

Appendix B – Standard Mission Object Parameters

This appendix gives a parameter description for each of the standard mission objects (as found in HEAD) which can be added via the World Editor Creator in-game tool. Although not explicitly stated below, each object can be assigned a name.

Some items have been marked TBD which means:

- A. Feature not working,
- B. Can't figure it out, OR
- C. Too tired to write about it right now...

Select one.

OK, it really means that I haven't figured it out yet. I'll update the document when I do. Some of these descriptions come directly from Melvin May's documents on his fx objects. I've marked these with **MM**.

Environment

fxShapeReplicator & fxFoliageReplicator Parameters

Key:

	fxShapeRelicator Only	fxFoliageReplicator Only	Common
Group	Field Name		Description
Transform	<i>position</i>		<x y z> position of fx Object.
	<i>rotation</i>		Values have no effect.
	<i>scale</i>		Values have no effect.
Debugging	<i>UseDebugInfo</i>		Enable debug feedback. Some features must be uncommented in code to turn them on.
	<i>DebugBoxHeight</i>		Quad-tree box heights.
	<i>HideFoliage</i>		Stop displaying foliage.
	<i>HideReplications</i>		Stop displaying shapes.
	<i>ShowPlacementArea</i>		Show the placement feedback device.
	<i>PlacementAreaHeight</i>		Changes height or feedback device.
	<i>PlacementColour</i>		Changes color of feedback device.

Media / Replications	<i>Seed</i>	Value used to deterministically generate random object positions and parameters.
	<i>FoliageFile</i>	Texture file to use for foliage. Must be suitable for use as billboard.
	<i>shapeFile</i>	DTS file to replicate.
	<i>FoliageCount</i>	Number of billboards to replicate.
	<i>ShapeCount</i>	Number of shapes to replicate.
	<i>FoliageRetries</i>	Determines how many times to attempt to place a billboard. Retries are sometimes required in order to meet placement criteria. Failed placement attempts result fewer objects placed.
	<i>ShapeRetries</i>	Determines how many times to attempt to place a shape. Retries are sometimes required in order to meet placement criteria. Failed placement attempts result fewer objects placed.
area / Placement Radius	<i>InnerRadiusX</i>	X dimension of inner do-not-place ellipse. Objects are not allowed in ellipse described by this and the <i>InnerRadiusY</i> dimension.
	<i>InnerRadiusY</i>	Y dimension of inner do-not-place ellipse. Objects are not allowed in ellipse described by this and the <i>InnerRadiusX</i> dimension.
	<i>OuterRadiusX</i>	X dimension of outer do-not-place ellipse. Objects are not allowed outside ellipse described by this and the <i>OuterRadiusY</i> dimension.
	<i>OuterRadiuxY</i>	Y dimension of outer do-not-place ellipse. Objects are not allowed outside ellipse described by this and the <i>OuterRadiusX</i> dimension.
Dimension	<i>MinWidth</i>	If scaling enabled (<i>FixSizeToMax</i> == false), this defines the billboard's minimum width.
	<i>MaxWidth</i>	If scaling enabled (<i>FixSizeToMax</i> == false), this defines the billboard's maximum width.
	<i>MinHeight</i>	If scaling enabled (<i>FixSizeToMax</i> == false), this defines the billboard's minimum height.
	<i>MaxHeight</i>	If scaling enabled (<i>FixSizeToMax</i> == false), this defines the billboard's maximum height.
	<i>FixAspectRatio</i>	Prevents texture stretching.
	<i>FixSizeToMax</i>	Forces all billboards to use <i>MaxWidth</i> and <i>MaxHeight</i> as their respective width and height.
	<i>OffsetZ</i>	This allows you to assist placement by lowering or raising the billboard by a fixed

		amount.
	<i>RandomFlip</i>	Allows random horizontal flipping of billboards, increasing variation for non-symmetric billboards.
Culling	<i><useCulling></i>	Enables culling algorithms. i.e. test whether a billboard is within view before rendering it. Warning: Overhead offsets value for small placements. Only use for large placements if at all.
	<i>CullResolution</i>	Determines size of culling quads. Lower values of <i>CullResolution</i> take longer to cull but more effectively removes non-visible billboards. Higher values of <i>CullResolution</i> take less time, but end up rendering more non-visible billboards. Tradeoff: Culling time vs. Fill.
	<i>ViewDistance</i>	When a billboards is at distane <i>ViewDistance</i> from the camera, it will be completely visible.
	<i>ViewClosest</i>	Controls closest point at which billboards will begin to fade out.
	<i>FadeInRegion</i> <i>FadeOutRegion</i>	Together, these determine width of region between fade-in and fade-out.
	<i>AlphaCutoff</i>	Controls general alpha level for rendering billboards.
	<i>GroundAlpha</i>	Controls alpha in region near ground. For fixing artifacts between billboard and ground.
Animation	<i>SwayOn</i>	Enables sway animation.
	<i>SwaySync</i>	All bilboards sway in sync for this fx Object.
	<i>SwayMagSide</i>	Side-to-side swaying magnitude.
	<i>SwayMagFront</i>	Back-and-forth swaying magnitude.
	<i>MinSwayTime</i>	Minimum sway time. Sway times are randomly chosen between a min and max on a per swing basis.
	<i>MaxSwayTime</i>	Maximum sway time. Sway times are randomly chosen between a min and max on a per swing basis.
Lighting	<i>LightOn</i>	Turns on luminance (self lighting).
	<i>LightSync</i>	Light billboards in sync.
	<i>MinLuminance</i>	Minimum light value.
	<i>MaxLuminance</i>	Maximum light value.
	<i>lightTime</i>	Time required to transition from Min to Max and Max to Min. i.e. each duration is equal to <i>lightTime</i> .

