

AIRFIELD LIGHTS TOOLBOX – Version 4

Airfield Lights Toolbox (or AFLT for short) is a comprehensive utility for the creation of custom airfield lights for Microsoft Flight Simulator and Lockheed Martin Prepare3D (collectively referred to as "FlightSim") airports. AFLT includes typical 3D models for the usual airfield light fixtures and approach lighting structures from which you should be able to create just about any airfield light arrangement. Where the stock models are not sufficient for your purposes, you may replace or supplement them with your own.

Illumination of the models may be either standard effects, inversely-mipmapped effects or 3-plane lights (P3D-only) that grow in size as the user aircraft gets further away, thus extending their visible range. In addition, the light source in FS9 models may also be BGL_LIGHTS.

For FS9 and FSX, both the 3D models and the corresponding lights are implemented as scenery. Unfortunately, with P3Dv2, Lockheed Martin discontinued support for certain legacy technologies, necessitating the use of Simconnect-controlled "simobjects" for lights whose characteristics are more complex than simply off in the daytime and on at other times. However, for FPS-efficiency purposes, only the AFLT light sources are controlled with Simconnect; the 3D models are still placed as standard scenery items.

This version of AFLT introduces a powerful graphical interface. "Point" AFLT to either an .xml or .bgl file containing an airport definition and an image of the runways, taxiways, aprons and associated lighting will appear.

Characteristics of edge and or centerline lighting for each taxiway and runway are specified using simple dialogs. AFLT automatically configures all standard approach and PAPI/VASI configurations, or you can create your own. Practically every parameter is adjustable, but if you are happy with the defaults, configuring any approach – even ALSF-2 or Calvert-2 – requires but a single mouse click. Or, if you are in a hurry, AFLT will, with only a few mouse clicks, configure the lighting for an entire airport based on the existing FlightSim data. It doesn't get any better than this!

For simplicity, references in this manual to FSX apply equally to FSX, FSX-SE and P3Dv1. The term "P3D" includes P3Dv3 and later versions. P3Dv2 has "difficulties" that preclude use of AFLT custom lighting.

INSTALLING, EXECUTING and UNINSTALLING AFLT

Compatibility – Data created with AFLT2 or AFLT3 is not compatible with this version. However, you are able to import data from those earlier versions.

Installation (All Versions) - AFLT does not affect the system registry. To install, simply copy the files and folders from the downloaded archive into a new folder of your choice (referred to as "the AFLT folder"). **Do not attempt to update an AFLT2 or AFLT3 installation with AFLT4.**

AFLT is a Microsoft NET.Framework 4.5 application. If NET.Framework 4.5 or later is not already installed on your computer, the "redistributable" can be downloaded from the Microsoft website at no charge.

Execution – To execute AFLT, double-click on *AFLT.exe*, or create a desktop shortcut to that file. To avoid “privilege” exceptions, AFLT installs with “Run as administrator” privileges. Consequently, the UAC will require confirmation each time you run AFLT.

Windows 7 users may wish to run AFLT in the XP compatibility mode. Running it otherwise may result in a “this program may not have installed correctly” message when AFLT is shut-down. Despite the error message, there is no known problem - other than the annoyance factor.

Initialization - When you shut-down AFLT for the first time, an additional file, *AFLT.ini*, is created and saved to the AFLT folder. AFLT “remembers” key settings from one session to the next in this file. The next time you run AFLT, those settings are restored.

FSX DX10 Preview Mode – AFLT is generally compatible with FSX DX10 Preview Mode – with one exception. When you pan around the airfield or approach from different directions, whole blocks of custom lights disappear and, eventually, re-appear. This is a known deficiency of FSX DX10 Preview Mode and affects several types of lights. To correct, this you must have the applicable *..._LightField.bgl* from Steve Parson’s DX10 Fixer in the *lscenery* folder to which you save the AFLT lights and his *fx_dx10field.fx* effect in your *Effects* folder. Note that when you uninstall the DX10 Fixer libraries, that effect is deleted from the Effects folder, so you may have to replace it.

Alternately, use effects with FS9 models when in DX10 Preview Mode.

Automatic Updates - Whenever AFLT is started, it optionally checks the support server to determine if a more recent release is available. If so, AFLT will download that release for you. The updated release must be manually installed in the normal manner.

Un-Installation - To uninstall AFLT, delete:

- the AFLT folder and all its contents, and
- any effects whose name starts with “fx_AFLT4_” from your *Effects* folder(s),
- for P3D, remove the *AFLT for P3D* folder from *Documents\Prepar3d v_ Add-ons*,
- any “purged” .bgl files you may have saved to scenery folders (see section entitled Purge Airport Stock Data Function), any
- any other AFLT files (names start with “AFLT_” from relevant scenery folders.

AFLT STOCK FILES

Airfields Lights Toolbox comes with everything you'll need to start creating all the usual airfield lighting elements.

