TechnoType
Explodes.KillPassengers=true ; boolean

[SOMEBUILDING]                ; BuildingType
Explodes.DuringBuildup=true  ; boolean
```

9.9.10 IronCurtain effects on organics customization

- In vanilla game, when iron-curtain is applied on organic units like infantries and squids, they could only get killed instantly by C4Warhead. This behavior is now dehardcoded, and the effect under iron-curtain can now be chosen among

  - `kill` : Iron-Curtain kills the organic object with a specifc warhead.

  - `invulnerable` : Iron-Curtain makes the organic object invulnerable like buildings and vehicles.

  - `ignore` : Iron-Curtain doesn't give any effect on the organic object.

In `rulesmd.ini`

```
[CombatDamage]
IronCurtain.EffectOnOrganics=kill  ; IronCurtain effect Enumeration (kill | invulnerable␣
↪| ignore), IronCurtain to Infantry and Techno with Organic=yes
IronCurtain.KillOrganicsWarhead=   ; IronCurtain uses this warhead to kill organics,␣
↪default to [CombatDamage]->C4Warhead

[SOMETECHNO]                       ; InfantryType or Organic TechnoType
IronCurtain.Effect=                ; IronCurtain effect Enumeration (kill | invulnerable␣
↪| ignore), default to [CombatDamage]-> IronCurtain.EffectOnOrganics
IronCurtain.KillWarhead=           ; IronCurtain uses this warhead to kill this organic,␣
↪default to [CombatDamage]->IronCurtain.KillWarhead
```

9.9.11 Jumpjet rotating on crashing toggle

- Jumpjet that is going to crash starts to change its facing uncontrollably, this can now be turned off.

In `rulesmd.ini`:

```
[SOMETECHNO]    ; TechnoType
JumpjetRotateOnCrash=true  ; boolean
```

> **Warning:** This may subject to further changes.

9.9.12 Kill spawns on low power

- `Powered=yes` structures that spawns aircraft like Aircrafts Carriers will stop targeting the enemy if low power.

- Spawned aircrafts self-destruct if they are flying.

In `rulesmd.ini`:

```
[SOMESTRUCTURE]          ; BuildingType
Powered.KillSpawns=false ; boolean
```

9.9.13 PipScale pip customizations

- It is now possible to change the size of pips (or more accurately the pixel increment to the next pip drawn) displayed on `PipScale`.

  - `Pips.Generic.(Buildings.)Size` is for non-ammo pips on non-building TechnoTypes / buildings, accordingly, and `Pips.Ammo.(Buildings.)Size` is in turn for ammo pips, split similarly between non-building technos and buildings.

  - Ammo pip size can also be overridden on per TechnoType-basis using `AmmoPipSize`.

- Ammo pip frames can now also be customized.

  - `AmmoPipFrame` and `AmmoPipFrame` are frames (zero-based) of `pips2.shp` used for ammo pip and empty ammo pip (this is not set by default) for when `PipWrap=0` (this is the default).

  - `AmmoPipWrapStartFrame` is used as start frame (zero-based, from `pips2.shp`) for when `PipWrap` is above 0. The start frame is the empty frame and up to `Ammo` divided by `PipWrap` frames after it are used for the different reload stages.

  - `AmmoPipOffset` can be used to shift the starting position of ammo pips.

- Pips for TechnoTypes with `Spawns` can now also be customized.

  - `ShowSpawnsPips` determines whether or not these pips are shown at all, as they are independent from `PipScale` setting.

  - `SpawnsPipFrame` and `EmptySpawnsPipFrame` are frames (zero-based) of `pips.shp` (for buildings) or `pips2.shp` (for others) used for a spawnee pip and empty spawnee pip, respectively.

  - `SpawnsPipSize` determines the pixel increment to the next pip drawn. Defaults to `[AudioVisual]` -> `Pips.Generic.(Buildings.)Size` if not set.

  - `SpawnsPipoffset` can be used to shift the starting position of spawnee pips.

- Pips for `Storage` can now also be customized via new keys in `[AudioVisual]`.

  - `Pips.Tiberiums.Frames` can be used to list frames (zero-based) of `pips.shp` (for buildings) or `pips2.shp` (for others) used for tiberium types, in the listed order corresponding to tiberium type index. Defaults to 5 for tiberium type index 1, otherwise 2.

    * `Pips.Tiberiums.EmptyFrame` can be used to set the frame for empty slots, defaults to 0.

  - `Pips.Tiberiums.DisplayOrder` controls in which order the tiberium type pips are displayed, takes a list of tiberium type indices. Any tiberium type not listed will be displayed in sequential order after the listed ones.

  - `Pips.Tiberiums.WeedFrame` controls which frame is displayed on Technos with `Weeder=yes`, takes a (zero-based) index of a frame in `pips.shp` (for buildings) or `pips2.shp` (for others). Defaults to 1.

    * `Pips.Tiberiums.WeedEmptyFrame` can be used to set the frame for empty weed slots, defaults to 0.

In `rulesmd.ini`:

```
[AudioVisual]
Pips.Generic.Size=4,0                ; X,Y, increment in pixels to next pip
Pips.Generic.Buildings.Size=4,2      ; X,Y, increment in pixels to next pip
Pips.Ammo.Size=4,0                   ; X,Y, increment in pixels to next pip
Pips.Ammo.Buildings.Size=4,2         ; X,Y, increment in pixels to next pip
Pips.Tiberiums.EmptyFrame=0          ; integer, frame of pips.shp (buildings) or pips2.
↪shp (others) (zero-based)
Pips.Tiberiums.Frames=2,5,2,2        ; list of integers, frames of pips.shp (buildings)
↪or pips2.shp (others) (zero-based)
Pips.Tiberiums.DisplayOrder=0,2,3,1  ; list of integers, tiberium type indices
Pips.Tiberiums.WeedEmptyFrame=0      ; integer, frame of pips.shp (buildings) or pips2.
↪shp (others) (zero-based)
Pips.Tiberiums.WeedFrame=1           ; integer, frame of pips.shp (buildings) or pips2.
↪shp (others) (zero-based)


[SOMETECHNO]                         ; TechnoType
AmmoPipFrame=13                      ; integer, frame of pips2.shp (zero-based)
EmptyAmmoPipFrame=-1                 ; integer, frame of pips2.shp (zero-based)
AmmoPipWrapStartFrame=14             ; integer, frame of pips2.shp (zero-based)
AmmoPipSize=                         ; X,Y, increment in pixels to next pip
AmmoPipOffset=0,0                    ; X,Y, position offset from default
ShowSpawnsPips=true                  ; boolean
SpawnsPipFrame=1                     ; integer, frame of pips.shp (buildings) or pips2.
↪shp (others) (zero-based)
EmptySpawnsPipFrame=0                ; integer, frame of pips.shp (buildings) or pips2.
↪shp (others) (zero-based)
SpawnsPipSize=                       ; X,Y, increment in pixels to next pip
SpawnsPipOffset=0,0                  ; X,Y, position offset from default
```

9.9.14 Re-enable obsolete [JumpjetControls]

- Re-enable obsolete [JumpjetControls], the keys in it will be as the default value of jumpjet units.

  - Moreover, added two tags for missing ones.

In `rulesmd.ini`:

```
[JumpjetControls]
Crash=5.0          ; floating point value
NoWobbles=false    ; boolean
```

Note: `CruiseHeight` is for `JumpjetHeight`, `WobblesPerSecond` is for `JumpjetWobbles`, `WobbleDeviation` is for `JumpjetDeviation`, and `Acceleration` is for `JumpjetAccel`. All other corresponding keys just simply have no Jumpjet prefix.

9.9.15 Voxel body multi-section shadows

- It is also now possible for vehicles and aircraft to display shadows for multiple sections of the voxel body at once, instead of just one section specified by ShadowIndex, by specifying the section indices in ShadowIndices (which defaults to ShadowIndex) in unit's artmd.ini entry.

  - ShadowIndex.Frame and ShadowIndices.Frame can be used to customize which frame of the HVA animation for the section from ShadowIndex and ShadowIndices is used to display the shadow, respectively. -1 is special value which means currently shown frame is used, and ShadowIndices.Frame defaults to this.

In artmd.ini:

```
[SOMETECHNO]          ; TechnoType
ShadowIndices=        ; list of integers (voxel section indices)
ShadowIndex.Frame=0   ; integer (HVA animation frame index)
ShadowIndices.Frame=  ; list of integers (HVA animation frame indices)
```

9.9.16 Voxel shadow scaling in air

- It is now possible to adjust how voxel air units (VehicleType & AircraftType) shadows scale in air. By default the shadows scale by AirShadowBaseScale (defaults to 0.5) amount if unit is ConsideredAircraft=true.

  - If HeightShadowScaling=true, the shadow is scaled by amount that is determined by following formula: Max(AirShadowBaseScale ^ (currentHeight / ShadowSizeCharacteristicHeight), HeightShadowScaling.MinScale), where currentHeight is unit's current height in leptons, ShadowSizeCharacteristicHeight overrideable value that defaults to the maximum cruise height (JumpjetHeight, FlightLevel etc) and HeightShadowScaling.MinScale sets a floor for the scale.

In rulesmd.ini:

```
[AudioVisual]
AirShadowBaseScale=0.5               ; floating point value
HeightShadowScaling=false            ; boolean
HeightShadowScaling.MinScale=0.0     ; floating point value

[SOMETECHNO]                         ; TechnoType
ShadowSizeCharacteristicHeight=      ; integer, height in leptons
```

9.9.17 Forbid parallel AI queues

- You can now set if specific types of factories do not have AI production cloning issue instead of Ares' indiscriminate behavior of AllowParallelAIQueues=no.

  - If AllowParallelAIQueues=no (*Ares feature*) is set, the tags have no effect.

In rulesmd.ini

```
[GlobalControls]
AllowParallelAIQueues=yes               ; must be set yes/true unless you don't use Ares
ForbidParallelAIQueues.Infantry=no      ; boolean
ForbidParallelAIQueues.Vehicle=no       ; boolean
ForbidParallelAIQueues.Navy=no          ; boolean
```

(continues on next page)

```
ForbidParallelAIQueues.Aircraft=no  ; boolean
ForbidParallelAIQueues.Building=no  ; boolean
```

9.10 Terrains

9.10.1 Customizable ore spawners

Different ore spawners in Rise of the East mod

- You can now specify which type of ore certain TerrainType would generate.

- It's also now possible to specify a range value for an ore generation area different compared to standard 3x3 rectangle. Ore will be uniformly distributed across all affected cells in a spread range.

- You can specify which ore growth stage will be spawned and how many cells will be filled with ore per ore generation animation. Corresponding tags accept either a single integer value or two comma-separated values to allow randomized growth stages from the range (inclusive).

In `rulesmd.ini`:

```
[SOMETERRAINTYPE]                 ; TerrainType
SpawnsTiberium.Type=0             ; tiberium/ore type index
SpawnsTiberium.Range=1            ; integer, radius in cells
SpawnsTiberium.GrowthStage=3      ; integer - single or comma-sep. range
SpawnsTiberium.CellsPerAnim=1     ; integer - single or comma-sep. range
```

9.10.2 Minimap color customization

- TerrainTypes can now be made to display on minimap with different colors by setting `MinimapColor`.

In `rulesmd.ini`:

```
[SOMETERRAINTYPE]  ; TerrainType
MinimapColor=      ; integer - Red,Green,Blue
```

9.10.3 Passable & buildable-upon TerrainTypes

- TerrainTypes can now be made passable or buildable upon by setting `IsPassable` or `CanBeBuiltOn`, respectively.

  - Movement cursor is displayed on `IsPassable` TerrainTypes unless force-firing.

  - `CanBeBuiltOn=true` terrain objects are removed when building is placed on them.

In `rulesmd.ini`:

```
[SOMETERRAINTYPE]   ; TerrainType
IsPassable=false    ; boolean
CanBeBuiltOn=false  ; boolean
```

9.11 Tiberiums (ores)

9.11.1 Minimap color customization

- Ore can now be made to display on minimap with different colors by setting `MinimapColor` on Tiberiums.

In `rulesmd.ini`:

```
[SOMEORE]      ; Tiberium
MinimapColor=  ; integer - Red,Green,Blue
```

9.12 Vehicles

9.12.1 Customizing crushing tilt and slowdown

- Vehicles with `Crusher=true` and `OmniCrusher=true` / `MovementZone=CrusherAll` were hardcoded to tilt when crushing vehicles / walls respectively. This now obeys `TiltsWhenCrushes` but can be customized individually for these two scenarios using `TiltsWhenCrusher.Vehicles` and `TiltsWhenCrusher.Overlays`, which both default to `TiltsWhenCrushes`.

- `CrushForwardTiltPerFrame` determines how much the forward tilt is adjusted per frame when crushing overlays or vehicles. Defaults to -0.02 for vehicles using Ship locomotor crushing overlays, -0.050000001 for all other cases.

- `CrushOverlayExtraForwardTilt` is additional forward tilt applied after an overlay has been crushed by the vehicle.

- It is possible to customize the movement speed slowdown when `MovementZone=CrusherAll` vehicle crushes walls by setting `CrushSlowdownMultiplier`.

In `rulesmd.ini`:

```
[SOMEVEHICLE]                        ; VehicleType
TiltsWhenCrushes.Vehicles=           ; boolean
TiltsWhenCrushes.Overlays=           ; boolean
CrushForwardTiltPerFrame=            ; floating point value
CrushOverlayExtraForwardTilt=0.02    ; floating point value
CrushSlowdownMultiplier=0.2          ; floating point value
```

9.12.2 Destroy animations

- `DestroyAnim` has been extended to work with VehicleTypes, with option to pick random animation if `DestroyAnim.Random` is set to true. These animations store owner and facing information for use with *Create-Unit logic*.

In `rulesmd.ini`:

```
[SOMEVEHICLE]                        ; VehicleType
DestroyAnim=                         ; list of animations
DestroyAnim.Random=true              ; boolean
```

9.12.3 IsSimpleDeployer vehicle deploy animation / direction customization

- `DeployingAnim.AllowAnyDirection` if set, disables any direction constraints for deployers with `DeployingAnim` set. Only works for ground units.
- `DeployingAnim.KeepUnitVisible` determines if the unit is hidden while the animation is playing.
- `DeployingAnim.ReverseForUndeploy` controls whether or not the animation is played in reverse for undeploying.
- `DeployingAnim.UseUnitDrawer` controls whether or not the animation is displayed in the unit's palette and team colours or regular animation palette, including a potential custom palette.

In `rulesmd.ini`:

```
[SOMEVEHICLE]                           ; VehicleType
DeployingAnim.AllowAnyDirection=false   ; boolean
DeployingAnim.KeepUnitVisible=false     ; boolean
DeployingAnim.ReverseForUndeploy=true   ; boolean
DeployingAnim.UseUnitDrawer=true        ; boolean
```

9.12.4 Preserve Iron Curtain status on type conversion

Bugfix in action

- Iron Curtain status is now preserved by default when converting between TechnoTypes via `DeploysInto/UndeploysInto`.

    - This behavior can be turned off per-TechnoType and global basis.

    - `IronCurtain.Modifier` is re-applied upon type conversion.

In `rulesmd.ini`:

```
[CombatDamage]
IronCurtain.KeptOnDeploy=yes ; boolean

[SOMETECHNO]                   ; VehicleType with DeploysInto or BuildingType with
→UndeploysInto
IronCurtain.KeptOnDeploy=    ; boolean, default to [CombatDamage]->IronCurtain.
→KeptOnDeploy
```

9.12.5 Stationary vehicles

- Setting VehicleType `Speed` to 0 now makes game treat them as stationary, behaving in very similar manner to deployed vehicles with `IsSimpleDeployer` set to true. Should not be used on buildable vehicles, as they won't be able to exit factories.

9.12.6 Voxel turret shadow

- Vehicle voxel turrets can now draw shadows if `[AudioVisual] -> DrawTurretShadow` is set to true. This can be overridden per VehicleType by setting `TurretShadow` in the vehicle's `artmd.ini` section.

In `rulesmd.ini`:

```
[AudioVisual]
DrawTurretShadow=false  ; boolean
```

In `artmd.ini`:

```
[SOMEUNIT]      ; UnitType
TurretShadow=   ; boolean
```

9.12.7 `IsSimpleDeployer` vehicle auto-deploy / deploy block on ammo change

- Vehicle deployment can now be affected by ammo count.

    - `Ammo.AutoDeployMinimumAmount` determines the minimal number of ammo at which a vehicle converts/deploys automatically.

    - `Ammo.DeployUnlockMinimumAmount` determines the minimal number of ammo that unlocks issuing vehicle converting/deploying command.

        * `Ammo.AutoDeployMaximumAmount` and `Ammo.DeployUnlockMaximumAmount` behave analogically.

        * Setting a negative number will disable ammo count check.

In `rulesmd.ini`:

```
[SOMEVEHICLE]                           ; VehicleType
Ammo.AutoDeployMinimumAmount=-1         ; integer
Ammo.AutoDeployMaximumAmount=-1         ; integer
Ammo.DeployUnlockMinimumAmount=-1       ; integer
Ammo.DeployUnlockMaximumAmount=-1       ; integer
```

> **Warning:** Auto-deploy feature requires `Convert.Deploy` from Ares' Type Conversion to change type. Unit without it will constantly use deploy command on self until ammo is changed.

9.12.8 `IsSimpleDeployer` vehicle ammo change on deploy

- `Ammo.AddOnDeploy` determines the number of ammo added or substracted on unit deploy.

In `rulesmd.ini`:

```
[SOMEVEHICLE]           ; VehicleType
Ammo.AddOnDeploy=0       ; integer
```

9.13 Veinholes & Weeds

9.13.1 Veinholes

- Veinhole monsters now work like they used to in Tiberian Sun.

- Their core parameters are still loaded from `[General]`

- The Warhead used by veins is specified under `[CombatDamage]`. The warhead has to be properly listed under `[Warheads]` as well. The warhead has to have `Veinhole=yes` set.

- Veinholes are hardcoded to use several overlay types.

- The vein attack animation specified under `[AudioVisual]` is what deals the damage. The animation has to be properly listed under `[Animations]` as well.

- Units can be made immune to veins the same way as in Tiberian Sun.

- The monster itself is represented by the `VEINTREE` TerrainType, which has `IsVeinhole=true` set. Its strength is what determines the strength of the Veinhole.

Note: Everything listed below functions identically to Tiberian Sun. Many of the tags from Tiberian Sun have been re-enabled. The values provided below are identical to those found in TS and YR rules. You can read more about them on ModENC: VeinholeGrowthRate, VeinholeShrinkRate, MaxVeinholeGrowth, VeinDamage, VeinholeTypeClass, VeinholeWarhead, Veinhole, VeinAttack, ImmuneToVeins, IsVeinhole

---

In `rulesmd.ini`:

```
[General]
VeinholeGrowthRate=300          ; integer
VeinholeShrinkRate=100          ; integer
```

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```ini
MaxVeinholeGrowth=2000        ; integer
VeinDamage=5                  ; integer
VeinholeTypeClass=VEINTREE    ; TerrainType

[CombatDamage]
VeinholeWarhead=VeinholeWH    ; Warhead

[VeinholeWH]
Veinhole=yes

[AudioVisual]
VeinAttack=VEINATAC           ; Animation

[TechnoType]
EliteAbilities=VEIN_PROOF
ImmuneToVeins=yes

[VEINTREE]
IsVeinhole=true
Strength=1000                 ; integer - the strength of the Veinhole
```

> **Warning:** The game expects certain overlays related to Veinholes to have certain indices, they are listed below. Please keep in mind that the indices in the OverlayTypes list are 0-based, formed internally by the game, and the identifiers left of "=" don't matter. Vanilla `rulesmd.ini` already has the required overlays listed at the correct indices.

In `rulesmd.ini`:

```ini
[OverlayTypes]
126=VEINS                     ; The veins (weeds)
167=VEINHOLE                  ; The Veinhole itself
178=VEINHOLEDUMMY             ; A technical overlay
```

9.13.2 Weeds & Weed Eaters

- Vehicles with `Weeder=yes` can now collect weeds. The weeds can then be deposited into a building with `Weeder=yes`.

- Weeds are not stored in a building's storage, but rather in a House's storage. The weed capacity is listed under `[General]->WeedCapacity`.

- Weeders now show the ore gathering animation. It can be customized the same way as for harvesters.

- Weeders can use the Teleport locomotor like chrono miners.

9.13.3 Weed-consuming superweapons

- Superweapons can consume weeds to recharge, like the Chemical Missile special in Tiberian Sun.

Note: As the code for the Chemical Missile had been removed, setting `Type=ChemMissile` will not work.

In `rulesmd.ini`:

```
[SuperWeaponType]
UseWeeds=no                                     ; boolean - should the SW use weeds to
↪recharge?
UseWeeds.Amount=                                ; integer - how many? default is General-
↪>WeedCapacity
UseWeeds.StorageTimer=no                        ; boolean - should the counter on the
↪sidebar display the % of weeds stored?
UseWeeds.ReadinessAnimationPercentage=0.9       ; double - when this many weeds % are
↪stored, the SW will show it's ready on the building (open nuke/open chrono, etc.)
```

9.14 VoxelAnims

9.14.1 Customizable debris & meteor impact and warhead detonation behaviour

- The INI keys and behaviour is mostly identical to the equivalent behaviour available to regular animations. Main difference is that the keys must be listed in the VoxelAnim's entry in `rulesmd.ini`, not `artmd.ini`.

9.15 Warheads

9.15.1 Customizable Warhead animation behaviour

- It is possible to make game play random animation from `AnimList` by setting `AnimList.PickRandom` to true. The result is similar to what `EMEffect=true` produces, however it comes with no side-effects (`EMEffect=true` prevents `Inviso=true` projectiles from snapping on targets, making them miss moving targets).

- If `AnimList.CreateAll` is set to true, all animations from `AnimList` are created, instead of a single anim based on damage or random if `AnimList.PickRandom` is set to true.

- If `AnimList.CreationInterval` is set to a value higher than 0, there will be that number of detonations of the Warhead before animations from `AnimList` will be created again. If the Warhead had a TechnoType firing it, this number is remembered by the TechnoType across all Warheads fired by it, otherwise it is shared between all detonations of same WarheadType period. This can be useful for things like `Airburst` with large spread where one might want uniform distribution of animations to appear but not on every detonation.

- `SplashList` can be used to override animations displayed if the Warhead has `Conventional=true` and it hits water, by default animations from `[CombatDamage]` -> `SplashList` are used.

  - `SplashList.PickRandom`, `SplashList.CreateAll` and `SplashList.CreationInterval` apply to these animations in same manner as the `AnimList` equivalents.

- `CreateAnimsOnZeroDamage`, if set to true, makes it so that `AnimList` or `SplashList` animations are created even if the weapon that fired the Warhead deals zero damage.

- Setting `Conventional.IgnoreUnits` to true on Warhead with `Conventional=true` will make the Warhead detonate on non-underwater VehicleTypes on water tiles as if they are water tiles, instead of treating it as land.

In `rulesmd.ini`:

```
[SOMEWARHEAD]                    ; WarheadType
AnimList.PickRandom=false        ; boolean
AnimList.CreateAll=false         ; boolean
AnimList.CreationInterval=0      ; integer
SplashList=                      ; List of animations
SplashList.PickRandom=false      ; boolean
SplashList.CreateAll=false       ; boolean
SplashList.CreationInterval=0    ; integer
CreateAnimsOnZeroDamage=false    ; boolean
Conventional.IgnoreUnits=false   ; boolean
```

9.15.2 Custom debris animations and additional debris spawn settings

- You can now use `DebrisAnims` to specify a list of debris animations to spawn instead of animations from `[General]` -> `MetallicDebris` when Warhead with `MaxDebris > 0` and no `DebrisTypes` (VoxelAnims) listed is detonated.
- `Debris.Conventional`, if set to true, makes `DebrisTypes` or `DebrisAnims` only spawn if Warhead is fired on non-water cell.

In `rulesmd.ini`:

```
[SOMEWARHEAD]             ; WarheadType
DebrisAnims=             ; List of animations
Debris.Conventional=false  ; boolean
```

9.15.3 Allowing damage dealt to firer

- You can now allow warhead to deal damage (and apply damage-adjacent effects such as `KillDriver` and `DisableWeapons/Sonar/Flash.Duration` *(Ares features)*) on the object that is considered as the firer of the Warhead even if it does not have `DamageSelf=true`.
  - Note that effect of `Psychedelic=true`, despite being tied to damage will still fail to apply on the firer as it does not affect any objects belonging to same house as the firer, including itself.

In `rulesmd.ini`:

```
[SOMEWARHEAD]             ; WarheadType
AllowDamageOnSelf=false  ; boolean
```

9.15.4 Customizing decloak on damaging targets

- You can now specify whether or not the warhead decloaks objects that are damaged by the warhead.

In `rulesmd.ini`:

```
[SOMEWARHEAD]                    ; WarheadType
DecloakDamagedTargets=true  ; boolean
```

9.15.5 Restricting screen shaking to current view

- You can now specify whether or not the warhead can only shake screen (`ShakeX/Ylo/hi`) if it is detonated while visible on current screen view.