Restrictions / Restrains	<i>AllowOnTerrain</i>	Allows objects to be placed on terrain.
	<i>AllowOnInteriors</i>	Allows objects to be placed on interiors.
	<i>AllowOnStatics</i>	Allows objects to be placed on static shapes.
	<i>AllowOnWater</i>	Allows objects to be placed in area covered by water.
	<i>AllowWaterSurface</i>	Place on surface of water. Otherwise will be placed on terrain below water.
	<i>AllowedTerrainSlope</i>	Maximum slope to place on. Slopes beyond this value will be devoid of objects.
	<i>AlignToTerrain</i>	Causes DTS shapes to align to up vector of terrain if placed on terrain.
	<i>Interactions</i>	Enables collision boxes if DTS shape has one.
	<i>TerrainAlignment</i>	Vector to adjust how shape aligns to terrain when <i>AlignToTerrain</i> is true.
Object Transforms	<i>ShapeScaleMin</i>	Minimum randomly selected scale for DTS shape.
	<i>ShapeScaleMax</i>	Maximum randomly selected scale for DTS shape.
	<i>ShapeRotationMin</i>	Minium random rotation for DTS shape.
	<i>ShapeRotationMax</i>	Maximum random rotation for DTS shape.
	<i>OffsetZ</i>	This allows you to assist placement by lowering or raising the shape by a fixed amount.

fxFoliageReplicator

Parameter Category	Parameters
Transform	<p>position < X Y Z > rotation <mult DegX DegY DegZ> scale <X Y Z></p> <ul style="list-style-type: none"> • x
Debugging	<p>UseDebugInfo</p> <ul style="list-style-type: none"> • MM: This flag allows you to see relevant debugging information. For the moment I have enabled the ability to see the quad-tree boxes themselves. There are other things that can be enabled but I have decided to make them part of the code e.g. you need to uncomment lines within the code to enable them. <p>DebugBoxHeight</p> <ul style="list-style-type: none"> • MM: This field was requested by Phil Carlisle to enable you to control the height of the quad-tree boxes shown on-screen. The value here is an interpolation. 1 = Top of quad-tree box / 0 = Bottom / .5 = Half way / etc. <p>This is to make it easier to see where the quad-boxes are when you have a big difference between the lowest and highest billboards.</p> <p>HideFoliage</p> <ul style="list-style-type: none"> • MM: This option allows you to temporary hide the replicated objects. This could be handy if the replicated objects are obscuring some detail you are editing. For instance, you may be hiding a secret key in the forest ... :) <p>ShowPlacementArea</p> <ul style="list-style-type: none"> • MM: The elliptical placement area that the replicator uses to replicate objects is not obvious from the configuration options. When this is turned on and you are within the editor, then a rather groovey coloured band sweeps around the circumference of the elliptical area selected. You can change this area and position by moving the replicator to see the exact bounds to which objects will be contained. Note, you can only see this band when you are within the editor and the replicator object is within the cameras' view. <p>PlacementAreaHeight</p> <ul style="list-style-type: none"> • MM: You can configure the placement band (see - 'ShowPlacementArea') to different heights. The band is clipped by objects within the scene and it can be hard to see sometimes particularly on hilly terrain. The 'height' is centered along the Z(0) axis of the replicator object. <p>PlacementColour</p> <ul style="list-style-type: none"> • MM: You can configure the placement band colour (see -

	'ShowPlacementArea'). The band defaults to a set colour and when using multiple replicators it is nice to configure each to its own colour to differentiate each replicator.
Media	<p>Seed</p> <ul style="list-style-type: none"> MM: This value is the Seed value for the random number generator. Changing this value results in a different distribution of pseudo-random numbers. You can change this value to almost anything if you are not happy with the placement of objects that has been chosen. Also, if you populate with multiple replicators then give each a different number. Note that a small value change here results in a completely different set of placements. <p>FoliageFile</p> <ul style="list-style-type: none"> MM: This allows you to select any texture file. Valid paths include the mod directory, so something like "fps/data/mycoolgrass1" would do fine. Sorry, no compound textures at the moment but that is coming. For the moment, simply use multiple replicator objects. <p>FoliageCount</p> <ul style="list-style-type: none"> MM: The quantity of replicated Foliage items you require. Make sure your graphics card can handle it or you'll end up with 1fps (or less!) <p>FoliageRetries</p> <ul style="list-style-type: none"> MM: When the replicator is tasked with finding a home for each Foliage item, it will look at the configuration options described within the replicator and attempt to find a random position to place it. It will choose random locations and then see if they fit the configuration constraints, if not then it will try again. The replicator will attempt this <FoliageRetries> for EACH object. If it does not succeed then it will give up for that object and continue with the next.
area	<p>InnerRadiusX InnerRadiusY</p> <ul style="list-style-type: none"> MM: The placement area for billboards is centered around the replicator position based upon an elliptical ring-area whose inner bound is defined with <RadiusInnerX,RadiusInnerY>. The replicator will choose a random polar angle outside this region. <p>OuterRadiusX OuterRadiusY</p> <ul style="list-style-type: none"> MM: The placement area for billboards is centered around the replicator position based upon an elliptical ring-area whose outer bound is defined with <RadiusOuterX,RadiusOuterY>. The replicator will choose a random polar angle inside this region.
Dimensions	<p>MinWidth MaxWidth MinHeight MaxHeight</p>

	<ul style="list-style-type: none"> MM: When placing Foliage onto the terrain, the Foliage can be optionally scaled randomly from Min to Max in Width/Height. <p>FixAspectRatio</p> <ul style="list-style-type: none"> MM: Keeps the aspect ratio of the original texture correct. The Height is chosen according to the above settings and is also used for the width as well to keep the aspect ratio correct. <p>FixSizeToMax</p> <ul style="list-style-type: none"> MM: Fixes the size to the <MaxWidth>/<MaxHeight> settings above (if you don't want random sizes). <p>OffsetZ</p> <ul style="list-style-type: none"> MM: When placing foliage onto the terrain, sometimes they do not quite meet the ground. Also, when they are allowed to be placed on steep slopes they can sometimes stick out of the terrain looks damn silly. Use -Z values to lower Foliage and +Z to raise them. <p>RandomFlip</p> <ul style="list-style-type: none"> MM: Randomly flips the the billboard horizontally. This can add a little more variety to the billboard images. Obviously this is only effective on non-horizontally-symmetric textures.
Culling	<p><useCulling></p> <ul style="list-style-type: none"> MM: Turns-on the culling facility. If you are using the replicator to create only a few items or only in a very small area then the culling algorithm can actually slow things down slightly. This gives you the ability to turn it off although you should avoid this unless you are sure you know what you're doing! <p>CullResolution</p> <ul style="list-style-type: none"> MM: The culling algorithm is difficult to explain but it is essential to understanding how to efficiently control large quantities of billboards. Without culling *all* billboards are tested to see if they are in view and if so they are rendered. If your billboards are spread out over a large distance then chances are that you won't be able to view many of them but they are still tested to see if they are in view. The culling algorithm avoids this and only tests the ones that are in view. How can it know this without testing them, chicken and the egg I hear you shout! Well, the replicator creates a structured database of billboards and their positions at the level startup phases. Basically the algorithm splits up your total defined area (see 'RadiusOuterX/Y') into quadrants the smallest of which is this field 'CullResolution'. Above these are progressively larger blocks which cover each lower quadrant. Imagine a cube of blocks where each block has four smaller blocks directly below it repeating for many levels until each small block is your resolution. The algorithm can check the larger block first and check to see if it's in view. If it's not it can effectively ignore all the smaller sub-areas below it therefore removing the need to check them. I told you this was