- a set of 3D base models for each of FS9 and FSX (FSX models are used for P3D and associated textures for the following fixtures are included:
 - o runway/ taxiway edge lights (“Edge”)
 - o split light for runway thresholds (“Split”)
 - o ground- and tower-mounted strobe lights (“Strobe”, “Strobe_T”)
 - o approach lighting structures and approach lamps (“Approach_T”, “Approach”)
 - o hold-short warning lights (“Wigwag”)

- o PAPI/VASIs ("PAPI_VASI"), and
- o dual-headed obstruction lights ("Obstruction")
- o aeronautical beacons; flashes red continually and, optionally, strobes during the daytime while flashing red at night. ("Beacon_T")

The names in parenthesis are the formal names used in AFLT. The Edge and Strobe models may be used in both uni- and omni-directional applications. (Approach lights are always uni-directional.) The 3D model files (.mdl), together with their textures, are saved in AFLT's *BaseModels* folder. Each model is more fully described in Appendix "A"

- *BaseModels.txt* - a tabular text file specifying for each base model the function it serves and the offset from the base model's reference point of the attachment point for the light(s). Its format is described in Appendix "A". If you replace or add a base model, you'll have to update/make a corresponding entry in this file before you will be able to use it.
- *Colors.txt* - a tabular text file specifying, among other things, the RGB value for each color available for use and the position of that color on the texture *obj_AF_Lights* in its various configurations. BGL_LIGHT color, effect color and the color of the model's light lens are controlled by this file. The format is described in detail in Appendix "B". You may add up to three of your own colors or edit any of existing ones.
- *Lights.txt* - a tabular text file specifying for each light type the base model file to be used and its directional and visibility characteristics – including the size of the related effects. Its format is described in Appendix "C". If you add any base models, you'll also have to make corresponding entries in *Lights.txt* before you will be able to use them.
- *Import.txt* – cross-reference material supporting the import of AFT2 and AFLT3 project data. You will have no need to change this file.
- *BGL_LIGHT and Effect Light Size* – The stock texture file that controls the size of AFLT's BGL_LIGHTs results in lights that some, including me, think are too big and bright. The AFLT archive folder Effects includes replacement textures that will reduce the size of BGL_LIGHTs generally. Please note, however, using these files will affect the lights at all airports, not just those where AFLT-generated lights are used. If you want to try them, copy the file:
 - o for FS9, *halo.bmp* into your *FS9\Texture* folder, or
 - o for FSX, *fx_2.bmp* into the *Effects\Texture* folder,
 overwriting the stock files of the same name. Be sure to backup the stock files first in case you don't like what happens with these replacement files.

(I obtained *halo.bmp* from an attachment to a fsDeveloper.com post some time ago. Unfortunately, I have been unable to find that post again in order to give proper credit. So, thank you, whoever you are. The *fx-2.bmp* file in the archive is my own work product.) Feel free to re-tweak these files as you think necessary.

PROJECTS

AFLT is project-oriented. Each project must have a unique identifier (project ID). Project IDs may be any character string. But, since the related files generated by AFLT

will be prefaced with "AFLT_*projectID*", you'll want to keep it short – perhaps the ICAO or IATA code for the airport. The Project ID is specified as the initial entry when creating a project.

The AFLT folder contains a folder named "Projects". All project data is saved in sub-folders named as the Project ID, including 3D .mdl files, associated textures, object libraries and placement data.

For FS9 and FSX, AFLT will optionally copy the object libraries it creates and textures to another folder of your choice – the Scenery Folder. If used, the folder's path is entered on the Make Library dialog. Normally, the Scenery Folder would be the folder containing the airport's *ls scenery* folder as specified in the Scenery Library and its associated *ltexture* folder. But, you can have the object libraries and textures saved to any location. For P3D, AFLT saves all files in the folder *Documents\Prepar3d v_ Add-ons\ AFLT for P3D* - even if you create custom lighting for more than one airport.

QUICK START

The first time you start AFLT, a blank drawing surface with a menu bar appears. Click Create New Project (Project menu). You'll be asked to specify a Project ID. Once that is entered, an "open files" dialog will appear. Navigate to the .xml or .bgl file containing the definition of the airport of interest ("**airport reference file**") and click Open. **You should not choose the copy of the airport .bgl in the scenery folder since, if you do, you will be unable to "purge" it later. Instead, make a copy of the "scenery" .bgl, move it elsewhere and use the copy as your reference file.** If there are no error messages, you should see an image of the airport showing runways, taxiways and aprons – and custom lighting based on the stock lighting specified in the file selected for that airport. (Note that the positions of the lights will not match the positions of the stock lighting in FlightSim. AFLT uses a proprietary algorithm to place lights to better reflect the real-world.)

The custom lighting you see will have been generated with default parameters. Should this not reflect real-world conditions at that airport, select Default Lighting Parameters (Options menu) and make any necessary changes. These changes will be applied and the display regenerated using them immediately upon closing the dialog. These default parameters (whether edited or not) are saved with each airport and will be automatically invoked whenever the airport project is loaded. The most recently entered values will be used for each new airport project..

Move the mouse over a runway or taxiway (it turns orange) and left click (it turns red, i.e. selected). Right-clicking anywhere on the drawing surface brings up a context menu. Select the desired operation from the context menu and "fill in the blanks" on the light-specification dialog that appears. When you close that dialog, the lights you have specified will appear on the drawing surface connected by one or more narrow lines. You can change or delete any programmed lighting by selecting the airport surface, lighting strip or light element of concern, right-clicking and selecting from the context menu.

You may wish to exclude some or all of the stock lighting in your project. To do so, load the airport and delete all the lighting you don't want to include. To delete all stock lighting clear the screen with Projects/Clear Placement Data. Then, Save Placement

Data. This will create a *Placement.xml* file which will prevent the unwanted stock data from appearing on subsequent startups of AFLT. (If a project unexpectedly starts-up with a blank screen, perhaps you have an empty *Placements.xml* file in the Project folder.)