In `rulesmd.ini`:

```
[SOMEWARHEAD]           ; WarheadType
ShakeIsLocal=false  ; boolean
```

9.16 Weapons

9.16.1 AmbientDamage customizations

- You can now specify separate Warhead used for `AmbientDamage` via `AmbientDamage.Warhead` or make it never apply to weapon's main target by setting `AmbientDamage.IgnoreTarget` to true.

In `rulesmd.ini`:

```
[SOMEWEAPON]                       ; WeaponType
AmbientDamage.Warhead=             ; WarheadType
AmbientDamage.IgnoreTarget=false  ; boolean
```

9.16.2 Customizable disk laser radius

- You can now set disk laser animation radius using a new tag.

In `rulesmd.ini`:

```
[SOMEWEAPON]              ; WeaponType
DiskLaser.Radius=240   ; floating point value
                       ; 240 is the default saucer disk radius
```

9.16.3 Customizable ROF random delay

- By default weapon ROF has a random delay of 0 to 2 frames added to it. This random delay is now customizable, globally and on per-WeaponType basis.

In `rulesmd.ini`:

```
[CombatDamage]
ROF.RandomDelay=0,2  ; integer - single or comma-sep. range (game frames)

[SOMEWEAPON]          ; WeaponType
ROF.RandomDelay=      ; integer - single or comma-sep. range (game frames)
```

9.16.4 Single-color lasers

Comparison of `IsSingleColor=yes` lasers with higher thickness to regular ones (RA2: Reboot)

- You can now set laser to draw using only `LaserInnerColor` by setting `IsSingleColor`, in same manner as `IsHouseColor` lasers do using player's team color. These lasers respect laser thickness. Note that this is not available on prism support weapons.

In `rulesmd.ini`:

```
[SOMEWEAPON]        ; WeaponType
IsSingleColor=false ; boolean
```

9.16.5 Toggle-able ElectricBolt visuals

EBolt customization utilized for different Tesla bolt weapon usage (RA2: Reboot)

- You can now specify individual bolts you want to disable for `IsElectricBolt=true` weapons. Note that this is only a visual change.

In `rulesmd.ini`:

```
[SOMEWEAPONTYPE]        ; WeaponType
Bolt.Disable1=false     ; boolean
Bolt.Disable2=false     ; boolean
Bolt.Disable3=false     ; boolean
```

Note: Due to technical constraints, this does not work with electric bolts created from support weapon of Ares' Prism Forwarding.

9.16.6 Customizable ElectricBolt Arcs

- By default `IsElectricBolt=true` effect draws a bolt with 8 arcs. This can now be customized per WeaponType with `Bolt.Arcs`. Value of 0 results in a straight line being drawn.

In `rulesmd.ini`:

```
[SOMEWEAPONTYPE]          ; WeaponType
Bolt.Arcs=8               ; integer, number of arcs in a bolt
```

Note: Due to technical constraints, this does not work with electric bolts created from support weapon of Ares' Prism Forwarding.

9.17 RadialIndicator visibility

In vanilla game, a structure's radial indicator can be drawn only when it belongs to the player. Now it can also be visible to observer. On top of that, you can specify its visibility from other houses.

In `rulesmd.ini`:

```
[AudioVisual]
RadialIndicatorVisibility=allies  ; list of Affected House Enumeration (owner/self |␣
→allies/ally | enemies/enemy | all)
```

9.18 Crate generation

The statistic distribution of the randomly generated crates is now more uniform within the visible map region by using an optimized sampling procedure.

- You can now limit the crates' spawn region to land only.

In `rulesmd.ini`:

```
[CrateRules]
CrateOnlyOnLand=no  ; boolean
```

9.19 DropPod

DropPod properties can now be customized on a per-InfantryType basis.

- Note that the DropPod is actually the infantry itself with a different shp image.
- If you want to attach the trailer animation to the pod, set `DropPod.Trailer.Attached` to yes.
- By default LaserTrails that are attached to the infantry will not be drawn if it's on DropPod.
    - If you really want to use it, set `DropPodOnly` on the LaserTrail's type entry in art.
- If you want `DropPod.Weapon` to be fired only upon hard landing, set `DropPod.Weapon.HitLandOnly` to true.
- The landing speed is not smaller than it's current height /10 + 2 for unknown reason. A small `DropPod.Speed` value therefore results in exponential deceleration.

In `rulesmd.ini`

```
[SOMEINFANTRY]
DropPod.Angle =                ; double, default to [General]->DropPodAngle, measured in
→radians
DropPod.AtmosphereEntry =      ; anim, default to [AudioVisual]->AtmosphereEntry
DropPod.GroundAnim =           ; 2 anims, default to [General]->DropPod
DropPod.AirImage =             ; SHP file, the pod's shape, default to POD
DropPod.Height =               ; int, default to [General]->DropPodHeight
DropPod.Puff =                 ; anim, default to [General]->DropPodPuff
DropPod.Speed =                ; int, default to [General]->DropPodSpeed
DropPod.Trailer =              ; anim, default to [General]->DropPodTrailer, which by
→default is SMOKEY
DropPod.Trailer.Attached =     ; boolean, default to no
DropPod.Trailer.SpawnDelay =   ; int, number of frames between each spawn of DropPod.
→Trailer, default to 6
DropPod.Weapon =               ; weapon, default to [General]->DropPodWeapon
DropPod.Weapon.HitLandOnly =   ; boolean, default to no
```

AI SCRIPTING AND MAPPING

This page describes all AI scripting and mapping related additions and changes introduced by Phobos.

10.1 Bugfixes and Miscellanous

- Script action `Move to cell` now obeys YR cell calculation now. Using `1000 * Y + X` as its cell value. (was `128 * Y + X` as it's a RA1 leftover)

- The game now can reads waypoints ranges in [0, 2147483647]. (was [0,701])

- Map trigger action `125 Build At...` can now play buildup anim and becomes singleplayer-AI-repairable optionally (needs *following changes to* `fadata.ini`.

- Both Global Variables (`VariableNames` in `rulesmd.ini`) and Local Variables (`VariableNames` in map) are now unlimited.

- Script action `Deploy` now has vehicles with `DeploysInto` searching for free space to deploy at if failing to do so at initial location, instead of simply getting stuck.

- Teams spawned by trigger action 7,80,107 can use IFV and opentopped logic normally. `InitialPayload` logic from Ares is not supported yet.

- If a pre-placed building has a `NaturalParticleSystem`, it used to always be created when the game starts. This has been removed.

10.2 Singleplayer Misssion Maps

10.2.1 Base node repairing

- In singleplayer campaign missions you can now decide whether AI can repair the base nodes / buildings delivered by SW (Ares) by setting `RepairBaseNodes`.

In map file:

```
[Country House]
RepairBaseNodes=false,false,false  ; list of 3 booleans indicating whether AI repair
→basenodes in Easy / Normal / Difficult game diffculty.
```

10.2.2 Default loading screen and briefing offsets

- It is now possible to set defaults for singleplayer map loading screen briefing pixel offsets and the loading screen images and palette that are used if there are no values defined for the map itself.

  - Note that despite the key name being `DefaultLS800BkgdPal`, this applies to both shapes just like the original scenario-specific `LS800BkgdPal` does.

- In `missionmd.ini`:

```
[Defaults]
DefaultLS640BriefLocX=0  ; integer
DefaultLS640BriefLocY=0  ; integer
DefaultLS800BriefLocX=0  ; integer
DefaultLS800BriefLocY=0  ; integer
DefaultLS640BkgdName=    ; filename - including the .shp extension.
DefaultLS800BkgdName=    ; filename - including the .shp extension.
DefaultLS800BkgdPal=     ; filename - including the .pal extension
```

10.2.3 MCV redeploying

- You can now decide whether MCV can redeploy in singleplayer campaign missions by setting `MCVRedeploys`. Overrides `[MultiplayerDialogSettings]->MCVRedeploys` only in singleplayer campaign missions.

In map file:

```
[Basic]
MCVRedeploys=false  ; boolean
```

10.2.4 Set par times and related string labels in missionmd.ini

- By default the singleplayer mission par times and message strings are defined in `[Ranking]` section of the map file itself. These can now also be set in the map file's section in `missionmd.ini`, taking precedence over the map file's settings but defaulting to them if not set.

In `missionmd.ini`:

```
[SOMEMISSION]              ; Filename of mission map
Ranking.ParTimeEasy=       ; time string (hh:mm:ss)
Ranking.ParTimeMedium=     ; time string (hh:mm:ss)
Ranking.ParTimeHard=       ; time string (hh:mm:ss)
Ranking.UnderParTitle=     ; CSF entry key
Ranking.UnderParMessage=   ; CSF entry key
Ranking.OverParTitle=      ; CSF entry key
Ranking.OverParMessage=    ; CSF entry key
```

10.2.5 Show briefing dialog on startup

- You can now have the briefing dialog screen show up on singleplayer campaign mission startup by setting
  ShowBriefing to true in map file's [Basic] section, or in the map file's section in missionmd.ini (latter
  takes precedence over former if available). This can be disabled by user by setting ShowBriefing to false in
  Ra2MD.ini.

  - BriefingTheme (In order of precedence from highest to lowest: missionmd.ini, map file, side entry in
    rulesmd.ini) can be used to define a custom theme to play on this briefing screen. If not set, the loading
    screen theme will keep playing until the scenario starts properly.

  - String labels for the startup briefing dialog screen's resume button as well as the but-
    ton's status bar text can be customized by setting ShowBriefingResumeButtonLabel and
    ShowBriefingResumeButtonStatusLabel respectively. They default to the same labels used by
    the briefing screen dialog when opened otherwise.

In missionmd.ini:

```
[SOMEMISSION]   ; Filename of mission map
ShowBriefing=   ; boolean
BriefingTheme=  ; Theme name
```

In map file:

```
[Basic]
ShowBriefing=false  ; boolean
BriefingTheme=      ; Theme name
```

In rulesmd.ini

```
[SOMESIDE]      ; Side
BriefingTheme=  ; Theme name
```

In uimd.ini

```
[UISettings]
ShowBriefingResumeButtonLabel=GUI:Resume                      ; CSF entry key
ShowBriefingResumeButtonStatusLabel=STT:BriefingButtonReturn  ; CSF entry key
```

In RA2MD.ini:

```
[Phobos]
ShowBriefing=true  ; boolean
```

10.3 Script Actions

10.3.1 `10000-10999` Ingame Actions

`10000-10049` Attack Actions

- These actions instruct the TeamType to use the TaskForce to approach and attack the target specified by the
  second parameter which is an index of a generic pre-defined group. Look at the tables below for the possible
  actions (first parameter value) and arguments (the second parameter value).

- For threat-based attack actions `TargetSpecialThreatCoefficientDefault` and `EnemyHouseThreatBonus` tags from `rulesmd.ini` are accounted.

- All aircraft that attack other air units will end the script. This behavior is intentional because without it aircraft had some bugs that weren't fixable at the time of developing the feature.

- `AITargetTypes` actions instruct the TeamType to use the TaskForce to approach and attack the target specified by the second parameter which is an index of a modder-defined group from `AITargetTypess`. Look at the tables below for the possible actions (first parameter value) and arguments (the second parameter value).