	<p>difficult to explain!</p> <ul style="list-style-type: none">• MM: Basically, the rule is that the replicator will split up the replicated area into blocks the size of 'CullResolution'. The larger your area, the more time and memory are needed to create this structure. Try to keep the 'CullResolution' large enough so that good-size blocks of foliage can be checked quickly but not too large that the blocks are as big as your viewing frustum. Also, your viewing frustum is not simply the 'VisibleDistance' as set in the "Sky" object but the smaller of that or the 'ViewDistance'+ 'FadeInRegion' as set in this object.• MM: As an example:-<ul style="list-style-type: none">○ The 'VisibleDistance' is 500,○ The 'RadiusOuterX/Y' are 512 (an area 1024 squared),○ The 'ViewDistance' is 250 and the 'FadeInRegion' is '50'.• MM: A good setting for this scene would be 64 as the area is quite large (1024 squared) and results in 1024/64 highest resolution blocks.• MM: Use <UseDebugInfo> to aid you. If the boxes are spaced very far apart you can try reducing the value else make it bigger if the boxes are very close. At all times monitor your FPS when tweaking this value as it's the ultimate guide.•• MM: If you are confused by this field then please drop me an email and I will try to explain it better.•• MM: Values of 16/32/64/128/256 are good depending upon your area/visible distance.•• MM: This algorithm allows you to maintain *massive* quantities of foliage easily but you must be aware of the memory usage. To this end, the replicator dumps various information to the console each time it creates foliage (@startup & Editor/Apply). You get information such as Node allocations/Time Taken for analysis and approximate memory usages.• MM: IMPORTANT NOTES:-<ul style="list-style-type: none">○ The algorithm is more memory efficient if the 'CullResolution' can divide the largest diameter of the replicator evenly.○ Also I have clamped 'CullResolution' so that you cannot set it higher than half the largest diameter or lower than 8.○ Values lower than 8 can result in hundreds of megabytes being allocated for sizable areas! <p>ViewDistance</p> <ul style="list-style-type: none">• MM: Controls the point at which the foliage will be completely faded-in.
--	---

	<p>ViewClosest</p> <ul style="list-style-type: none"> MM: Controls the point nearest to the camera at which the foliage will start fading-out. This can be use to stop foliage entering the cabin when a vehicle like the Racing demo. <p>FadeInRegion <FadeOutRegion></p> <ul style="list-style-type: none"> MM: Controls the distances which the fade-in/out will take place. A larger value will result in a slower/longer fade-in/out. The FadeIn/Out extend the ViewDistance/ViewCloset parameters. <p>AlphaCutoff</p> <ul style="list-style-type: none"> MM: Allows you to control the alpha level at which the rendering takes place. This can be very handy in feathering the edges of the foliage. <p>GroundAlpha</p> <ul style="list-style-type: none"> MM: Allows you to control the alpha level at the base of the billboard. This allows you to reduce the harsh intersection that billboards have with the terrain.
Animation	<p>SwayOn</p> <ul style="list-style-type: none"> MM: Turns the animated swaying on/off - Duh! <p>SwaySync</p> <ul style="list-style-type: none"> MM: Ensures that all the billboards sway in sync (within each replicator). <p><SwayMagSide> SwayMagFront</p> <ul style="list-style-type: none"> MM: The distance of the swaying side to side and front to back respectively. <p>MinSwayTime MaxSwayTime</p> <ul style="list-style-type: none"> MM: The limits of a random period for the swing (in seconds).
Lighting	<p>LightOn</p> <ul style="list-style-type: none"> MM: Turns the animated luminance on/off - Duh! <p>LightSync</p> <ul style="list-style-type: none"> MM: Ensures that all the billboards are lit in sync (within each replicator). <p>MinLuminance MaxLuminance</p> <ul style="list-style-type: none"> MM: The limits of the luminance shift (0 - 1). <p>lightTime</p> <ul style="list-style-type: none"> MM: The time taken to sweep from Min->Max->Min luminance values.
Restrictions	<p>AllowOnTerrain AllowOnInteriors AllowOnStatics AllowOnWater</p> <ul style="list-style-type: none"> MM: When the replicator is choosing positions to place Foliage

	<p>you can choose whether to allow or disallow four different object types onto which they can be placed. This provides a very powerful means of placement. <AllowOnStatics> replaces the previous <AllowStacking> option.</p> <p>AllowWaterSurface</p> <ul style="list-style-type: none"> MM: When the replicator is allowed to placed the objects on water then this option controls whether the objects are allowed to be placed on the surface or the underlying terrain. <p>AllowedTerrainSlope</p> <ul style="list-style-type: none"> MM: When placing objects onto the terrain (or other objects - see 'AllowStacking') the replicator will ensure that it meets the slope requirements. You can control the maximum slope (from the 'Up' vector 'Z' in degrees). 90degrees gives almost no restriction but something like 15degrees only allows objects to be placed on fairly flat terrain.
--	--

Special Notes:

X

fxShapeReplicator

Parameter Category	Parameters
Transform	<p>position < X Y Z ></p> <ul style="list-style-type: none"> x <p>rotation <mult DegX DegY DegZ></p> <ul style="list-style-type: none"> x <p>scale <X Y Z></p> <ul style="list-style-type: none"> x
Debugging	<p>HideReplications</p> <p>ShowPlacementArea</p> <ul style="list-style-type: none"> MM: The elliptical placement area that the replicator uses to replicate objects is not obvious from the configuration options. When this is turned on and you are within the editor, then a rather groovey coloured band sweeps around the circumference of the elliptical area selected. You can change this area and position by moving the replicator to see the exact bounds to which objects will be contained. Note, you can only see this band when you are within the editor and the replicator object is within the cameras' view. <p>PlacementAreaHeight</p> <ul style="list-style-type: none"> MM: You can configure the placement band (see - 'ShowPlacementArea') to different heights. The band is clipped

	<p>by objects within the scene and it can be hard to see sometimes particularly on hilly terrain. The 'height' is centered along the Z(0) axis of the replicator object.</p> <p>PlacementColour</p> <ul style="list-style-type: none"> MM: You can configure the placement band colour (see - 'ShowPlacementArea'). The band defaults to a set colour and when using multiple replicators it is nice to configure each to its own colour to differentiate each replicator.
Media	<p>shapeFile</p> <ul style="list-style-type: none"> MM: This allows you to select any .DTS file. Valid paths include the mod directory, so something like "fps/data/shapes/organic/tree1.dts" would do fine. Sorry, no compound objects at the moment but that is coming. For the moment, simply use multiple replicator objects.
Replications	<p>Seed</p> <ul style="list-style-type: none"> MM: This value is the Seed value for the random number generator. Changing this value results in a different distribution of pseudo-random numbers. You can change this value to almost anything if you are not happy with the placement of objects that has been chosen. <p>ShapeCount</p> <ul style="list-style-type: none"> MM: The quantity of replicated shapes you require. Make sure your graphics card can handle it or you'll end up with 1fps (or less!) <p>ShapeRetries</p> <ul style="list-style-type: none"> MM: When the replicator is tasked with finding a home for each shape, it will look at the configuration options described within the replicator and attempt to find a random position to place it. It will choose random locations and then see if they fit the configuration constraints, if not then it will try again. The replicator will attempt this <ShapeRetries> for EACH object. If it does not succeed then it will give up for that object and continue with the next.
Placement Radius	<p>InnerRadiusX InnerRadiusY</p> <ul style="list-style-type: none"> MM: The placement area for shapes is centered around the replicator position based upon an elliptical ring-area whose inner bound is defined with <RadiusInnerX,RadiusInnerY>. The replicator will choose a random polar angle outside this region. <p>OuterRadiusX OuterRadiusY</p> <ul style="list-style-type: none"> MM: The placement area for shapes is centered around the replicator position based upon an elliptical ring-area whose outer bound is defined with <RadiusOuterX,RadiusOuterY>. The replicator will choose a random polar angle inside this region.
Restrains	AllowOnTerrain

	<p>AllowOnInteriors</p> <p>AllowOnStatics</p> <p>AllowOnWater</p> <ul style="list-style-type: none">MM: When the replicator is choosing positions to place shapes you can choose whether to allow or disallow four different object types onto which they can be placed. This provides a very powerful means of placement. <AllowOnStatics> replaces the previous <AllowStacking> option. <p>AllowWaterSurface</p> <ul style="list-style-type: none">MM: When the replicator is allowed to placed the shapes on water then this option controls whether the objects are allowed to be placed on the surface or the underlying terrain. <p>AlignToTerrain</p> <ul style="list-style-type: none">MM: When objects are placed onto the terrain (or other objects - see 'AllowStacking') the replicator can align the object with the normal of the surface which it is placed. The results in objects that protrude from the surface they sit on. <p>Interactions</p> <ul style="list-style-type: none">MM: Normally, if you require interactions between the player (or other objects) and the replicated objects then the shapes need to reside on the server as well as the client. If you are sure that it is not possible to interact with the shapes (they may be trees on the side of the road in a racing game behind a barrier) then you can turn interactions off. This means that the server will not replicated the shapes itself which means that is does not have to scope the objects and can reduce the amount of memory used. <p>AllowedTerrainSlope</p> <p>TerrainAlignment</p> <ul style="list-style-type: none">MM: When aligning objects to the terrain (see 'AlignToTerrain') objects are placed exactly aligned with the surface normals which can look a bit severe in some cases. This option allows you to control the magnitude to which the terrain alignment happens in X, Y & Z. Zero is no effect and 1 is full effect. The default is "1 1 1".
--	---

Special Notes:

X

fxSunLight Parameters

Group	Field Name	Description
Misc	<i>direction</i>	A vector describing the direction of the lighting. Affects shadows, etc.
	<i>color</i>	Diffuse component in lighting calculations
	<i>ambient</i>	Ambient component in lighting calculations

Parameter Category	Parameters
Transform	<p>position < X Y Z ></p> <ul style="list-style-type: none"> • x <p>rotation <mult DegX DegY DegZ></p> <ul style="list-style-type: none"> • x <p>scale <X Y Z></p> <ul style="list-style-type: none"> • x
Debugging	<p>enable Turns on/off the sunlight.</p>
Media	<p>LocalFlareBitmap</p> <ul style="list-style-type: none"> • MM: Sets the bitmap to use for the local flare effect e.g. the effect of the camera lens. This flare uses a line-of-sight test to check whether it's visible. A bitmap with an alpha layer is normally best. <p>RemoteFlareBitmap</p> <ul style="list-style-type: none"> • MM: Sets the bitmap to use for the remote flare effect e.g. the sun itself. This does not use a line-of-sight test to check whether it's visible and appears behind all scene geometry. A bitmap with an alpha layer is normally best. Leave this field blank if you don't want this rendered.
SunOrbit	<p>SunAzimuth</p> <ul style="list-style-type: none"> • MM: Controls the direction of the sunlight. Enter a polar angle 0->359 degrees. <p>SunElevation</p> <ul style="list-style-type: none"> • MM: Controls the elevation of the sunlight. A value of 90 degrees is directly overhead and 0 = on the horizon. Enter an angle of -90 -> +90 degrees.
LensFlare	<p>FlareTP</p> <ul style="list-style-type: none"> • MM: Turns off the flare in Third-person view. <p>Colour</p> <ul style="list-style-type: none"> • MM: Colourises the flare if needed. White leaves the flare texture untouched. <p>Brightness</p> <ul style="list-style-type: none"> • MM: Sets the flare brightness. <p>FlareSize</p> <ul style="list-style-type: none"> • MM: Sets the flare size. 1 = original bitmap size. <p>FadeTime</p> <ul style="list-style-type: none"> • MM: When a flare appears/dissapears in real life they tend to fade-in/out rather than apearing instantly. This effect is caused by blooming and can be simulated here. A setting of around 0.25 seconds is normally good.