Should you so delete some stock data you really wish to customize, it's easy to retrieve. The bottom item in most of the context menus is "Use Stock Lighting". Select it and the all "stock" lighting will be displayed over the airport image. A small dialog will also appear in which you can select from "stock" lighting in a variety of ways. Click Apply after each selection. When you close the dialog, the stock lighting will be replaced by your currently programmed lights plus whatever "stock" lighting you selected. You may view the "stock" lighting at any time by clicking on the Stock Data in the View menu. But, to adopt stock lighting, you must use the context menu.

If you wish to supplement your project with data from an earlier AFLT2/3 project, click Import AFLT2/3 Project Data under the Project menu. You will be invited to locate your AFLT2/3 Library Folder after which a small dialog will appear. Click the Import File button and navigate to the project file (.bgl, .xml or .def) to be imported. The main display will be updated with each file. Close the dialog when finished.

Once you have implemented the desired lighting plan (or at any other time), click Save Placement Data (Project menu). Each time thereafter this airport project is loaded, the last-saved lighting data will be displayed. (The airport image is always derived from the reference airport file. At each startup, AFLT will automatically display the airport and associated lighting that was loaded when AFLT was closed

To create the object libraries, click Compile Data (Project menu). The Make Library dialog will appear. Select the FlightSim version to which the object libraries will apply, specify the Scenery Folder (not for P3D), select the desired general characteristics of the lighting and click Create/Save Library. A message will pop up telling you where AFLT will save the library. (You can abort at that stage if it not where you want the files placed.) Then, you'll see some windows flash on and off your screen (the compiler at work) and, finally, a message confirming that the library has been generated.

Run FlightSim. Voila! Your lighting appears. But, any stock data in the airport .bgl also appears. Use AFLT's Purge Airport Stock Data function or edit the airport .bgl file (using ADE or another airport editor) to remove the stock lighting.

Your satisfaction with the custom lighting created will likely depend on your knowledge of the full capability of AFLT and your use of some of the additional features. Consequently, it is strongly recommended you read this manual from cover to cover, especially the section on SIMOBJECTS if you are creating lighting for use in P3D.

GRAPHICAL USER INTERFACE

Following is an overview of the operation of the graphical interface, which displays the runways, taxiways and aprons of the selected airport and associated customized lighting.

The threshold of each runway is marked with a heavy solid line. Displaced thresholds are indicated by a heavy dotted line. Taxiways are divided into segments comprising contiguous links not interrupted by a crossing taxiway or runway. Where necessary,

links within a segment have been re-oriented so as to point in the same general direction, i.e., the end of one link is the start of its immediate neighbour.

When you move the mouse cursor over one of the airport surfaces, that surface will turn orange. Orange implies “captured”. Moving the cursor over an individual light results in an orange circle around the light. Associated lights (e.g., runway edge lights) are connected on the display by a narrow line. Placing the cursor on that line causes the line to turn orange. As well, if you have selected the optional tooltips, a summary of the surface/light/line characteristics is shown.

For convenience, when the cursor is over a runway, a chevron is drawn at the primary end. When the cursor hovers over a taxiway the direction of the link under the cursor is indicated by a chevron.

Left-clicking on an orange surface, light or line selects (i.e., it turns red) that element for the subsequent operation. A single click on a taxiway link selects that link. Once a lighting or surface element is selected, a right-click anywhere on the screen brings a context menu into view listing the functions available for that element. To place an independent light or line of lights left-click anywhere other than an airport surface (to deselect any selected surfaces or elements) and then right-click at the point where the light is to appear or the line is to start.

For runways, the context menu functions allow you to add, edit or replace each type of associated lighting individually, e.g., edge lights, approach lights, etc. or to delete same. For taxiways, the only unique variable is the left/center/right specification. All other taxiway lighting parameters are global and specified using Default Lighting Parameters (Options menu). For lines of lights, you can delete all members of the line or insert a new member. You can create, edit and delete individual lights.

Some of the element creation/editing dialogs may require positioning information. The location where the mouse-click selecting the context menu function occurred is retained for use in such dialogs. Most dialogs that uses positioning information will also accept user aircraft position instead if Flightsim is running.

Generally, light-specification dialogs open with only a single or a few field(s) enabled. All the other fields are disabled (grayed-out). Once data is entered into the key field(s), one or more other fields are enabled – and so on until all fields on the dialog are enabled - other than the Place Lights button. The Place Lights button is only enabled when all required data has been entered. If the Place Lights button is not enabled, there will be some textbox or set of checkboxes or radio-buttons that need attention. For further detail on these dialogs, please refer to the relevant section below.

When the Place Lights button is enabled and clicked, the dialog is closed and the symbols for the lights reflecting the specification appear on the airport display.

Generally, a line of lights or individual light whether in a line or not may be moved by selecting it and “dragging” it with the mouse.

Surface dimensions can be expressed in either the metric or US system (i.e., meters or feet). However, direct conversion from one to the other can be inconvenient. For example, a runway width of 60m. converts to 196.8ft. but, in the other direction, 200ft

converts to 60.97m. Consequently, direct conversion would necessitate adjustment of most parameters. It is expected the user will want to use the same dimensional system for all actions affecting a given set of lights. So, AFLT “remembers” the dimensional system in use when element is specified. If, when that data for that element is brought into view, the other dimensional system is active, AFLT will automatically switch and so advise the user. If you really want to use the previously active system, you can select that system using Preferences (Options) menu and make whatever adjustments are necessary.

Once you’ve created your custom lighting, click Make Library and select the Flightsim version. If you’ve done all this correctly, your AFLT light elements should be displayed the next time you “fly” to the airport of concern. Don’t forget to disable the corresponding lights in your airport definition file. The Purge Airport Stock Data function (Projects menu) will do this for you.) Otherwise, you’ll have both sets of lights.