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=i,n             ; For i values check the next table
```

Action	Argument	Repeats	Target Priority	Description
10000	Target Type#	Yes	Closer	
10001	Target Type#	No	Closer	Ends when a team member kill the designated target
10002	`AITargetTypes` index#	Yes	Closer	
10003	`AITargetTypes` index#	No	Closer	Ends when a team member kill the designated target
10004	`AITargetTypes` index#	Yes	Closer	Picks 1 random target from the list
10005	Target Type#	Yes	Farther	
10006	Target Type#	No	Farther	Ends when a team member kill the designated target
10007	`AITargetTypes` index#	Yes	Farther	
10008	`AITargetTypes` index#	No	Farther	Ends when a team member kill the designated target
10009	`AITargetTypes` index#	Yes	Farther	Picks 1 random target from the list
10010	Target Type#	Yes	Closer, higher threat	
10011	Target Type#	No	Closer, higher threat	Ends when a team member kill the designated target
10012	`AITargetTypes` index#	Yes	Closer, higher threat	
10013	`AITargetTypes` index#	No	Closer, higher threat	Ends when a team member kill the designated target
10014	Target Type#	Yes	Farther, higher threat	
10015	Target Type#	No	Farther, higher threat	Ends when a team member kill the designated target
10016	`AITargetTypes` index#	Yes	Farther, higher threat	
10017	`AITargetTypes` index#	No	Farther, higher threat	Ends when a team member kill the designated target

- The following values are the *Target Type#* which can be used as second parameter of the new attack script actions:

- 'Buildings considered as vehicles' means buildings with both `UndeploysInto` set & `Foundation=1x1` and `ConsideredVehicle` not set or buildings with `ConsideredVehicle=true`.

Value	Target Type	Description
1	Anything	Any enemy `VehicleTypes`, `AircraftTypes`, `InfantryTypes` and `BuildingTypes`
2	Structures	Any enemy `BuildingTypes` that are not considered as vehicles
3	Ore Miners	Any enemy `VehicleTypes` with `Harvester=yes` or `ResourceGatherer=yes`, `BuildingTyp`
4	Infantry	Any enemy `InfantryTypes`
5	Vehicles	Any enemy `VehicleTypes` or buildings considered as vehicles
6	Factories	Any enemy `BuildingTypes` with a `Factory=` setting
7	Base Defenses	Any enemy `BuildingTypes` with `IsBaseDefense=yes`
8	House Threats	Any object that targets anything of the Team's House or any enemy that is near to the Team Lead
9	Power Plants	Any enemy `BuildingTypes` with positive `Power=` values
10	Occupied	Any `BuildingTypes` with garrisoned infantry
11	Tech Buildings	Any `BuildingTypes` with `Unsellable=yes`, `Capturable=yes`, negative `TechLevel=` values
12	Refinery	Any enemy `BuildingTypes` with `Refinery=yes` or `ResourceGatherer=yes`, `VehicleType`
13	Mind Controller	Anything `VehicleTypes`, `AircraftTypes`, `InfantryTypes` and `BuildingTypes` with `MindC`
14	Air Units (incl. landed)	Any enemy, `AircraftTypes` and `Jumpjet=yes` `VehicleTypes` or `InfantryTypes`, including
15	Naval	Any enemy `BuildingTypes` and `VehicleTypes` with a `Naval=yes`, any enemy `VehicleType`
16	Disruptors	Any enemy objects with positive `InhibitorRange=` values, positive `RadarJamRadius=` values
17	Ground Vehicles	Any enemy `VehicleTypes` without `Naval=yes`, landed `AircraftTypes` or buildings consider
18	Economy	Any enemy `VehicleTypes` with `Harvester=yes` or `ResourceGatherer=yes`, `BuildingTyp`
19	Infantry Factory	Any enemy `BuildingTypes` with `Factory=InfantryType`
20	Vehicle Factory	Any enemy `BuildingTypes` with with `Naval=no` and `Factory=UnitType`
21	Aircraft Factory	Any enemy `BuildingTypes` with `Factory=AircraftType`
22	Radar	Any enemy `BuildingTypes` with `Radar=yes` or `SpySat=yes`
23	Tech Lab	Any enemy `BuildingTypes` in `[AI]>BuildTech=` list
24	Naval Factory	Any enemy `BuildingTypes` with `Naval=yes` and `Factory=UnitType`
25	Super Weapon	Any enemy `BuildingTypes` with `SuperWeapon=`, `SuperWeapon2=` or `SuperWeapons=`
26	Construction Yard	Any enemy `BuildingTypes` with `ConstructionYard=yes` and `Factory=BuildingType`
27	Neutrals	Any neutral object (Civilian)
28	Generators	Any enemy `BuildingTypes` with `CloakGenerator=yes` or `GapGenerator=yes`
29	Radar Jammer	Any enemy objects with positive `RadarJamRadius=` values
30	Inhibitors	Any enemy objects with positive `InhibitorRange=` values
31	Naval Units	Any enemy `VehicleTypes` with a `Naval=yes` or any enemy `VehicleTypes`, `AircraftTypes,`
32	Mobile Units	Anything `VehicleTypes`, `AircraftTypes` and `InfantryTypes`
33	Capturable	Any `BuildingTypes` with `Capturable=yes` or any `BuildingTypes` with `BridgeRepairHut`
34	Area Threats	Any enemy object that is inside of the Team Leader's Guard Area
35	Vehicle & Naval Factory	Any enemy `BuildingTypes` with `Factory=UnitType`
36	Non-defensive Structures	Any enemy `BuildingTypes` with `IsBaseDefense=no`

- The second parameter with a 0-based index for the `AITargetTypes` section specifies the list of possible `VehicleTypes`, `AircraftTypes`, `InfantryTypes` and `BuildingTypes` that can be evaluated.

- The *AITargetTypes index#* values are obtained in the new `AITargetTypes` section that must be declared in `rulesmd.ini`:

In `rulesmd.ini`:

```
[AITargetTypes]  ; List of TechnoType lists
0=SOMETECHNOTYPE,SOMEOTHERTECHNOTYPE,SAMPLETECHNOTYPE
1=ANOTHERTECHNOTYPE,YETANOTHERTECHNOTYPE
; ...
```

`10050–10099` Move Team to Techno Location actions

- These actions instructs the TeamType to use the TaskForce to approach the target specified by the second parameter. Look at the tables below for the possible actions (first parameter value).

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=i,n             ; For i values check the next table
```

Action	Argument	Target Owner	Target Priority	Description
10050	Target Type#	Enemy	Closer, higher threat	
10051	[AITargetType] index#	Enemy	Closer, higher threat	
10052	[AITargetType] index#	Enemy	Closer	Picks 1 random target from the selected list
10053	Target Type#	Friendly	Closer	
10054	[AITargetType] index#	Friendly	Closer	
10055	[AITargetType] index#	Friendly	Closer	Picks 1 random target from the selected list
10056	Target Type#	Enemy	Farther, higher threat	
10057	[AITargetType] index#	Enemy	Farther, higher threat	
10058	[AITargetType] index#	Enemy	Farther	Picks 1 random target from the selected list
10059	Target Type#	Friendly	Farther	
10060	[AITargetType] index#	Friendly	Farther	
10061	[AITargetType] index#	Friendly	Farther	Picks 1 random target from the selected list

`10100–10999` General Purpose

`10100` Timed Area Guard

- Puts the TaskForce into Area Guard mode for the given units of time. Unlike the original timed Guard script action (`5,n`) that just stays in place doing a basic guard operation this action has a more active role attacking nearby invaders or defending units that needs protection.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=10100,n         ; integer, time in ingame seconds
```

`10101` Wait Until Ammo is Full

- If the TaskForce contains unit(s) that use ammo then the the script will not continue until all these units have fully refilled the ammo.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]   ; ScriptType
x=10101,0
```

`10102` Regroup Temporarily Around the Team Leader

- Puts the TaskForce into Area Guard mode for the given amount of time around the Team Leader (this unit remains almost immobile until the action ends). The default radius around the leader is `[General] > CloseEnough` and the units will not leave that area.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]   ; ScriptType
x=10102,n
```

`10103` Load onto Transports

- If the TaskForce contains unit(s) that can be carried by the transports of the same TaskForce then this action will make the units enter the transports. In single player missions the next action must be "Wait until fully loaded" (`43,0`) or the script will not continue.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]   ; ScriptType
x=10103,0
```

`10104` Chronoshift to Enemy Base

- Chronoshifts the members of the TeamType using first available `Type=Chronosphere` superweapon to a location within `[General] -> AISafeDistance` (plus the additional distance defined in parameter, can be negative) cells from enemy house's base. The superweapon must be charged up to atleast `[General] -> AIMinorSuperReadyPercent` percentage of its recharge time to be available for use by this action.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]   ; ScriptType
x=10104,n          ; integer, additional distance in cells
```

10.3.2 `12000`–`12999` Suplementary/Setup Pre-actions

`12000` Wait if No Target Found

- When executed before a new Attack ScriptType actions like `Generic Target Type Attack` actions and `AITargetTypes Attack` actions the TeamType will remember that must wait 1 second if no target was selected. The second parameter is a positive value that specifies how much retries the Attack will do when no target was found before new Attack ScriptType Action is discarded & the script execution jumps to the next line. The value `0` means infinite retries.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=12000,n           ; integer n=0
```

`12001` Modify Target Distance

- By default `Moving Team to techno location` actions ends when the Team Leader reaches a distance declared in rulesmd.ini called `CloseEnough`. When this action is executed before the actions `Moving Team to techno location` overwrites `CloseEnough` value. This action works only the first time and `CloseEnough` will be used again the next Movement action.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=12001,n
```

`12002` Set Move Action End Mode

- Sets how the Movement actions ends and jumps to the next line. This action works only the first time and `CloseEnough` will be used again the next Movement action.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=12002,n
```

- The possible argument values are:

Argument	Action ends when...
0	Team Leader reaches the minimum distance
1	One unit reaches the minimum distance
2	All team members reached the minimum distance

10.3.3 `14000`–`14999` Utility Actions

`14000` Team's Trigger Weight Reward

- When executed before a new Attack ScriptType actions like `Generic Target Type Attack` actions and `AITargetTypes Attack` actions the TeamType will remember that must be rewarded increasing the current weight of the AI Trigger when the TeamType Target was killed by any of the Team members. The current weight will never surprass the minimum weight and maximum weight limits of the AI Trigger. The second parameter is a positive value.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=14000,n         ; integer n=0
```

`14001` Increase AI Trigger Current Weight

- When executed this increases the current weight of the AI Trigger. The current weight will never surprass the minimum weight and maximum weight limits of the AI Trigger. Take note that all TeamTypes of the same AI Trigger will update the AI Trigger Current Weight sooner or later. The second parameter is a positive value. Take note that the original game only uses the first of the two Teams for calculating the AI Trigger Current weight at the end of the Trigger life, this action ignores if the Team is the first or the second of the AI Trigger and the Current weight is calculated when is executed the action.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=14001,n
```

`14002` Decrease AI Trigger Current Weight

- When executed this decreases the current weight of the AI Trigger. Details same as above.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=14002,n
```

`14003` Unregister Team Success

- Is just the opposite effect of the script action `49,0`. Like if the Team failed.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=14003,0
```

10.3.4 `16000`–`16999` **Flow Control**

`16000` **Start a Timed Jump to the Same Line**

- When the timer ends the current script action ends and start again the same script action. The timer jump repeats again (infinite loop) until is stopped with action `16002` or the team is destroyed.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=16000,n          ; integer n=0, in ingame seconds
```

`16001` **Start a Timed Jump to the Next Line**

- When the timer ends the current script action ends and start the next one in the script type list.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=16001,n          ; integer n=0, in ingame seconds
```

`16002` **Stop the Timed Jumps**

- If the Timed Jumps were activated this action stop the process.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=16002,0
```

`16003` **Randomly Skip Next Action**

- When executed this action picks a random value between 1 and 100. If the value is equal or below the second parameter then the next action will be skipped. If the second parameter is 0 means that the next action will never be skipped and 100 means thay always will be skipped.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=16003,n          ; where 0 > n <= 100
```

`16004` **Pick a Random Script**

- When executed this action picks a random Script Type and replaces the current script by the new picked one. The second parameter is a 0-based index from the new section `AIScriptsList` explained below.