	<p>BlendMode</p> <ul style="list-style-type: none"> MM: I have allowed for 3 different blending equations to be used which give different results dependant upon the type of image used for the flare. A setting of 0-2 will use the following OpenGL blending functions:- 0 = glBlendFunc(GL_SRC_ALPHA, GL_ONE); break; 1 = glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA); break; 2 = glBlendFunc(GL_ONE, GL_ONE)
Animation Options	<p>AnimColour</p> <ul style="list-style-type: none"> MM: A flag controlling whether colour animation is on or off. <p>AnimBrightness</p> <ul style="list-style-type: none"> MM: A flag controlling whether brightness animation is on or off. <p>AnimRotation</p> <ul style="list-style-type: none"> MM: A flag controlling whether rotation animation is on or off. <p>AnimSize</p> <ul style="list-style-type: none"> MM: A flag controlling whether size animation is on or off. <p>AnimAzimuth</p> <ul style="list-style-type: none"> MM: A flag controlling whether azimuth animation is on or off. <p>AnimElevation</p> <ul style="list-style-type: none"> MM: A flag controlling whether elevation animation is on or off. <p>LerpColour</p> <p>LerpBrightness</p> <p>LerpRotation</p> <p>LerpSize</p> <p>LerpAzimuth</p> <p>LerpElevation</p> <ul style="list-style-type: none"> MM: The fxsunlight uses a realtime clock to monitor its progress through animation strings. The fxsunlight more than often finds itself between animation key-frames. With LERPing on, you get the linearly interpolated values between key-frames. With it off you get sharp transitions. You may want to turn this off for instance to produce a flashing sunlight. With it on you would get a sunlight getting gradually brighter and then dimmer. <p>LinkFlareSize</p> <ul style="list-style-type: none"> MM: A flag controlling whether the flare size is directly proportional to it's luminance. The brighter the colour, the larger the flare. The flare is scaled according to it's current animation e.g. it never gets any bigger than it would with this setting off. <p>SingleColourKey</p> <ul style="list-style-type: none"> MM: When this is on, R,G & B channels use the red animation keys [RedKeys] (see below).
Animation Extents	<p>MinColour</p> <p>MaxColour</p> <ul style="list-style-type: none"> MM: When [AnimColour] is on, these fields control the from/to colours used in the animation. Note that you can animate

	<p>individual rgb channels if you want.</p> <p>MinBrightness MaxBrightness</p> <ul style="list-style-type: none"> MM: When [AnimBrightness] is on, these fields control the from/to brightness values used in the animation. <p>MinRotation MaxRotation</p> <ul style="list-style-type: none"> MM: When [AnimRotation] is on, these fields control the from/to rotation for the flare billboard. <p>minSize maxSize</p> <ul style="list-style-type: none"> MM: When [AnimSize] is on, these fields control the from/to size for the flare billboard. <p>MinAzimuth MaxAzimuth</p> <ul style="list-style-type: none"> MM: When [AnimAzimuth] is on, these fields control the from/to Azimuth for the flare billboard. <p>MinElevation MaxElevation</p> <ul style="list-style-type: none"> MM: When [AnimElevation] is on, these fields control the from/to Elevation for the flare billboard.
Animation Keys	<p>RedKeys GreenKeys BlueKeys</p> <ul style="list-style-type: none"> MM: These are the key-frame animation strings used to animate the colour. Enter a alpha character between 'A'-'Z'. 'A' corresponds to the [MinColour.X] value of the appropriate colour channel and 'Z' is the [MaxColour.X] value. A string of 'AZA' animates [MIN]->[MAX]-[MIN]. <p>BrightnessKeys</p> <ul style="list-style-type: none"> MM: As Colours keys but affects brightness values. <p>RotationKeys</p> <ul style="list-style-type: none"> MM: As Colours keys but affects Rotation values. <p>SizeKeys</p> <ul style="list-style-type: none"> MM: As Colours keys but affects Size values. <p>AzimuthKeys</p> <ul style="list-style-type: none"> MM: As Colours keys but affects Azimuth values. <p>ElevationKeys</p> <ul style="list-style-type: none"> MM: As Colours keys but affects Elevation values.
Animation Times	<p>ColourTime BrightnessTime RotationTime SizeTime AzimuthTime ElevationTime</p> <ul style="list-style-type: none"> MM: This is the time (in seconds) to cycle through the associated

	animation. Note that when the animation is complete the system starts again from the beginning of the animation string. If you want 'bounce' animation e.g from [MIN]->[MAX]-[MIN] then you would used something like 'AZA'.
--	--

Special Notes:

X

Lightning Parameters

Group	Field Name	Description
Transform	<i>position</i>	<x y z> position of lightning block.
	<i>rotation</i>	Values have no effect.
	<i>scale</i>	<x y z> scale of lightning block.
Datablock	<i>nameTag</i>	TBD
	<i>dataBlock</i>	Pre-defined datablock to use for this lightning object.
Strikes	<i>strikesPerMin</i>	Number of striker per minute.
	<i>strikeWidth</i>	TBD
	<i>strikeRadius</i>	TBD
	<i>chanceToHitTarget</i>	TBD
Colors	<i>color</i>	<r g b a> Starting color of bolt.
	<i>fadeColor</i>	<r g b a> Color to fade to.
Bolts	<i>boltRadius</i>	TBD
	<i>useFog</i>	If supported, use multitexturing and fog-coord extension to blend bolt with fog.