OPERATING OVERVIEW

The starting point for every light created with AFLT (generally referred to as an “element”), is a base model, i.e., a 3D model of the light fixture, or support or whatever. AFLT provides a set of stock base models (mdl files) and textures for all usual light types for both FS9 and FSX. P3D uses FSX stock base models. These stock models should satisfy most of your requirements. Each of these models has a single “empty” attachpoint, the location of which AFLT uses to position associated lights, whether BGL_LIGHTS, effects or 3-plane lights. The positions of the lights relative to the location of the attachpoint in each base model are defined in *BaseModels.txt*. Should you add or replace stock base models with your own models, you must make a corresponding entry in *BaseModels.txt* (see Appendix “A”).

Base models are assigned to one of the following “categories”:

- Edge General purpose edge light
- Split Displays different colors on the front and back sides
- Approach Uni-directional approach light head
- Approach-T Approach-lighting structure with one or more heads
- Strobe Fixed-frequency (2 cycles/second) flashing light
- PAPI-VASI PAPI/VASI applications in a variety of configurations
- Obstruction (Usually) building-mounted, dual headed red obstruction light
- Beacon Tower-mounted flashing red light with optional daytime strobe.

The Edge and Strobe categories may be either omni- or uni-directional. Their colors and intensity are user-specified. These models as well as Splits may be specified as surface-mounted, i.e., the lights are displayed at ground level without the 3D model.

Each “category” is expanded into one or more “styles”, primarily to reflect their directional and visibility characteristics. The “style” of each light (or set of lights) is user-selectable and should allow the creation of representative lights for all usual airfield applications. The file *Lights.txt* sets out the available light styles (see Appendix “C”). Users may add custom light styles by modifying *Lights.txt*. Following selection of a light style, the user assigns color(s), intensity and other characteristics as applicable.

AFLT supports a full range of pilot-controlled lighting, PCL, through the specification of on/off criteria using a system global variable (e.g., a COMS frequency or a transponder code) and, where appropriate, airport operating hours. With FS9 base models, if PCL is used during the daytime (for example, in low visibility conditions), in addition to the lights being on, the light lens "glow". (That's what the "day-glo" texture is used for.) Unfortunately, for technical reasons, this "glow" capability is not available with FSX or P3D models.

When used with P3D v3 or later, AFLT's custom lights will turn on automatically in low visibility.

AFLT allows the user to select from four light sources at compile time:

- BGL_LIGHTS (not available for P3D)
- standard effects
- inversely-mipmapped effects (not available for FS9)
- variable-size, 3-plane models, referred to as "LOD-Variable" (P3D only)

The characteristics of each is described in Appendix "D"

AFLT does not actually attach the lights to the 3D model with which they are associated. The 3D models are all compiled and saved as scenery. The separate .mdl files for the lights are created on-the-fly and positioned in accordance with the location of the attachpoint of their respective 3D model and the data in *BaseModels.txt*. Lights with identical on/off status, e.g., runway edge lights, are grouped and controlled by a single process. This, together with the separation of lights from the 3D models results in a significant reduction in FPS impact over earlier versions of AFLT, especially in P3D which would otherwise require each individual light to be a simobject.

Like any other scenery, in order to be rendered by Flightsim, the elements (other than simobjects) must be collected in an object library file. For Flightsim versions prior to P3D v3, AFLT optionally copies the object libraries and textures to the *ls scenery* and *lt texture* subfolders of the airport with which they are to be used (as specified in the Scenery Folder field of the Make Library dialog). For P3D v3 and later, AFLT creates (or adds to) a P3D Add-on Package (folder) and places that Add-on Package, named *AFLT for P3D*, in the appropriate *Documents\Prepar3D vn Add-ons* folder. For details of a P3D Add-on Package, please refer to the Add-ons section of the SDK.

When you start P3D, a small dialog containing two buttons: Connect and Disconnect, is created and minimized. This dialog, which has no use normally (but cannot be suppressed) can assist you in testing and allows you to make changes to the lights without having to restart P3D each time. Once P3D's startup is complete, the airfield lights should appear and the Disconnect button will be highlighted. To "tweak" your lights, open the dialog using the icon in the taskbar, click Disconnect, make whatever changes are necessary and regenerate the simobjects library and reinstall. Then click Connect. The revised lights should appear. This dialog will disappear when you shut down P3D, or you may close it – which will have the same effect as Disconnecting.