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=16004,n
```

The second parameter is a 0-based index for the `AIScriptsList` section that specifies the list of possible `ScriptTypes` that can be evaluated. The new `AIScriptsList` section must be declared in `rulesmd.ini` for making this script work:

In `rulesmd.ini`:

```
[AIScriptsList]  ; List of ScriptType lists
0=SOMESCRIPTTYPE,SOMEOTHERSCRIPTTYPE,SAMPLESCRIPTTYPE
1=ANOTHERSCRIPTTYPE,YETANOTHERSCRIPTTYPE
; ...
```

10.3.5 `18000`-18999 Variable Manipulation

`18000`-`18023` Edit Variable

- Operate a variable's value

- The variable's value type is int16 instead of int32 in trigger actions for some reason, which means it ranges from -2^15 to 2^15-1.

- Any numbers exceeding this limit will lead to unexpected results!

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=i,n             ; where 18000 <= i <= 18023, n is made up of two parts, the low 16␣
→bits is being used to store the variable index, the high 16 bits is being used for␣
→storing the param value.
```

`18024` - `18047` Edit Variable using Local Variable

- Operate a variable's value using a local variable's value

- Similar to 18000-18023, but the number to operate the value is being read from a local variable

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=i,n             ; where 18024 <= i <= 18047, n is made up of two parts, the low 16␣
→bits is being used to store the variable index, the high 16 bits is being used for␣
→storing the local variable index.
```

`18000` - `18071` Edit Variable using Global Variable

- Operate a variable's value using a global variable's value

- Similar to 18000-18023, but the number to operate the value is being read from a global variable

In `aimd.ini`:

```
[SOMESCRIPTTYPE]  ; ScriptType
x=i,n             ; where 18048 <= i <= 18071, n is made up of two parts, the low 16␣
→bits is being used to store the variable index, the high 16 bits is being used for␣
→storing the global variable index.
```

10.3.6 `19000`–`19999` Miscellanous/Uncategorized

This category is empty for now.

10.4 Trigger Actions

10.4.1 `500` Save Game

- Save the current game immediately (singleplayer game only).
- These vanilla CSF entries will be used: `TXT_SAVING_GAME`, `TXT_GAME_WAS_SAVED` and `TXT_ERROR_SAVING_GAME`.
- The save's description will look like `MapDescName - CSFText`.
- For example: `Allied Mission 25:  Esther's Money - Money Stolen`.

In `mycampaign.map`:

```
[Actions]
...
ID=ActionCount,[Action1],500,4,[CSFKey],0,0,0,0,A,[ActionX]
...
```

10.4.2 `501` Edit Variable

- Operate a variable's value
- The variable's value type is int32, which means it ranges from -2^31 to 2^31-1.
- Any numbers exceeding this limit will lead to unexpected results!

In `mycampaign.map`:

```
[Actions]
...
ID=ActionCount,[Action1],501,0,[VariableIndex],[Operation],[Number],[IsGlobalVariable],0,
→A,[ActionX]
...
```

Operation	Description
0	CurrentValue = Number
1	CurrentValue = CurrentValue + Number
2	CurrentValue = CurrentValue - Number
3	CurrentValue = CurrentValue * Number
4	CurrentValue = CurrentValue / Number
5	CurrentValue = CurrentValue % Number
6	CurrentValue = CurrentValue leftshift Number
7	CurrentValue = CurrentValue rightshift Number
8	CurrentValue = ~CurrentValue
9	CurrentValue = CurrentValue xor Number
10	CurrentValue = CurrentValue or Number
11	CurrentValue = CurrentValue and Number

10.4.3 `502` Generate random number

- Generate a random integer ranged in [Min, Max] and store it in a given variable

In `mycampaign.map`:

```
[Actions]
...
ID=ActionCount,[Action1],502,0,[VariableIndex],[Min],[Max],[IsGlobalVariable],0,A,
↪[ActionX]
...
```

10.4.4 `503` Print variable value

- Print a variable value to the message list

In `mycampaign.map`:

```
[Actions]
...
ID=ActionCount,[Action1],503,[VariableIndex],0,[IsGlobalVariable],0,0,0,A,[ActionX]
...
```

10.4.5 `504` Binary Operation

- Operate a variable's value with another variable's value
- Similar to 501, but the operation number is read from another variable

In `mycampaign.map`:

```
[Actions]
...
ID=ActionCount,[Action1],504,0,[VariableIndex],[Operation],[VariableForOperationIndex],
↪[IsGlobalVariable],[IsOperationGlobalVariable],A,[ActionX]
...
```

`Operation` can be looked up at action `501`

10.4.6 `505` Fire Super Weapon at specified location

- **Use with caution**
- Launch a Super Weapon from [SuperWeaponTypes] list at a specified location.
- `HouseIndex` can take various values:

House Index	Description
>= 0	The index of the current House in the map
4475-4482	Like in the index range 0-7
-1	Pick a random House that isn't Neutral
-2	Pick the first Neutral House
-3	Pick a random Human Player

- Coordinates X & Y can take possitive values or -1, in which case these values can take a random value from the visible map area.

In `mycampaign.map`:

```
[Actions]
...
ID=ActionCount,[Action1],505,0,0,[SuperWeaponTypesIndex],[HouseIndex],[CoordinateX],
↪[CoordinateY],A,[ActionX]
...
```

10.4.7 `506` Fire Super Weapon at specified Waypoint

- **Use with caution**
- Launch a Super Weapon from [SuperWeaponTypes] list at a specified waypoint.

In `mycampaign.map`:

```
[Actions]
...
ID=ActionCount,[Action1],506,0,0,[SuperWeaponTypesIndex],[HouseIndex],[WaypointIndex],0,
↪A,[ActionX]
...
```

10.4.8 `510` Toggle MCV redeployablility

- Force MCV's redeployablility by setting the third parameter.

In `mycampaign.map`:

```
[Actions]
...
ID=ActionCount,[Action1],510,0,0,[MCVRedeploy],0,0,0,A,[ActionX]
...
```

10.5 Trigger events

10.5.1 `500-511` Variable comparation

- Compares the variable's value with given number

In `mycampaign.map`:

```
[Events]
...
ID=EventCount,[Event1],[EVENTID],2,[VariableIndex],[Param],[EventX]
...
```

Event ID	Description	Global
500	CurrentValue > Number	No
501	CurrentValue < Number	No
502	CurrentValue = Number	No
503	CurrentValue >= Number	No
504	CurrentValue <= Number	No
505	CurrentValue & Number	No
506	CurrentValue > Number	Yes
507	CurrentValue < Number	Yes
508	CurrentValue = Number	Yes
509	CurrentValue >= Number	Yes
510	CurrentValue <= Number	Yes
511	CurrentValue & Number	Yes

10.5.2 `512-523` Variable comparation with local variable

- Compares the variable's value with given local variable value

In `mycampaign.map`:

```
[Events]
...
ID=EventCount,[Event1],[EVENTID],2,[VariableIndex],[LocalVariableIndex],[EventX]
...
```

Event ID	Description	Global
512	CurrentValue > LocalVariableValue	No
513	CurrentValue < LocalVariableValue	No
514	CurrentValue = LocalVariableValue	No
515	CurrentValue >= LocalVariableValue	No
516	CurrentValue <= LocalVariableValue	No
517	CurrentValue & LocalVariableValue	No
518	CurrentValue > LocalVariableValue	Yes
519	CurrentValue < LocalVariableValue	Yes
520	CurrentValue = LocalVariableValue	Yes
521	CurrentValue >= LocalVariableValue	Yes
522	CurrentValue <= LocalVariableValue	Yes
523	CurrentValue & LocalVariableValue	Yes

10.5.3 `524-535` Variable comparation with global variable

- Compares the variable's value with given global variable value

In `mycampaign.map`:

```
[Events]
...
ID=EventCount,[Event1],[EVENTID],2,[VariableIndex],[GlobalVariableIndex],[EventX]
...
```

Event ID	Description	Global
524	CurrentValue > GlobalVariableValue	No
525	CurrentValue < GlobalVariableValue	No
526	CurrentValue = GlobalVariableValue	No
527	CurrentValue >= GlobalVariableValue	No
528	CurrentValue <= GlobalVariableValue	No
529	CurrentValue & GlobalVariableValue	No
530	CurrentValue > GlobalVariableValue	Yes
531	CurrentValue < GlobalVariableValue	Yes
532	CurrentValue = GlobalVariableValue	Yes
533	CurrentValue >= GlobalVariableValue	Yes
534	CurrentValue <= GlobalVariableValue	Yes
535	CurrentValue & GlobalVariableValue	Yes

10.5.4 `600` The shield of the attached object is broken

In `mycampaign.map`:

```
[Events]
...
ID=EventCount,...,600,2,0,0,...
...
```

10.5.5 `601`-`602` House owns/doesn't own Techno Type

- 601: Springs when specified house owns at least 1 instance of set TechnoType.

- 602: Springs when specified house doesn't own a single instance of set TechnoType.

    - Multiplayer houses (indices 4475 through 4482) are supported.

Note: These events, as opposed to events 81 & 82 from Ares, take house as a parameter instead of using the trigger owner.

In `mycampaign.map`:

```
[Events]
...
ID=EventCount,...,[EVENTID],2,[HouseIndex],[TechnoType],...
...
```

USER INTERFACE

This page lists all user interface additions, changes, fixes that are implemented in Phobos.

11.1 Bugfixes and miscellanous

- Enabled ability to load full-color non-paletted PCX graphics of any bitness. This applies to every single PCX file that is loaded, including the Ares-supported PCX files.

- You can specify custom `gamemd.exe` icon via `-icon` command line argument followed by absolute or relative path to an `*.ico` file (f. ex. `gamemd.exe -icon Resources/clienticon.ico`).

- Fixed `Blowfish.dll`-caused error `***FATAL*** String Manager failed to initialize properly`, which occurred if `Blowfish.dll` could not be registered in the OS, for example, it happened when the player did not have administrator rights. With Phobos, if the game did not find a registered file in the system, it will no longer try to register this file, but will load it bypassing registration.

- Fixed non-IME keyboard input to be working correctly for languages / keyboard layouts that use character ranges other than Basic Latin and Latin-1 Supplement (font support required).

- Fixed position and layer of info tip and reveal production cameo on selected building

- Timer (superweapon, mission etc) blinking color scheme can be customized by setting `[AudioVisual]` -> `TimerBlinkColorScheme`. Defaults to third color scheme listed in `[Colors]`.

Note: You can use the improved vanilla font which can be found on Phobos supplementaries repo which has way more Unicode character coverage than the default one.

11.2 Audio

- You can now specify which soundtrack themes would play on win or lose.

In `rulesmd.ini`:

```
[SOMESIDE]              ; Side
IngameScore.WinTheme=   ; Soundtrack theme ID
IngameScore.LoseTheme=  ; Soundtrack theme ID
```

11.3 Battle screen UI/UX

11.3.1 Digital display

Default configuration of digital display using example shapes from Phobos supplementaries.

- You can now configure various types of numerical counters to be displayed over Techno to represent its attributes, such as health points or shield points.

- `Anchor.Horizontal` and `Anchor.Vertical` set the anchor point from which the display is drawn (depending on `Align`) relative to unit's center/selection box. For buildings, `Anchor.Building` is used instead.

  - `Offset` and `Offset.ShieldDelta` (the latter applied when a shield is active) can be used to further modify the position.

- By default, values are displayed in `current/maximum` format (i.e. 20/40). `HideMaxValue=yes` will make the counter show only the current value (i.e. 20). `Percentage=yes` changes the format to `percent%` (i.e. 50%).

- `CanSee` and `CanSee.Observer` can limit visibility to specific players.

- The digits can be either a custom shape (.shp) or text drawn using the game font. This depends on whether `Shape` is set.

  - `Text.Color`, `Text.Color.ConditionYellow` and `Text.Color.ConditionRed` allow customization of the font color. `Text.Background=yes` will additionally draw a black rectangle background.

  - When using shapes, a custom palette can be specified with `Palette`. `Shape.Spacing` controls pixel buffer between characters.

  - Frames 0-9 will be used as digits when the owner's health bar is green, 10-19 when yellow, 20-29 when red. For / and % characters, frame numbers are 30-31, 32-33, 34-35, respectively.

- Default `Offset.ShieldDelta` for `InfoType=Shield` is `0,-10`, `0,0` for others.

- Default `Shape.Spacing` for buildings is `4,-2`, `4,0` for others.

In `rulesmd.ini`:

```
[DigitalDisplayTypes]
0=SOMEDIGITALDISPLAYTYPE

[AudioVisual]
Buildings.DefaultDigitalDisplayTypes=    ; list of DigitalDisplayTypes
Infantry.DefaultDigitalDisplayTypes=     ; list of DigitalDisplayTypes
Vehicles.DefaultDigitalDisplayTypes=     ; list of DigitalDisplayTypes
Aircraft.DefaultDigitalDisplayTypes=     ; list of DigitalDisplayTypes

[SOMEDIGITALDISPLAYTYPE]                  ; DigitalDisplayType
; Generic
InfoType=Health                           ; Displayed value enumeration
→(health|shield|ammo|mindcontrol|spawns|passengers|tiberium|experience|occupants|gattlingstage)
Offset=0,0                                ; integers - horizontal, vertical
Offset.ShieldDelta=                       ; integers - horizontal, vertical
Align=right                               ; Text alignment enumeration (left|right|center/
→centre)
Anchor.Horizontal=right                   ; Horizontal position enumeration (left|center/
→centre|right)
Anchor.Vertical=top                       ; Vertical position enumeration (top|center/
→centre|bottom)
Anchor.Building=top                       ; Hexagon vertex enumeration
→(top|lefttop|leftbottom|bottom|rightbottom|righttop)
Percentage=false                          ; boolean
HideMaxValue=false                        ; boolean
VisibleToHouses=owner                     ; Affected house enumeration (none|owner/
→self|allies|ally|team|enemies|enemy|all)
VisibleToHouses.Observer=true             ; boolean
; Text
Text.Color=0,255,0                        ; integers - Red, Green, Blue
Text.Color.ConditionYellow=255,255,0      ; integers - Red, Green, Blue
Text.Color.ConditionRed=255,0,0           ; integers - Red, Green, Blue
Text.Background=false                      ; boolean
; Shape
Shape=                                     ; filename with .shp extension, if not present,
→game-drawn text will be used instead
Palette=palette.pal                        ; filename with .pal extension
Shape.Spacing=                             ; integers - horizontal, vertical spacing
→between digits