Audio Emitters Parameters

Group	Field Name	Description
Transform	<i>position</i>	<x y z> position of emitter.
	<i>rotation</i>	<x y z> rotation affecting where 3D sound points. No effect on non-3D mode.
	<i>scale</i>	Values have no effect
profile	<i>profile</i>	Predefined audio emitter profile to use for this object.
	<i>useProfileDescription</i>	Flag determining whether profile is used
Media	<i>description</i>	Advanced feature. (see ‘Audio Descriptions’ below)
	<i>fileName</i>	Relative path to sound file, including extension.
	<i>type</i>	Global ‘gain group’. Allows ‘grouped’ emitters and other sound elements to have their gain adjusted as a group.
Sound	<i>volume</i>	Master Gain for this emitter.
	<i>outsideAmbient</i>	TBD. Leave this on.
	<i>referenceDistance</i>	Point at which volume drops to 50%, beyond which roll-off factors take effect.
	<i>maxDistance</i>	On-off triggering distance for emitter.
	<i>minDistance</i>	Deprecated field.
Looping	<i>isLooping</i>	Enable looping.
	<i>loopCount</i>	Number of loops to execute prior to stopping: -1 – Loop infinitely, 0/1 – Loop Once (1 may play twice in non-3D mode) N > 1 – Loop N times
	<i>minLoopGap</i>	Minimum delay between loops. ~ 2 * val in milliseconds
	<i>maxLoopGap</i>	Maximum delay between loops. ~ 2 * val in milliseconds
	<i>is3D</i>	Enable 3D Sound.
Advanced	<i>coneInsideAngle</i>	Angle of inner cone sweep. (discussed below)
	<i>coneOutsideAngle</i>	Angle of outer cone sweep. (discussed below)
	<i>coneOutsideVolume</i>	Volume in area remaining beyond outer cone.
	<i>coneVector</i>	Value of sound cone pointing vector. Warning: DO NOT EDIT (updated automatically based on rotation matrix). This is purely informational, providing an easy means of pulling out the object’s pointing vector.

Precipitation Parameters

Group	Field Name	Description
Transform	<i>position</i>	Values have no effect.
	<i>rotation</i>	Values have no effect.
	<i>scale</i>	Values have no effect.
Misc	<i>nameTag</i>	TBD
	<i>dataBlock</i>	Pre-defined datablock to use for this precipitation object.
Velocity	<i>offsetSpeed</i>	[0.0, TBD] Values greater than zero cause precipitation to fall at an angle. Otherwise, it fall straight down.
	<i>minVelocity</i>	[0.0, TBD] Minimum velocity for precipitation particles.
	<i>maxVelocity</i>	[0.0, TBD] Maximum velocity for precipitation particles.
colors	<i>color1</i>	<r g b a> Shade color for 1/3 of precipitation particles.
	<i>color2</i>	<r g b a> Shade color for 1/3 of precipitation particles.
	<i>color3</i>	<r g b a> Shade color for 1/3 of precipitation particles.
Misc	<i>percentage</i>	[0.0, 1.0] $\text{NumDrops} == \text{percentage} * \text{maxNumDrops}$
	<i>maxNumDrops</i>	[0, 2000] $\text{NumDrops} == \text{percentage} * \text{maxNumDrops}$
	<i>maxRadius</i>	[0, N] Radius around camera in which precipitation will fall.
Dynamic Fields	<i>locked</i>	Deprecated

Precipitation Preferences

Field Name	Description
<i>pref::precipitationOn</i>	Enables precipitation globally.
<i>pref:prePause</i>	If set to true, causes precipitation to pause. i.e. Drops freeze in their current positions.

Precipitation Datablock

Field Name	Description
<i>type</i>	[0, 1] TBD
<i>materialList</i>	Location of DML files.
<i>soundProfile</i>	Name of sound profile datablock for this precipitation datablock.
<i>sizeX</i>	0.5 TBD
<i>sizeY</i>	0.5 TBD
<i>movingBoxPer</i>	0.35 TBD
<i>divHeightVal</i>	0.5 TBD
<i>sizeBigBox</i>	1 TBD
<i>topBoxSpeed</i>	20 TBD
<i>bottomDrawHeight</i>	40 Height at which drops first appear.
<i>skipIfPer</i>	-0.3 TBD
<i>bottomSpeedPer</i>	1.0 TBD
<i>frontPeedPer</i>	1.5 TBD
<i>frontRadiusPer</i>	0.5 TBD

ParticleEmitterNodeData (PEND) Datablock Parameters

Parameter	Range	Description
timeMultiple	[0.01, 100.0]	Time multiplier, used to increase or decrease elapsed time by a ratio. Affects ejection period, ejection position calculation. TEST MORE

ParticleEmitterData (PED) Datablock Parameters

Parameter	Range – Default	Description
ejectionPeriodMS	[1, INF] - 100	Milliseconds between last and next particle ejection.
periodVarianceMS	(0, ejectionPeriodMS] - 0	Amount to vary ejection period by.
ejectionVelocity	[0, INF] - 2.0	Initial velocity imparted to particles.
velocityVariance	[0, ejectionVelocity] - 1.0	Amount to vary initial velocity by.
ejectionOffset	[0, INF] - 0.0	Particle ejections begins at <i>ejectionOffset</i> distance from emitter.
thetaMax	[0, 180] [thetaMin, 180] - 90.0	Modifies emitter ejection up and down. This modifies the PEN up vector. 0 = fully up, 180 = fully down
thetaMin	[0, 180] [0, thetaMax] - 0.0	Modifies emitter ejection up and down. This modifies the PEN up vector. 0 = fully up, 180 = fully down
phiReferenceVel	[0, 360]	Causes emission point to rotate clockwise N degrees per second about the PEN UP vector.
phiVariance	[0, 360]	Separate from <i>phiReferenceVal</i> , this parameters enables a random ejection between 0 degrees and <i>phiVariance</i> .
overrideAdvance	false	Always false (legacy code).

orientParticles	true or false	true – Face emission direction. false – Face camera.
orientOnVelocity	true or false	true – If <i>orientParticles</i> == true, face direction of motion. false – Use <i>orientParticles</i> setting.
particles	PD name(s)	List of PD datablocks to use/emit.
lifetimeMS	[0, TBD]	Length of time to eject particles before stopping (in milliseconds). N == 0 – Always on N == >0 – N Milliseconds
lifetimeVariance	[0, lifetimeMS)	Amount to vary lifetimeMS by.
useEmitterSizes	false	Not used for PENs. These apply to particle emitters attached to a particle emitter object (See Particles chapter of Tech School).
useEmitter Colors	false	Not used for PENs. These apply to particle emitters attached to a particle emitter object (See Particles chapter of Tech School).