AFLT CONTROLS

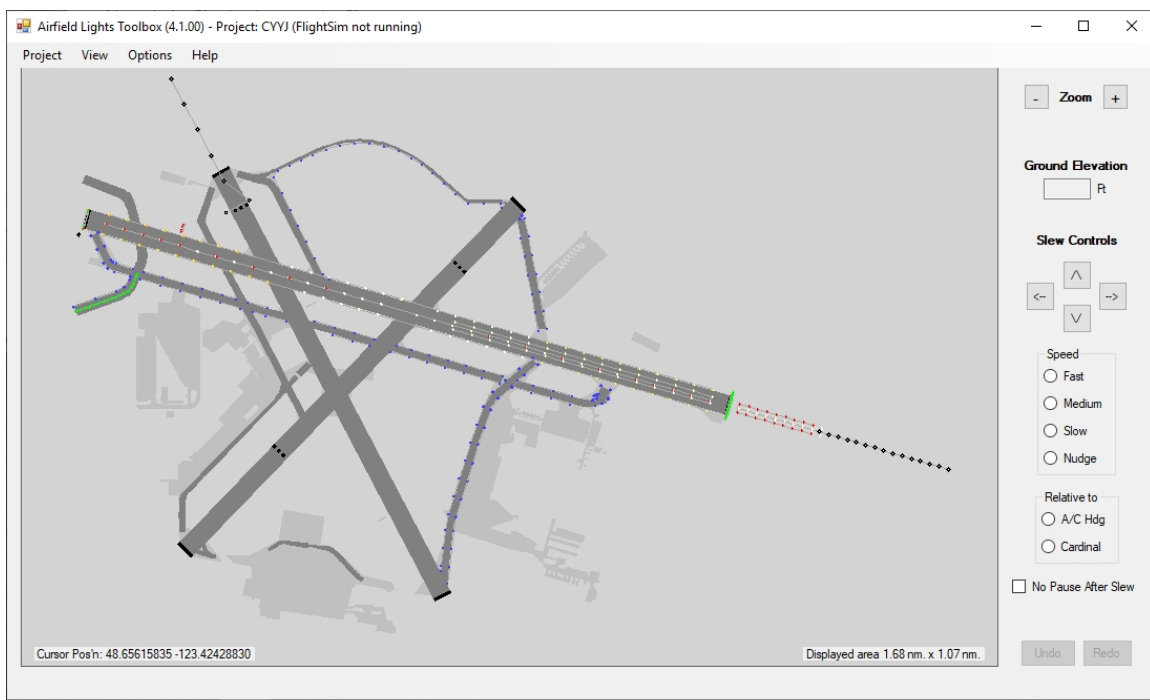
AFLT's Main Panel is shown below. It is the primary "working surface". It provides:

- a detailed image of the runways, taxiways and aprons of the airport,

- currently-specified lights,
- menus of the various functions available,
- display zoom controls (the mouse wheel can also be used for zooming),
- user aircraft slew controls, and
- textual display of the geographic cursor position, the geographic size of the displayed area and the ground elevation under the user aircraft.

Across the top of this dialog is the main menu bar containing four items

- Project– creating, opening, importing and compiling data files and for designating an airport of interest
- View – selecting the airport surfaces/characteristics displayed
- Options – selection of options and display formats, and
- Help – version information and on-line access to this user manual.



Main Panel

When FlightSim is running, AFLT reports the ground elevation under the user aircraft near the upper-right corner of the Main Panel. The position of the user aircraft is also displayed

The Zoom controls are located in the upper right corner of the Main Panel. Left-clicking these buttons will increase or decrease the geographic area displayed by 10%. If you depress and hold-down the left mouse button while over one of these buttons, the displayed area will continue to increase or decrease for so long as the mouse button is held down. You may also zoom the display from the mouse-wheel with a 10% change per click. Scroll bars are displayed as necessary.

To change the center location of the display, depress the mouse-wheel with the cursor positioned anywhere in the display area and move the mouse. The display will follow. Alternately, a related item appears at the bottom of most context menus:

- Re-center at Mouse position – right-click where you want the new center to be and select this item, and

When Flightsim is running (connection with AFLT will be automatic), you may slew the user aircraft:

- using either the Main Panel Slew controls or by moving the cursor over the aircraft symbol on the display,
- depressing the left mouse button and dragging the symbol (and the user aircraft) to the desired position, or
- with the Move User A/C to Cursor Position itm in the context menu.

Normally, Flightsim will be paused following any slew operation. You may override this by checking the No Pause After Slew box.

Undo and Redo buttons are below the slew controls. (Ctrl-Z and Ctrl-Y may also be used.) If you delete or add back a node near the edge of the display, the data may re-center. Most operations on the display can be undone/redone.

Project Menu

The Project menu is used to start new projects and load and save placement data. When selected, the bottom item has an associated listbox that displays the names of the airport files recently selected. To reselect one of those files, simply click on its name. To select a new file, click on the menu item and navigate to the file of interest. The menu contains the following items:

- Select Project – Select from a list of projects
- Create New Project – Start a new project. As noted earlier, you should not choose the copy of the airport .bgl in the scenery folder as your airport reference file since, if you do, you will be unable to “purge” it later. Instead, make a copy outside any active scenery folder of the “scenery” .bgl and use the copy as your reference file.
- Import Project Data from AFLT2/3 – Import data from a AFLT2/3 project
- Delete Project – Deletes the currently-selected project
- Save Placement Data – Saves current placement data to the Project Data Folder. Two files are created: Placements.xml and LinkLight.xml. A backup of each is saved in the Project Folder should you inadvertently save erroneous data. Should it be necessary, both should be restored.
- Save Placement Data as ... - Saves the current placement data to another location
- Clear Placement Data – Clears any existing data from the display
- Compile Data - Opens the Make Library dialog.
- Purge Reference Airport Stock Data – Initiates The Purge Airport Stock Data function (see PURGE AIRPORT STOCK DATA FUNCTION below)

- (Re)Load Airport Image - Loads airport data from a .bgl or .xml file designated by the user and displays an image of the airport surfaces. If you have airport files with varying “stock” lighting arrangements, you may select from among them at any time. If you have saved any placement data (Placements.xml in the Project Folder), you will have the option of preserving it for use with the new reference airport. **But, do not retain any earlier placements if those placements are not directly applicable to the new reference airport file. Also, when a new airport image is selected – even if it is identical to the earlier one - the records of all deletions from the earlier stock data will be lost.**

View Menu

The View Menu, as the name suggests, controls what is seen in the display area at any time.