[SOMETECHNOTYPE]
DigitalDisplay.Disable=false              ; boolean
DigitalDisplayTypes=                      ; list of DigitalDisplayTypes
```

In `RA2MD.ini`:

```
[Phobos]
DigitalDisplay.Enable=false               ; boolean
```

Note: An example shape file for digits can be found on Phobos supplementaries repo).

11.3.2 Show designator & inhibitor range

- It is now possible to display range of designator and inhibitor units when in super weapon targeting mode. Each instance of player owned techno types listed in `[SuperWeapon]->SW.Designators` will display a circle with radius set in `[TechnoType]->DesignatorRange` or `Sight`.

  - In a similar manner, each instance of enemy owned techno types listed in `[SuperWeapon]->SW.Inhibitors` will display a circle with radius set in `[TechnoType]->InhibitorRange` or `Sight`.

- This feature can be disabled globally with `[AudioVisual]->ShowDesignatorRange=false` or per Super-WeaponType with `[SuperWeapon]->ShowDesignatorRange=false`.

- This feature can be toggled *by the player* (if enabled in the mod) with `ShowDesignatorRange` in `Ra2MD.ini` or with "Toggle Designator Range" hotkey in "Interface" category.
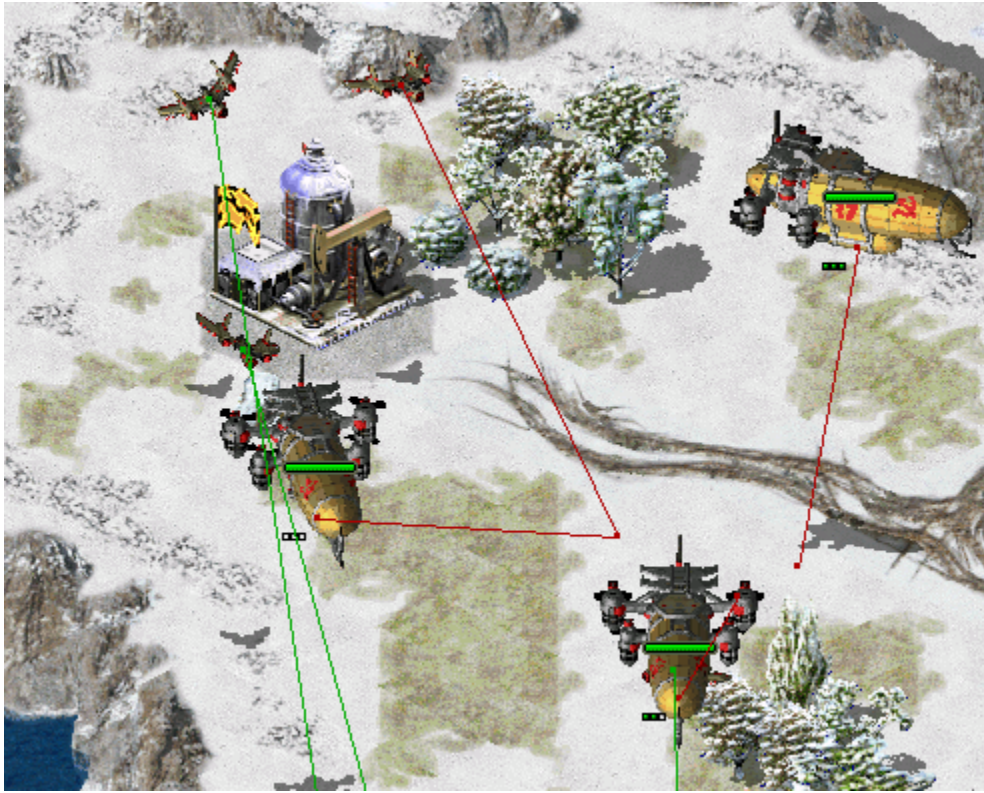
In `rulesmd.ini`:

```
[AudioVisual]
ShowDesignatorRange=true     ; boolean

[SOMESW]                     ; SuperWeapon
ShowDesignatorRange=true     ; boolean
```

In `RA2MD.ini`:

```
[Phobos]
ShowDesignatorRange=false               ; boolean
```

11.3.3 Hide health bars

Health bars hidden in
CnC: Final War

- Health bar display can now be turned off as needed, hiding both the health bar box and health pips.

In `rulesmd.ini`:

```
[SOMENAME]           ; TechnoType
HealthBar.Hide=false  ; boolean
```

11.3.4 Low priority for box selection

Harvesters not selected together with battle units in Rise of the East mod

- You can now set lower priority for an ingame object (currently has effect on units mostly), which means it will be excluded from box selection if there's at least one normal priority unit in the box. Otherwise it would be selected as normal. Works with box+type selecting (type select hotkey + drag) and regular box selecting. Box shift-selection adds low-priority units to the group if there are no normal priority units among the appended ones.

In `rulesmd.ini`:

```
[SOMETECHNO]                ; TechnoType
LowSelectionPriority=false  ; boolean
```

- This behavior is designed to be toggleable by users. For now you can only do that externally via client or manually.

In `RA2MD.ini`:

```
[Phobos]
PrioritySelectionFiltering=true  ; boolean
```

11.3.5 Visual indication of income from grinders and refineries

- `DisplayIncome` can be set to display the amount of credits acquired when a building is grinding units / receiving ore dump from harvesters or slaves.

- Multiple income within less than one in-game second have their amounts coalesced into single display.

  - `DisplayIncome.Houses` determines which houses can see the credits display.

    * If you don't want players to see how AI cheats with `VirtualPurifiers` for example, `DisplayIncome.AllowAI` can be set to false to disable the display. It overrides the previous option.

  - `DisplayIncome.Offset` is additional pixel offset for the center of the credits display, by default (0,0) at building's center. -`[AudioVisual]`->`DisplayIncome` also allows to display the amount of credits when selling a unit on a repair bay.

In `rulesmd.ini`:

```
[AudioVisual]
DisplayIncome=false         ; boolean
DisplayIncome.Houses=All  ; Affected House Enumeration (none|owner/self|allies/
→ally|team|enemies/enemy|all)
DisplayIncome.AllowAI=yes ; boolean

[SOMEBUILDING]             ; BuildingType
DisplayIncome=            ; boolean, defaults to [AudioVisual]->DisplayIncome
DisplayIncome.Houses=     ; Affected House Enumeration, defaults to [AudioVisual]->
→DisplayIncome.Houses
DisplayIncome.Offset=0,0  ; X,Y, pixels relative to default
```

11.3.6 Placement preview
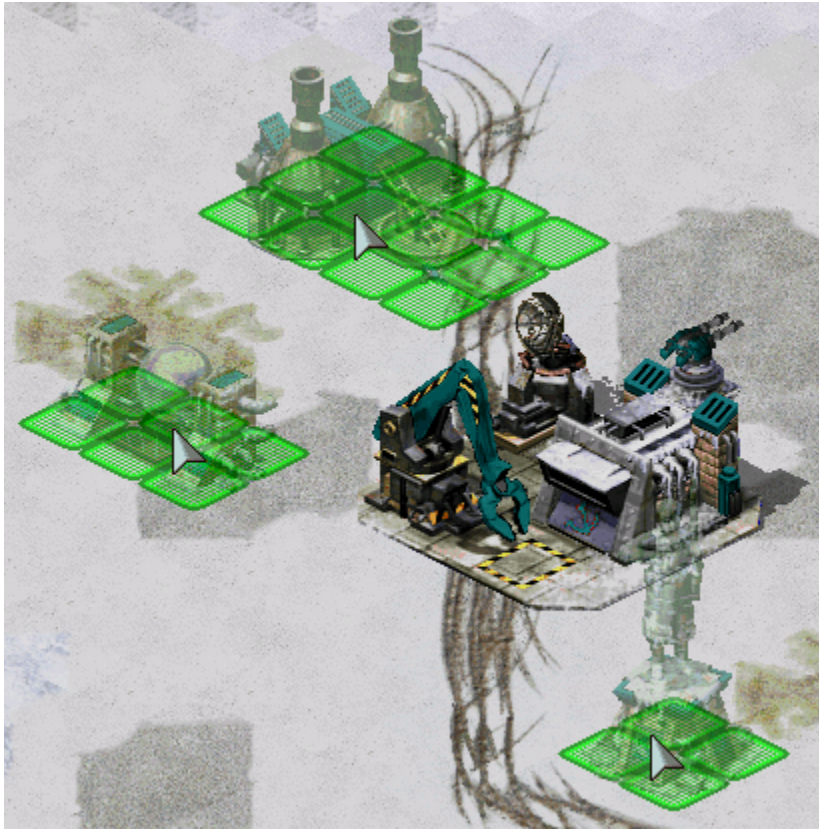
Building placement preview using 50% translucency in Rise of the East

- Building previews can now be enabled when placing a building for construction. This can be enabled on a global basis with `[AudioVisual]->PlacementPreview` and then further customized for each building with `[SOMEBUILDING]->PlacementPreview`.

- The building placement grid (`place.shp`) translucency setting can be adjusted via `PlacementGrid.Translucency` if `PlacementPreview` is disabled and `PlacementGrid.TranslucencyWithPreview` if enabled.

- If using the building's appropriate `Buildup` is not desired, customizations allow for you to choose the exact SHP and frame you'd prefer to show as preview through `PlacementPreview.Shape`, `PlacementPreview.ShapeFrame` and `PlacementPreview.Palette`.

  - You can specify theater-specific palettes and shapes by putting three ~ marks to the theater specific part of the filename. ~~~ is replaced with the theater's three-letter extension.

- `PlacementPreview.ShapeFrame=` tag defaults to building's artmd.ini `Buildup` entry's last non-shadow frame. If there is no 'Buildup' specified it will instead attempt to default to the building's normal first frame (animation frames and bibs are not included in this preview).

In `rulesmd.ini`:

```
[AudioVisual]
PlacementGrid.Translucency=0              ; translucency level (0/25/50/75)
PlacementGrid.TranslucencyWithPreview=  ; translucency level (0/25/50/75), defaults to
↪[AudioVisual]->PlacementGrid.Translucency
```

(continues on next page)

```
PlacementPreview=no                    ; boolean
PlacementPreview.Translucency=75       ; translucency level (0/25/50/75)

[SOMEBUILDING]
PlacementPreview=yes                    ; boolean
PlacementPreview.Shape=                 ; filename - including the .shp extension. If not
→set uses building's artmd.ini Buildup SHP (based on Building's Image)
PlacementPreview.ShapeFrame=            ; integer, zero-based frame index used for
→displaying the preview
PlacementPreview.Offset=0,-15,1         ; integer, expressed in X,Y,Z used to alter
→position preview
PlacementPreview.Remap=yes              ; boolean, does this preview use player remap colors
PlacementPreview.Palette=               ; filename - including the .pal extension
PlacementPreview.Translucency=          ; translucency level (0/25/50/75), defaults to
→[AudioVisual]->PlacementPreview.Translucency
```

Note: The `PlacementPreview.Palette` option is not used when `PlacementPreview.Remap=yes` is set to yes. This may change in future.

- This behavior is designed to be toggleable by users. For now you can only do that externally via client or manually.

In `RA2MD.ini`:

```
[Phobos]
ShowPlacementPreview=yes   ; boolean
```

11.3.7 Real time timers

- Timers can now display values in real time, taking game speed into account. This can be enabled with `RealTimeTimers=true`.

- By default, time is calculated relative to desired framerate. Enabling `RealTimeTimers.Adaptive` (always true for unlimited FPS and custom speeds) will calculate time relative to *current* FPS, accounting for lag.

  - When playing with unlimited FPS (or custom speed above 60 FPS), the timers might constantly change value because of the unstable nature.

- This option respects custom game speeds.

- This behavior is designed to be toggleable by users. For now you can only do that externally via client or manually.

In `ra2md.ini`:

```
[Phobos]
RealTimeTimers=false           ; boolean
RealTimeTimers.Adaptive=false  ; boolean
```

11.3.8 SuperWeapon ShowTimer sorting

- You can now sort the timers of superweapons in ascending order from top to bottom according to a given priority value.

In `rulesmd.ini`

```
[SOMESWTYPE]
ShowTimer=yes
ShowTimer.Priority=0  ; integer
```

11.3.9 Flashing Technos on selecting

Selecting technos, controlled by player, now may show a flash effect by setting `SelectionFlashDuration` parameter. Set `SelectionFlashDuration=0` to disable it.

In `rulesmd.ini`:

```
[AudioVisual]
SelectionFlashDuration=0  ; integer, number of frames
```

11.4 Hotkey Commands

11.4.1 [ ] Display Damage Numbers

- Switches on/off floating numbers when dealing damage. See *this* for details.
- For localization add `TXT_DISPLAY_DAMAGE` and `TXT_DISPLAY_DAMAGE_DESC` into your `.csf` file.

11.4.2 [ ] Dump Object Info

- Writes currently hovered or last selected object info in log and shows a message. See *this* for details.
- For localization add `TXT_DUMP_OBJECT_INFO` and `TXT_DUMP_OBJECT_INFO_DESC` into your `.csf` file.

11.4.3 [ ] Next Idle Harvester

- Selects and centers the camera on the next TechnoType that is counted via the *harvester counter* and is currently idle.
- For localization add `TXT_NEXT_IDLE_HARVESTER` and `TXT_NEXT_IDLE_HARVESTER_DESC` into your `.csf` file.

11.4.4 [ ] Quicksave

- Save the current singleplayer game.

- For localization, add `TXT_QUICKSAVE`, `TXT_QUICKSAVE_DESC`, `TXT_QUICKSAVE_SUFFIX` and `MSG:NotAvailableInMultiplayer` into your `.csf` file.

  - These vanilla CSF entries will be used: `TXT_SAVING_GAME`, `TXT_GAME_WAS_SAVED` and `TXT_ERROR_SAVING_GAME`.

  - The save should be looks like `Allied Mission 25: Esther's Money - QuickSaved`

11.4.5 [ ] Toggle Designator Range

- Switches on/off super weapon designator range indicator. See *this* for details.

- For localization add `TXT_DESIGNATOR_RANGE` and `TXT_DESIGNATOR_RANGE_DESC` into your `.csf` file.

11.4.6 [ ] Toggle Digital Display

- Switches on/off *digital gisplay types*.

- For localization add `TXT_DIGITAL_DISPLAY` and `TXT_DIGITAL_DISPLAY_DESC` into your `.csf` file.

11.5 Loading screen

- PCX files can now be used as loadscreen images.

  - You can specify custom loadscreen with Ares tag `File.LoadScreen`.

  - Campaign loading screen (`missionmd.ini->[LS800BkgdName]`) can also use PCX image.

  - Observer loading screen can use `ls800obs.pcx` *(or `ls640obs.pcx` when screen width is 640)* for this feature.

- The loadscreen size can now be different from the default `800x600` one; if the image is bigger than the screen it's centered and cropped.

  - This feature works in conjunction with CnCNet5 spawner DLL which resizes loadscreen window to actual monitor size and places the image in center. If there's no CnCNet5 spawner loaded, the window resolution will be always `800x600`.

  - Same applies to campaign loading screen (`missionmd.ini->[LS800BkgdName]`).

- You can now disable hardcoded black dots that YR engine shows over empty spawn locations, which allows to use prettier and more correctly placed markers that are produced by Map Renderer instead.

In `uimd.ini`:

```
[LoadingScreen]
DisableEmptySpawnPositions=false  ; boolean
```

11.6 Sidebar / Battle UI

11.6.1 Cameo Sorting

- You can now specify Cameo Priority for any TechnoType/SuperWeaponType. Vanilla sorting rules are here.

    - The Cameo Priority is checked just before evevything vanilla. Greater `CameoPriority` wins.

In `rulesmd.ini`:

```
[SOMENAME]              ; TechnoType / SuperWeaponType
CameoPriority=0         ; integer
```

11.6.2 Center pause menu background

- Pause menu background (`bkgdXX(y).shp`) can now optionally be centered on the center of the available space instead of top-left corner. This allows for backgrounds to be better designed with resolutions larger than `1024x768` in mind.

In `uimd.ini`:

```
[Sidebar]
CenterPauseMenuBackground=false  ; boolean
```

11.6.3 Custom Missing Cameo (`XXICON.SHP`)

- You can now specify any SHP/PCX file as XXICON.SHP for missing cameo.

In `rulesmd.ini`:

```
[AudioVisual]
MissingCameo=XXICON.SHP  ; filename - including the .shp/.pcx extension
```

11.6.4 Harvester counter

Harvester Counter in Fantasy ADVENTURE

- An additional counter for your active/total harvesters can be added near the credits indicator.

- You can specify which TechnoType should be counted as a Harvester with `Harvester.Counted`. If not set, the techno with `Harvester=yes` or `Enslaves=SOMESLAVE` will be counted.

    - Can be set to true on buildings with `ProduceCashAmount` to count them as active 'harvesters' while generating credits.

- The counter is displayed with the format of `Label(Active Harvesters)/(Total Harvesters)`. The label is U+26CF by default.

- You can adjust counter position by `Sidebar.HarvesterCounter.Offset`, negative means left/up, positive means right/down.

- By setting `HarvesterCounter.ConditionYellow` and `HarvesterCounter.ConditionRed`, the game will warn player by changing the color of counter whenever the active percentage of harvesters less than or equals to them, like HP changing with `ConditionYellow` and `ConditionRed`.

In `uimd.ini`:

```
[Sidebar]
HarvesterCounter.Show=false          ; boolean
HarvesterCounter.Label=<none>        ; CSF entry key
HarvesterCounter.ConditionYellow=99% ; floating point value, percents
HarvesterCounter.ConditionRed=50%    ; floating point value, percents
```

In `rulesmd.ini`:

```
[SOMETECHNO]                                   ; TechnoType
Harvester.Counted=                             ; boolean

[SOMESIDE]                                     ; Side
Sidebar.HarvesterCounter.Offset=0,0            ; X,Y, pixels relative to default
Sidebar.HarvesterCounter.ColorYellow=255,255,0 ; integer - R,G,B
Sidebar.HarvesterCounter.ColorRed=255,0,0      ; integer - R,G,B
```

Note: If you use the vanilla font in your mod, you can use the improved font (v4 and higher; can be found on Phobos supplementaries repo) which among everything already includes the mentioned icons. Otherwise you'd need to draw them yourself using WWFontEditor, for example.

11.6.5 Power delta counter

Power delta Counter in Assault Amerika

- An additional counter for your power delta (surplus) can be added near the credits indicator.

- The counter is displayed with the format of `Label(sign)(Power Delta)`. The label is `PowerLabel` used in `ToolTips` (by default U+26A1).

- When the power of the player is blacked-out by a spy or force-shield, `PowerBlackoutLabel` in `ToolTips` is displayed instead (by default U+26A1 U+274C), the text color is `Sidebar.PowerDelta.ColorGrey`.

- You can adjust counter position by `Sidebar.PowerDelta.Offset`, negative means left/up, positive means right/down.

- You can adjust counter text alignment by `Sidebar.PowerDelta.Align`, acceptable values are left, right, center/centre.

- By setting `PowerDelta.ConditionYellow` and `PowerDelta.ConditionRed`, the game will warn player by changing the color of counter whenever the percentage of used power exceeds the value (i.e. when drain to output ratio is above 100%, the counter will turn red).

- The exception for this rule is when both power output and drain are 0 - in this case the counter will default to yellow.

In `uimd.ini`:

```
[Sidebar]
PowerDelta.Show=false           ; boolean
PowerDelta.ConditionYellow=75%  ; floating point value, percents
PowerDelta.ConditionRed=100%    ; floating point value, percents
```

In `rulesmd.ini`:

```
[SOMESIDE]                              ; Side
Sidebar.PowerDelta.Offset=0,0           ; X,Y, pixels relative to default
Sidebar.PowerDelta.ColorGreen=0,255,0   ; integer - R,G,B
Sidebar.PowerDelta.ColorYellow=255,255,0 ; integer - R,G,B
Sidebar.PowerDelta.ColorRed=255,0,0     ; integer - R,G,B
Sidebar.PowerDelta.ColorGrey=128,128,128 ; integer - R,G,B
Sidebar.PowerDelta.Align=left           ; Alignment enumeration - left | center/centre
→| right
```

Note: If you use the vanilla font in your mod, you can use the improved font (v4 and higher; can be found on Phobos supplementaries repo) which among everything already includes the mentioned icons. Otherwise you'd need to draw them yourself using WWFontEditor, for example.

11.6.6 Producing Progress

Producing Progress bars in Fantasy ADVENTURE

- You can now know your factories' status via sidebar!

- You need to draw your own assets (`tab0xpp.shp`, x is replaced by 0-3) and put them into `sidec0x.mix`.

In `uimd.ini`:

```
[Sidebar]
ProducingProgress.Show=false  ; boolean
```

In `rulesmd.ini`:

```
[SOMESIDE]                              ; Side
Sidebar.ProducingProgress.Offset=0,0  ; X,Y, pixels relative to default
```

11.6.7 Specify Sidebar style

- It's now possible to switch hardcoded sidebar button coords to use GDI sidebar coords by setting `Sidebar.GDIPosition`. Defaults to true for first side, false for all others.

In `rulesmd.ini`:

```
[SOMESIDE]              ; Side
Sidebar.GDIPositions=  ; boolean
```

11.7 Tooltips

Extended tooltips used in CnC: Final War

- Sidebar tooltips can now display extended information about the TechnoType/SWType when hovered over it's cameo. In addition the low character limit is lifted when the feature is enabled via the corresponding tag, allowing for 1024 character long tooltips.

- TechnoType's tooltip would display it's name, cost, power, build time and description (when applicable).

- SWType's tooltip would display it's name, cost, and recharge time (when applicable).

- Extended tooltips don't use `TXT_MONEY_FORMAT_1` and `TXT_MONEY_FORMAT_2`. Instead you can specify cost, power and time labels (displayed before correspoding values) with the corresponding tags. Characters `$ U+0024`, `U+26A1` and `U+231A` are used by default.

- Fixed a bug when switching build queue tabs via QWER didn't make tooltips disappear as they should, resulting in stuck tooltips.

- The tooltips can now go over the sidebar bounds to accommodate for longer contents. You can control maximum text width with a new tag (paddings are excluded from the number you specify).

In `uimd.ini`:

```
[ToolTips]
ExtendedToolTips=false        ; boolean
CostLabel=<none>              ; CSF entry key
PowerLabel=<none>             ; CSF entry key
PowerBlackoutLabel=<none>     ; CSF entry key
TimeLabel=<none>              ; CSF entry key
MaxWidth=0                    ; integer, pixels
```

In `rulesmd.ini`:

```
[SOMENAME]              ; TechnoType or SWType
UIDescription=<none>    ; CSF entry key
```

- The descriptions are designed to be toggleable by users. For now you can only do that externally via client or manually.

In `RA2MD.ini`:

```
[Phobos]
ToolTipDescriptions=true   ; boolean
```

Note: Same as with harvester counter, you can download the improved font (v4 and higher; can be found on Phobos supplementaries repo) or draw your own icons.

- The background color and opacity of tooltips can now be customized globally or per side.

In `rulesmd.ini`:

```
[SOMESIDE]
ToolTip.Background.Color=0,0,0      ; integer - R,G,B, defaults to [AudioVisual]->
↪ToolTip.Background.Color, which defaults to `0,0,0`
ToolTip.Background.Opacity=100      ; integer, ranged in [0, 100], defaults to␣
↪[AudioVisual]->ToolTip.Background.Opacity, which defaults to `100`
ToolTip.Background.BlurSize=0.0     ; float, defaults to [AudioVisual]->ToolTip.
↪Background.BlurSize, which defaults to `0.0`
```

Note: The blur effect is resource intensive. Please make sure you really want to enable this effect, otherwise leave it to 0.0 so it stays disabled.

In `RA2MD.ini`:

```
[Phobos]
ToolTipBlur=false  ; boolean, whether the blur effect of tooltips will be enabled.
```

11.8 Miscellanous

11.8.1 Skip saving game on starting a new campaign

When starting a new campaign, the game automatically saves the game. Now you can decide whether you want that to happen or not.

In `RA2MD.ini`:

```
[Phobos]
SaveGameOnScenarioStart=true ; boolean
```

MISCELLANOUS

This page describes every change in Phobos that wasn't categorized into a proper category yet.

12.1 Player colors

12.1.1 Unlimited skirmish colors

- It is now possible to have an unlimited number of skirmish/multiplayer player colors, as opposed to 8 in Yuri's Revenge and 16 with Ares.

- This feature must be enabled with `SkirmishUnlimitedColors=true` in `[General]` section of game rules.

- When enabled, the game will treat color indices passed from spawner as indices for `[Colors]` section entries.

  - In example, with original rules, index 6 will correspond to color `Orange=25,230,255`.

- Phobos writes additional information to the `SYNC#.txt` log files when a desynchronization occurs such as calls to random number generator functions, facing / target / destination changes etc.

Note: This feature should only be used if you use a spawner/outside client (i.e. CNCNet client). Using it in the original YR launcher will produce undesireable effects.

Warning: Due to technical incompatibilities, enabling this feature disables Ares' Customizable Dropdown Colors.

In `rulesmd.ini`:

```
[General]
SkirmishUnlimitedColors=false        ; boolean
```

12.2 Developer tools

12.2.1 Additional sync logging

- Phobos writes additional information to the SYNC#.txt log files when a desynchronization occurs such as calls to random number generator functions, facing / target / destination changes etc.

12.2.2 Dump Object Info

Object info dump from CnC: Reloaded

- There's a new hotkey to dump selected/hovered object info on press. Available only if `DebugKeysEnabled` under `[GlobalControls]` is set to true in `rulesmd.ini`.

12.2.3 Display Damage Numbers

- There's a new hotkey to show exact numbers of damage dealt on units & buildings. The numbers are shown in red (blue against shields) for damage, and for healing damage in green (cyan against shields). They are shown on the affected units and will move upwards after appearing. Available only if `DebugKeysEnabled` under `[GlobalControls]` is set to true in `rulesmd.ini`.

12.2.4 Frame Step In

- There's a new hotkey to execute the game frame by frame for development usage.
  - You can switch to frame by frame mode and then use frame step in command to forward 1, 5, 10, 15, 30 or 60 frames by one hit.

12.2.5 Save variables to file

- There's a new hotkey to write all local variables to `locals.ini` and all global variables to `globals.ini`. Available only if `DebugKeysEnabled` under `[GlobalControls]` is set to true in `rulesmd.ini`.

- Variables will be also automatically saved to file on scenario end if `[General]SaveVariablesOnScenarioEnd=true` is set in `rulesmd.ini`.

- Variable section will use the same name as the mission file name in capital letters, i.e. `[MYCAMPAIGN.MAP]`.
  - Variables will be written as key-value pairs, i.e. `MyVariable=1`

- If an INI file with the same name (`locals.ini`/`globals.ini`) doesn't exist, it will be created. If it exists, all sections will be preserved.

In `rulesmd.ini`:

```
[General]
SaveVariablesOnScenarioEnd=false    ; boolean
```

12.2.6 Semantic locomotor aliases

- It's now possible to write locomotor aliases instead of their CLSIDs in the `Locomotor` tag value. Use the table below to find the needed alias for a locomotor.

Alias	CLSID
Drive	{4A582741-9839-11d1-B709-00A024DDAFD1}
Jumpjet	{92612C46-F71F-11d1-AC9F-006008055BB5}
Hover	{4A582742-9839-11d1-B709-00A024DDAFD1}
Rocket	{B7B49766-E576-11d3-9BD9-00104B972FE8}
Tunnel	{4A582743-9839-11d1-B709-00A024DDAFD1}
Walk	{4A582744-9839-11d1-B709-00A024DDAFD1}
DropPod	{4A582745-9839-11d1-B709-00A024DDAFD1}
Fly	{4A582746-9839-11d1-B709-00A024DDAFD1}
Teleport	{4A582747-9839-11d1-B709-00A024DDAFD1}
Mech	{55D141B8-DB94-11d1-AC98-006008055BB5}
Ship	{2BEA74E1-7CCA-11d3-BE14-00104B62A16C}

12.3 Game Speed

12.3.1 Single player game speed

- It is now possible to change the default (GS4/Fast/30FPS) campaign game speed with `CampaignDefaultGameSpeed`.

- It is now possible to change the *values* of single player game speed, by inputing a pair of values. This feature must be enabled with `CustomGS=true`. **Only values between 10 and 60 FPS can be consistently achieved.**

  - Custom game speed is achieved by periodically manipulating the delay between game frames, thus increasing or decreasing FPS.

  - `CustomGSN.ChangeInterval` describes the frame interval between applying the effect. A value of 2 means "every other frame", 3 means "every 3 frames" etc. Increase of speedup/slowdown is approximately logarithmic.

  - `CustomGSN.ChangeDelay` sets the delay (game speed number) to use every `CustomGSN.ChangeInterval` frames.

  - `CustomGSN.DefaultDelay` sets the delay (game speed number) to use on other frames.

  - Using game speed 6 (Fastest) in either `CustomGSN.ChangeDelay` or `CustomGSN.DefaultDelay` allows to set FPS above 60. **However, the resulting FPS may vary on different machines.**

Note: Currently there is no way to set desired FPS directly. Use the generator below to get required values. The generator supports values from 10 to 60.

In `rulesmd.ini`:

```
[General]
CustomGS=false              ; boolean
CustomGSN.ChangeInterval=-1 ; integer >= 1
CustomGSN.ChangeDelay=N     ; integer between 0 and 6
CustomGSN.DefaultDelay=N    ; integer between 0 and 6
; where N = 0, 1, 2, 3, 4, 5, 6
```

In `RA2MD.ini`:

```
[Phobos]
CampaignDefaultGameSpeed=4  ; integer
```

12.4 INI

12.4.1 Include files

Note: This feature must be enabled via a command line argument `-Include`.

- INI files can now include other files (merge them into self) using `[$Include]` section.

  - `[$Include]` section contains a list of files to read and include. Files can be directly in the Red Alert 2 directory or in a loaded MIX file.

- Files will be added in the same order they are defined. Index of each file **must be unique among all included files**.

- Inclusion can be nested recursively (included files can include files further). Recursion is depth-first (before including next file, check if the current one includes anything).

- When the same entry exists in two files, then the one read later will overwrite the value.

- This feature can be used in *any* INI file, be it `rulesmd.ini`, `artmd.ini`, `soundmd.ini`, map file or anything else.

Warning: Due to a technical issue, there is a chance that ***the first line of a included file will be skipped!*** To prevent this, included files should start with an empty line or a comment.

Warning: When this feature is enabled, the Ares equivalent of `[$Include]` is disabled!

In any file:

```
[$Include]
0=somefile.ini        ; file name
```

12.4.2 Section inheritance

Note: This feature must be enabled via a command line argument `-Inheritance`.

- You can now make sections (children) inherit entries from other sections (parents) with `$Inherits` entry.

  - When a section has no value set for an entry (or an entry is missing), the game will attempt to use parent's value. If no value is found, only then the default will be used.

  - When multiple parents are specified, the order of inheritance is "first come, first served", looking up comma separated parents from left to right.

  - Inheritance can be nested recursively (parent sections can have their own parents). Recursion is depth-first (before inheriting from the next parent, check if the current parent has parents).

  - This feature can be used in *any* INI file, be it `rulesmd.ini`, `artmd.ini`, `soundmd.ini`, map file or anything else.

Warning: When this feature is enabled, the Ares equivalent of `$Inherits` (undocumented) is disabled!

Warning: This feature may noticeably increase game loading time, depending on the size of game rules and used hardware.

In any file:

```
[PARENT1SECTION]

[PARENT2SECTION]

[CHILDSECTION]
$Inherits=PARENT1SECTION,PARENT2SECTION...  ; section names
```


Warning The project is currently not maintained actively enough and thus we are looking for active maintainers at the moment. Please message us in Discord channel (or PM Kerbiter directly).

PHOBOS

. . . is a community engine extension project providing a set of new features and fixes for Yuri's Revenge based on modified YRpp and Syringe to allow injecting code. It's meant to accompany Ares rather than replace it, thus it won't introduce incompatibilities.

While Phobos is independent of Ares and does NOT require Ares specifically to function, Phobos complements some of the features found in Ares and vice versa.

You can discuss the project at a dedicated channel on C&C Mod Haven.

13.1 Downloads

You can choose one of the following:

- Latest stable branch build (most bug-free release but very slow on new features)

- Latest development branch builds (a bit less bug-free releases, devbuilds get new features when they are finished)

- Latest development branch nightly (added unreleased features that will be in next devbuild)

- Individual new feature nightly builds for testing can be found in pull requests

13.1.1 Note on nightly builds

Last two listed versions are bleeding edge (don't redistribute them outside of testing!) and have build information (commit and branch/tag) in them which is displayed ingame and can't be turned off. You can get a build for development branch (link above) any up-to-date pull request via an automatic bot comment that would appear in it and would contain the most recent successfully compiled version of Phobos for that feature branch. Please note that the build is produced *only if the PR has no merge conflicts*. Alternatively, you can get an artifact manually from GitHub Actions runs. You can get an artifact for a specific commit which is built automatically with a GitHub Actions workflow, just press on a green tick, open the workflow, find and download the build artifact. This is limited to authorized users only.

13.2 Installation and Usage

1. If you don't have Syringe installed into your mod already, you can download it together with the latest Ares package. To install simply drop `Syringe.exe` into your game folder (where your `gamemd.exe` is located). It's highly recommended to **install Ares** too to get full Phobos feature set, just drop all the files from the archive except documentation folder into your game folder.

2. Obtain a Phobos "package" (official builds can be found on releases page; read below to learn how to get nightly builds). You should end up with two files: `Phobos.dll` and `Phobos.pdb`.

3. Place those files in the game folder (where your `gamemd.exe` is located).

4. To launch the game with Phobos (and all other installed Syringe-compatible engine extensions including Ares) you need to execute `Syringe.exe "gamemd.exe" [command line arguments for gamemd.exe]` in command line (omit arguments if you don't need any). `RunAres.bat` from Ares package does the same so you may use that as well.

If you already use Ares in your mod, you just need to drop Phobos files mentioned above in your game folder, Syringe will load Phobos automatically. This also applies to mods using XNA client with Syringe; if your mod doesn't use Syringe and Ares (or you just haven't set up the client) yet we recommend to use CnCNet client mod base by Starkku which is compatible with Ares and Phobos out of the box.

Additional files and tools that you may need are located at Phobos supplementaries repo.

By default Phobos doesn't do any very noticeable changes except a few bugfixes. To learn how to use Phobos features head over to official documentation.

13.3 Documentation

- Official docs (also available in Chinese)

You can switch between versions (displays latest develop nightly version by default) in the bottom left corner, as well as download a PDF version.

The documentation is split by a few major categories, each represented with a page on the sidebar. Each page has its contents grouped into multiple subcategories, be it buildings, technotypes, infantries, superweapons or something else.

13.3.1 How to read code snippets

```
; which section the entries should be in
; can be a freeform name - in this case the comment would explain what it is
; if no comment to be found - then it's a precise name
[SOMENAME]              ; BuildingType
; KeyName=DefaultValue ; accepted type with optional explanation
; if there's nothing to the right of equals sign - the default value is empty/absent
; if these keys have had their value set, they can only be set to their default
; unset state again by setting the value to <default>, <none> or none
; for list of values only <default> clears the entire list
; if the default value is not static - it's written and explained in a comment
UIDescription=<none> ; CSF entry key
```

13.4 Building manually

1. Install **Visual Studio** (2022 is recommended, 2019 is minimum) with the dependencies listed in `.vsconfig` (it will prompt you to install missing dependences when you open the project, or you can run VS installer and import the config). If you prefer to use **Visual Studio Code** you may install **VS Build Tools** with the dependencies from `.vsconfig` instead. Not using a code editor or IDE and building via **command line scripts** included with the project is also an option.

2. Clone this repo recursively via your favorite git client (that will also clone YRpp).

3. To build the extension:

   - in Visual Studio: open the solution file in VS and build it (`Debug` build config is recommended);

   - in VSCode: open the project folder and hit `Run Build Task...` (`Ctrl + Shift + B`);

   - barebones: run `scripts/build_debug.bat`.

4. Upon build completion the resulting `Phobos.dll` and `Phobos.pdb` would be placed in the subfolder identical to the name of the buildconfig executed.

13.5 Credits

13.5.1 Developers

- **Belonit (Gluk-v48)** - project author

- **Kerbiter (Metadorius)** - project co-author, BDFL, maintainer (semi-active for the time being; Patreon, PM me for PayPal to avoid fees)

- **Starkku** - co-maintainer, developer (Patreon)

- **Uranusian (Thrifinesma)** - retired developer, CN community ambassador (Patreon, AliPay)

- **secsome (SEC-SOME)** - developer

- **Otamaa (Fahroni, BoredEXE)** - developer (PayPal)

- **FS-21** - developer

- **Morton (MortonPL)** - co-maintainer, developer

- **Trsdy (chaserli)** - co-maintainer, developer

For all contributions see *full credits list*.

Thanks to everyone who uses Phobos, tests changes and reports bugs! You can show your appreciation and help project by displaying the logo (monochrome version can be found here) in your client/launcher (make it open Phobos GitHub page for extra fanciness), linking to Phobos repository, contributing or donating to us via the links above.

13.6 Legal and License

The Phobos project is an unofficial open-source community collaboration project to extend the Red Alert 2 Yuri's Revenge engine for modding and compatibility purposes.

As a modification, the project complies with EA C&C modding guidelines; should there be conflict between the project's license and modding guidelines - the rules imposed by guidelines shall take precedence (for example, the project should not be commercial or used to make money).

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