ParticleData (PD) Datablock Parameters

Parameter	Range - Default	Description
dragCoefficient	(0, TBD] - 0.0	Factor determining velocity subtracted per second.
windCoefficient	[0, 1.0] - 1.0	Percentage of wind vector added to particle vector.
gravityCoefficient	[TBD, TBD] - 0.0	Gravitational acceleration for particle. Negative values cause particles to rise.
inheritedVelFactor	[TBD, TBD] - 0.0	Multiplier determining how much of the PED. ejectionVelocity is added to the initial velocity of the particle.
constantAcceleration	[TBD, TBD] - 0.0	Incremental velocity added to particle velocity on a per-second basis.
lifetimeMS	[100, TBD] - 1000.0	Particle life in milliseconds. At the end of its life, the particle is deleted.
lifetimeVarianceMS	[100, lifetimeMS] - 0.0	Amount to vary lifetimeMS by.

spinSpeed	[-10000, 10000] - 0.0	Speed at which particle rotates about its facing vector. Only valid when <i>PED.orientParticles</i> == false
spinRandomMin	[-10000, 10000] - 0.0	Minimum random value added to <i>spinSpeed</i> .
spinRandomMax	[-10000, 10000] - 0.0	Maximum random value added to <i>spinSpeed</i> .
useInvAlpha	true or false - false	Inverts interpretation of texture alpha.
animateTexture	true or false - false	Sequence between additional textures, specified in <i>animTexName[50]</i> .
framesPerSec	[1, 200] - 1	Frame frequency for animated textures.
textureName	"Path + File Name" NULL	Texture path and filename (PNG only). Must be <= 255 characters long
animTexName[50]	"Path + File Name" NULL	Additional texture path and filenames (PNG only). Used when <i>animateTexture</i> == true. <i>animTexName[0]</i> same as <i>textureName</i>
colors [4]	<R, G, B, I>	Color interpolation values. Note: Only these values determine particle color. The texture is used as an alpha-map, not for coloration.
sizes[4]	[0, TBD]	Size interpolation values.
times[4]	[0, 1]	Key frames. These affect interpolation rates over life of particle.

PEN Parameters

Group	Field Name	Description
Transform	<i>position</i>	Used to set location of PEN
	<i>rotation</i>	Values have no effect
	<i>scale</i>	Values have no effect
Misc	<i>nameTag</i>	TBD
	<i>dataBlock</i>	PEND datablock name
	<i>emitter</i> (<u>Particle data</u> in ME)	PED datablock name
	<i>velocity</i>	Initial ejection velocity for this emitter

Sky Parameters

Group	Field Name	Description
Transform	<i>position</i>	Values have no effect
	<i>rotation</i>	Values have no effect
	<i>scale</i>	Values have no effect
Media	<i>materialList</i>	Specifies the DML file to be used. The DML (see below) file lists all textures to be used for Sky object.
Clouds	<i>cloudText</i>	Values have no effect
	<i>cloudHeightPer[0]</i> <i>cloudHeightPer[1]</i> <i>cloudHeightPer[2]</i>	These value is used to calculate the 'height' of the cloud layers.
	<i>cloudSpeed[0]</i> <i>cloudSpeed[1]</i> <i>cloudSpeed[2]</i>	These values represent the velocity at which clouds move along the vector: <i>windVelocity</i> .
Visibility	<i>visibleDistance</i>	You can think of this as 'draw distance'. Technically, this is about the distance between the camera and the far plane of the render frustum. Warning: This value can significantly affect render speeds.
Fog	<i>fogDistance</i>	Visible distance for general fog.
	<i>fogColor</i>	Color for all fog (general and layers).
	<i>fogVolume1</i> <i>fogVolume2</i> <i>fogVolume3</i>	These fields specify the following attributes of the three fog 'layers'. Each field takes three floating point values: <distance bottom top>
	<i>fogVolumeColor1</i> <i>fogVolumeColor2</i> <i>fogVolumeColor2</i>	Values have no effect.
Wind	<i>windVelocity</i>	This field is misnamed. In fact it represents a vector giving the wind direction. Changes to this will change the direction the clouds move in.
	<i>windEffectPrecipitation</i>	EFM – TBD
Misc	<i>SkySolidColor</i>	This fields specifies the color of the the skybox before textures are applied. The values are: <R G B A> and specified as values between 0.0 and 1.0.
	<i>useSkyTextures</i>	When checked, this causes the engine to use the textures specified in the DML file. Alternately, you can just go with the solid sky color.
	<i>renderBottomTexture</i>	This allows you to disable the bottom texture.

		This is mostly useful if you will be having terrain covering your whole mission.
	<i>noRenderBans</i>	When checked, the engine renders the sides of the sky box completely from top to bottom. When un-checked, the sides are partially rendered. I'll talk more about this effect below

Special Notes:

X

Sun Parameters

Group	Field Name	Description
Misc	<i>direction</i>	A vector describing the direction of the lighting. Affects shadows, etc.
	<i>color</i>	Diffuse component in lighting calculations
	<i>ambient</i>	Ambient component in lighting calculations

Special Notes:

- Multiple OK, but increases lighting calculation time.

Terrain

Parameter Category	Parameters
Transform	rotation scale
	detail texture terrainFile squareSize emptySquares position

Special Notes:

- X

Parameter Category	Parameters
rotation	<1 0 0 0> - DO NOT CHANGE
scale	<1 1 1> - DO NOT CHANGE
detailTexture	This texture is used to add local detail to the terrain when the camera is in close to the terrain. See below for image to clarify this concept. (thanks to Sanguinus who helped me with this on the GG IRC)

terrainFile	This is the source file from which your terrain is loaded at startup. - DO NOT CHANGE
squareSize (in Meters)	Default: 8 The default map has 256 x 256 points, multiplied by 8 == 2km x 2km You can change this, but caution is the word. (see 'Alternate Terrain Sizing' below)
emptySquares	Clearly this is a list of emptySquares, the problem is that these values don't seem to work out as indicies. I'm still puzzling over this (EFM). - Changing this has no effect
position	<-1024, -1024,0> Offset to allow center of map to be at World Origin. - Changing this has no effect
Special Notes: X	

Water

This reference is for the HEAD version of Water ONLY. The head version incorporates Melvin May's work and is superior to, although a bit more complicated than, water from 1_1_2. Note also that I have taken some of Melv's descriptions of parameters directly (MM).