Airport designers often use closed or very narrow (0’ or 1’ wide) taxiways for special purposes. AFLT classifies as a “narrow” any taxiway whose width is less than a user-specified value (set from Set Taxiway Wide/Narrow Width). While narrow taxiways may be displayed, they are otherwise largely ignored.

Any combination of the following airport surfaces may be displayed:

- runways
- regular (“wide”) taxiways $> n$ (i.e. wider than the “wide/narrow” width)
- “narrow” taxiways $< n$ (i.e., “narrow” taxiways)
- closed taxiways (processed as regular taxiways when in view)
- taxi- and parking-paths as well as an outline of parking stalls
- aprons

If you suppress the display of runways, the runway links are displayed instead.

The View Menu also contains the following functions

- Failed Taxiways – If AFLT is unable to apply lighting to any taxiway link, if this item is checked, that/those links will be displayed yellow rather than the normal grey.
- Stock Data – the “stock” lighting from the current airport reference file is displayed in place of the programmed lighting
- Light Size Increase/Decrease/Auto – allows the user to control the size of the displayed lights
- Set Taxiway Wide/Narrow Width - the dividing line between “wide” and “narrow” taxiways
- Set Displayed Width of Paths/Narrow Links - unless set at 0, all paths and narrow taxiways are displayed using this width irrespective of their otherwise specified widths
- Dark Background – displays the light symbols on a dark background for better contrast
- On with PCL – displays only those lights subject to pilot control or that are otherwise turned on in low visibility.

Options Menu

The Options Menu contains the following items:

- Show Tooltips – When checked, a tooltip is displayed whenever the mouse cursor hovers over a light strip or element or the user aircraft symbol displaying positional and other information.
- Display Formats/Units – opens a second dialog from which you select lat/lon display format and distance and elevation units
- Select Proximity (pixels) - the maximum distance between the mouse cursor “hot-spot” and the center of a displayed node or the user aircraft symbol for selection of that node/symbol to occur.
- Mouse Breakout (pixels) – the minimum distance the mouse cursor must be moved before a node or the user aircraft symbol will be “dragged” from its position.

Default Taxiway and Runway Lighting Parameters

***** RUNWAYS *****

Rt. M.

Spacing 200.0 60.0

Offset from Edge 5.0 1.5

Complexity NORMAL

***** TAXIWAYS *****

Edge Centerline

Base Model Edge Edge

Color Blue Front Green Back

Rt. M. Rt. M.

Spacing 200.0 60.0 50.0 15.0

Min. Spacing 25.0 10.0 25.0 10.0

Offset 5.0 1.5 0.0 0.0 (-)ve = Left

Intensity ☒ Low ☐ Medium ☐ High

Complexity NORMAL

Turn >= 5 deg.

Corner Spacing <= 30 deg.

Save

Default Lighting Parameters Dialog

- Default Lighting Parameters – Opens a dialog for specification of global runway and taxiway lighting parameters, such as: color, spacing and offsets.

Dimensional items are specified in both feet and meters. The applicable set will be selected automatically based on the Preferences selection when placement data is saved. Thereafter, the applicable set of dimensions will automatically be used whenever the project is loaded.

Two parameters require explanation.

- o Turn >= - If the heading of two consecutive taxiway links differs by more than this amount, their intersection will be handled as a “turn”, i.e., an edge light is placed at the beginning and end of the turn and intervening lights spaced evenly based on the following parameter.
- o Corner Spacing <= - Within a “turn”, edge lights are evenly spaced based on a subtended angle less than the specified value.
- Don't Purge PAPI/VASIs - Stock PAPI/VASI lighting is superior to AFLT's at close range. However, until P3Dv4, PAPI/VASI visibility was far too short - a situation overcome by AFLT with inverse-mipmapped and LOD-variable lighting options. Consequently, in some situations, it may be desirable to have both stock and AFLT lights. Checking the Don't Purge menu item accomplishes this.
- Check for Updates at Start-up - AFLT can access its website server to determine if a new general release or development release is available. When either is checked, AFLT will attempt to find an updated version at start-up. If that operation is suppressed and you click on this item, AFLT searches for an update immediately. You can also check for an update from the Help menu.
- Reposition Aircraft when Data Loaded – When checked, if FlightSim is running when a project is loaded, the user aircraft will be repositioned to the geographic center of the data.

CREATING/EDITING/DELETING LIGHTS

Taxiways are divided into surfaces comprising the contiguous links (segments) not interrupted by a crossing taxiway or runway. A single click on a taxiway link selects that segment only. Use <Ctrl> and <Shift> to select multiple links in a surface. Double-click to select all links in the surface. Once a surface or taxiway link, light or line is selected, a right-click anywhere on the dialog brings a context menu into view listing the functions available for the selected element. To add a single light or a line of lights, right-click with nothing selected. The context menu will contain an appropriate subset of the following:

<u>Selected</u>	<u>Functions</u>	<u>Posn Used</u>
Runways	Add/Edit Edge and C/L Lights	No
	Add/Edit Approach Lighting	No
	Add/Edit PAPI/VASI	Yes
	Add/Edit Runway End Lights	No
	Delete (each of the above)	No
Taxiways	Add Dual Light Bars	Yes
	Edit Link Lighting	No
Individual Light*	Edit Light	No
	Copy Light	No

<u>Selected</u>	<u>Functions</u>	<u>Posn Used</u>
	Paste Light	Yes
	Join Lights	No
	Delete Selected Light(s)	No
Line of Lights*	Edit Line Parameters	Yes
	Insert Light into Line	Yes
	Join Lights	No
	Delete Line	No
	Extend Line	Yes
None	Add Single Light	Yes
	Add Line of Lights	Yes

- * Certain of these functions are not available for taxiways that have been moved or otherwise edited.

The following function is always available from the context menu:

- Recenter (display) at Mouse Position

and, if Flightsim is running, also:

- Move User A/C to Mouse Position; if a light is selected at the time, the heading of the aircraft will point to that light.

Regarding deletions, for taxiway lights, you may either use a “delete” function or choose the Edit Link Lighting from the context menu and adjust the lighting as necessary. When you delete lines of lights associated with a runway, e.g. an element of an approach array, AIFP will delete the same item from stock data. If you delete a line of lights not associated with a runway, that lighting cannot automatically be deleted from stock data. To delete such lighting from stock data, select Stock Data from the View menu and delete the item again. While you may delete individual lights from a line in placement data, there is no way for AIFP to accomplish the same deletion from stock data. The alternative is to delete the entire line from stock data and re-create the line in AIFP.

Note that the centerline light at taxiway intersections will not be lit if more than two taxiways intersect. This is to avoid the “spider web” of lights so common in Flightsim. Such intersections require manual placement of centerline lighting where desired.

When pasting/inserting individual lights, if the cursor is hovering over a line of lights, the light is inserted into that line. Otherwise, the light is placed at the location of the cursor. Select the light to be copied, right-click and select Copy Light from the context menu. Then, at each point where the light is to be pasted, right-click again and select Paste Light from the context menu. Lights may be pasted into existing lines by right clicking on the line when the light is to be pasted. If the light you are pasting is dissimilar to those already in the line, AFLT will ask for confirmation.

Additional segments can be added to a line by selecting the light at the end where the segment is to be added, right-clicking and clicking on Extend Line in the context menu.

Joining lights allows multiple (previously) individual lights or lines of lights to be handled as a single entity. To join lights, select either:

- the individual light (that will become the first or last light in the line), or
- the first or last light in an existing line of lights,

right-click to bring up the context menu and select Join Lights. This enables the “hot cursor”. Then, hover the cursor over (capture) the individual light or the light at the end of the line to which the selected element is to be added, and then left-click. If the light you are adding is dissimilar to those already in the line, AFLT will ask for confirmation.

Initiating Other Functions - Upon selecting a context menu function, a new dialog will appear to support the creation or replacement of the selected element. If the selected element (e.g., edge lights) already exists for the selected surface, the dialog will be initialized to reflect that element. Selecting Delete simply deletes the lights of that type following confirmation. Otherwise, the dialogs are all initialized with representative default parameters.

Once the new specification is complete, click the dialog’s Place Lights button. The dialog will close and the results will appear on the airport surface displayed as a series of connected symbols.

Some of the element creation/editing dialogs may require positioning information. The position of the mouse when right-clicked to bring up the context menu is retained and made available to the selected dialog. Most dialogs that use cursor-positioning information will also accept user aircraft position if Flightsim is running.

All the lights in a line are initially placed:

- at, or in the case of tower-mounted lights a fixed distance above, ground level or the specified elevation,
- using a single, specified light style, and
- unless surface placement is designated, with a 3D model.

If you wish to vary these characteristics for an individual light in a strip, following initial placement, select and edit that light as desired.

Moving Lights – Lights may only be moved by “dragging”. An entire line of lights may be selected and “dragged”. Within a line, individual lights may be moved as follows:

- in a line created as a line of lights, the end lights and those at “corners” may be – “dragged” in any direction; upon completion of the “drag” operation, intermediate lights (between ends and/or “corners”) are automatically moved to form a series of straight lines; only ends and corners may be selected;
- in other lines (e.g., edge lights or approach light elements), individual lights may only be moved in the direction of the line.

Illustrated below are the various light specification dialogs. For the most part, these dialogs are self-explanatory.

Place Runway Edge and Centerline Lights

Lights - Runway 09/27

Models

Edge

Split

Intensity ☐ Low ☒ Medium ☐ High

Complexity

Edge Lights

Spacing (Ft.)

Offset From Edge (Ft.)

☒ Caution Zone Length (Ft.)

☐ Fill Gaps at Intersections

☐ White Displaced Threshold Edge Lights

☐ First Light at Half Spacing

☒ **Centerline Lights**

Spacing (Ft.)

Offset for Pri (Ft.)

☐ L ☐ R

☒ Caution Zone

Place Runway Lights

Place Runway Approach Lights (showing the available lighting configurations)

Approach Lighting - Runway 09/27

End: ☒ Primary (09) ☐ Secondary (27)

Configuration: **ALSF2** (dropdown menu open showing: None, Custom_ALS, Custom_Calvert, ALSF1, **ALSF2**, CALVERT, CALVERT2, LIAL (Canada), MALS, MALSR, ODALS, RAIL, REIL, SALS, SSALF, SSALS, SSALR)

Intensity: ☒ High

Complexity: (dropdown menu open showing the same list as Configuration)

Length (Rt.): 3000 Offset from C/L (Rt.): 40 Longitudinal Spacing (Rt.): 2 Bar: 3 Spacing (Rt.): 5 Model Name: Approach_T

Extension Each Side (Rt.): 45 Lateral Spacing (Rt.): 5.0 Offset from: Model Name: Approach