Parameter Category	Parameters
Transform	position < X Y Z > <ul style="list-style-type: none">Position of water anchor (see gizmo). rotation <mult DegX DegY DegZ> <ul style="list-style-type: none">No effect. scale <X Y Z> <ul style="list-style-type: none">X and Y can be changed in increments of 32. Other values will be (eventually) reset to next larger multiple of 32.Z can be changed in any increment you wish. (see below for discussion regarding 'Changing Water Z Scale')
Debugging	UseDepthMask <ul style="list-style-type: none">MM: A toggle which turns on/off the depth-map feature. Note, that this returns the fluid rendering to it's standard method (off).
Media	surfaceTexture <ul style="list-style-type: none">MM: Allows you to select the texture generally used for the surface. ShoreTexture <ul style="list-style-type: none">MM: Allows you to select the texture used in shallow areas. envMapOverTexture <ul style="list-style-type: none">MM: The environment map texture used when looking over the fluid surface. envMapUnderTexture <ul style="list-style-type: none">MM: The environment map texture used when looking under the fluid surface. submergeTexture <ul style="list-style-type: none">EFM - TBD

Fluid	<p>liquidType EFM – TBD</p> <p>density EFM – TBD</p> <p>viscosity EFM – TBD</p>
Surface	<p>"surfaceOpacity" - Controls the maximum opacity of the surface. (0.0 -> 1.0)</p> <p>"envMapIntensity" - Controls the intensity of the applied environment map. (0.0 -> 1.0). Note that setting the intensity to 0 results in the environment map pass being skipped which increases performance slightly.</p> <p>"TessSurface"/"TessShore" - These control the number of times the textures are repeated over the waterblock surface for surface/shore textures. Be careful, setting this value too low on a large waterblock can result in a highly distorted surface!</p> <p>"SurfaceParallax" - The surface is render as two layers. When the surface is distorting or flowing then this controls the ratio of one surface with respect to the other. For instance, if you use (0.5) then one surface will move at half the speed of the other.</p>
Movement	<p>"FlowAngle"/"FlowRate" - These fields allow you to control the way the fluid flows. The "Flowrate" controls how fast the fluid flows and the "FlowAngle" is a polar angle controlling it's direction. Using a "FlowRate" of 0 completely stops the fluid flowing.</p> <p>"DistortGridScale"/"DistortMag"/"DistortTime" - These fields control the distortion effect of the fluid surface. These fields allow you to create many different surface effects but have to be handled carefully otherwise you can distort the surface too much and get strange rendering effects. To control the speed use "DistortTime". Use "DistortMag" to control the overall magnitude of the distortion. "DistortGridScale" normally does not need adjusting but I have included it as it controls the distortion per unit world-grid unit. What this means is that a setting for a small waterblock may not look correct on a large one and this field allows you to adjust for i.</p>
Depth Fx	<p>"ShoreDepth" - Controls the depth at which the shore texture will</p>

	<p>start being applied. Larger values result in larger shore texture areas. Setting this value too high can result in only seeing the shore textures!</p> <p>"DepthGradient" - Controls the gradient which the shore textures will interpolate between "MinAlpha" / "MaxAlpha". I have changed this value from a sigmoid function to a gamma-correction function. The value of 1 equates to linear-interpolation, whereas values 0->1 equate to fast fade-out / slow fade-in and the values 1->inf equate to slow fade-out / fast fade-in (from deep to shallow). To be honest, just start at 1 and try different values below / above until you are happy with the results.</p> <p>"MinAlpha"/"MaxAlpha" - These control the alpha levels used from shore to deep fluid. The "MinAlpha" can be used to stop you getting totally transparent areas. Please note that you will always be able to see underneath the fluid surface but this is what fog volumes are used for in the "Sky" object. Set a fog volume Z to just below the surface to stop this happening.</p> <p>None of these values effect performance at runtime and only adjust the creation of the alpha-map.</p>
Misc	AudioEnvironment RemoveWetEdges

Dynamic Fields

params3
textureSize
envMapTexture
params0
floodFill
params1
extent
params2
seedPoints

Special Notes:
X

Mission

Camera

Parameter Category	Parameters
Transform	position < X Y Z > <ul style="list-style-type: none">x rotation <mult DegX DegY DegZ> <ul style="list-style-type: none">x scale <X Y Z> <ul style="list-style-type: none">x
Misc	nameTag dataBlock

Special Notes:
X

Markers

Parameter Category	Parameters
Transform	position rotation scale
Misc	seqNum msToNext

Special Notes:
X

Mission Area

Parameter Category	Parameters
--------------------	------------

Dimensions	area flightCeiling flightCeilingRange
------------	---

Special Notes:

- Required for every mission.
- Only one allowed.
- Can be larger than terrain home block.

Physical Zone Parameters

Group	Field Name	Description
Transform	<i>position</i>	<x y z> position of P zone
	<i>rotation</i>	<x y z> rotation of P zone Does not affect orientation of <i>appliedForce</i> vector
	<i>scale</i>	<x y z> scale of P zone
Misc	<i>velocityMod</i>	[-40.0, 40.0] Player velocity multiplier
	<i>gravityMod</i>	[-40.0, 40.0] Local gravity multiplier
	<i>appliedForce</i>	<x y z> Local force vector. Each value can have a value between -40000.0 and 40000.0
	<i>polyhedron</i>	IGNORE THIS

Special Notes:

X

Triggers

Parameter Category	Parameters
Transform	position < X Y Z > <ul style="list-style-type: none">• x rotation <mult DegX DegY DegZ> <ul style="list-style-type: none">• x scale <X Y Z> <ul style="list-style-type: none">• x
Misc	nameTag dataBlock polyhedron

Special Notes:

X