☒ Center Line

Length (Rt.): 2400 Longitudinal Spacing (Rt.): 100 Lights/Bar: 5 Spacing (Rt.): 3.375 Model Name: Approach_T

☒ Terminating Bars

Side Bars: ☒ ☐ 500ft ☒ 1000ft

Termination Bar: ☐ Wing Bar: ☐

Offset from C/L (Rt.): 40 Lights/Bar: 3 Spacing (Rt.): 5 Model Name: Approach_T

☐ Cross/Decision Bars

	Width (Rt.)	Offset from C/L (Rt.)	Towers	Lights/Tower	Spacing (Rt.)	Model Name
☒ 500/150m	15	15	1	4	5	Approach_T
☒ 1000/300m	35	15	2	4	5	Approach_T

☒ Strobes

No. of Strobes: 15 Longitudinal Spacing (Rt.): 100 Distance to Inner Strobe (Rt.): 1000 Model Name: Strobe_T (Uni)

☐ REIL Offset from Threshold: 0 Offset from Rwy Edge: 40 Model Name: Strobe (Uni)

Place Lights

Place Approach Lights

Only those major elements that are checked will be included in the approach lighting. Most items should be self-explanatory to those familiar with the configuration specified.

However, one that won't be intuitive is the 3D Models on Runway checkbox under Threshold Lighting (upper right quadrant in illustration above). AFLT automatically suppresses the 3D model for any runway, taxiway or approach light on a runway surface and displays the light at ground level. However, threshold light bars in approach lighting systems are often located just on the runway surface (where the 3D model would be suppressed). Checking this box – which is only enabled when needed – ensures all lights in the bar have 3D models.

While you may select either end of the runway in the Approach Lights dialog, and also in those for runway end lights and PAPI/VASIs, only one end may be added or edited at a time. When you click on Place Lights, only the lights for selected end of the runway will be updated.

Place PAPIs and VASIs (with and without the configuration combobox dropped down)

Place PAPI or VASI for Runway 09/27

End: ☒ Primary (09) ☐ Secondary (27)

Complexity: SPARSE

Configuration: VASI-2

Side: ☒ Left ☐ Right

Position at:

- or -

Offset (Rt.) from Edge: 20.0 and End: 750.0

Spacing (Rt.) between - Lights: 16.0 and Bars: 300.0

Glideslope (deg): 3.00 ☐ TVASI shows Red

Place PAPI or VASI

Place PAPI or VASI for Runway 09/27

End: ☒ Primary (09) ☐ Secondary (27)

Complexity: SPARSE

Configuration: VASI-2

Side: ☐ Left ☐ Right

Position at:

- or -

Offset (Rt.) from Edge: 20.0 and End: 750.0

Spacing (Rt.) between - Lights: 16.0 and Bars: 300.0

Glideslope (deg): 3.00 ☐ TVASI shows Red

Selection of PAPI/VASI

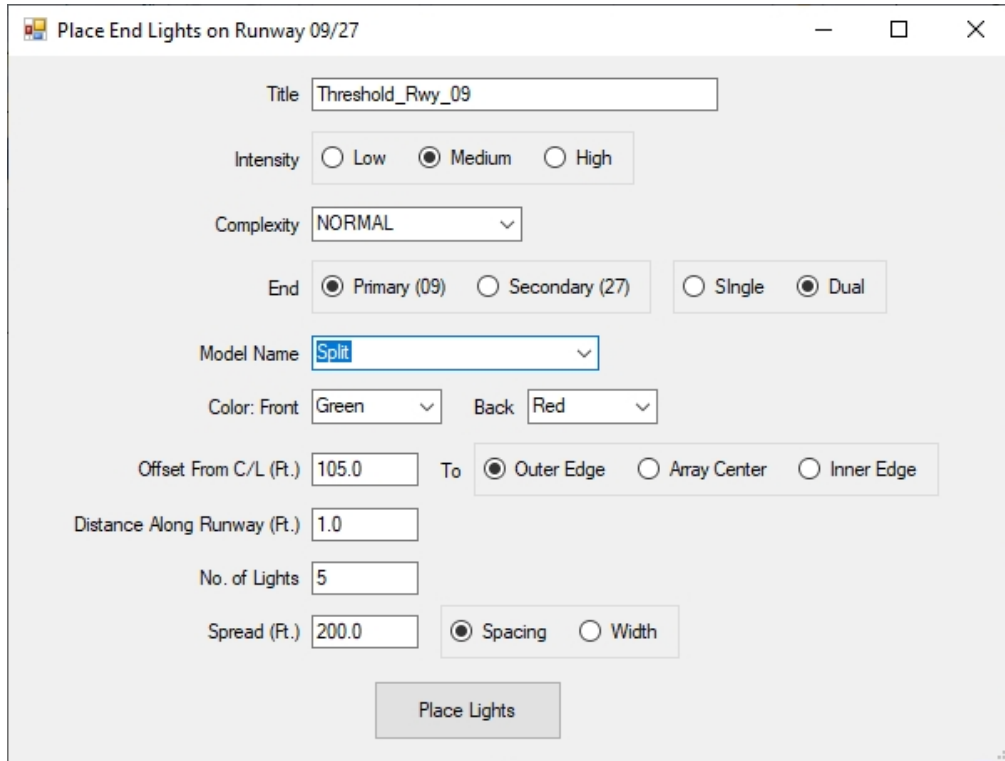
Clicking either the Cursor or User A/C buttons overrides the position specification in the bottom portion of the dialog and places the specified PAPI/VASI arrangement at the position of the cursor when double-clicked or at the current position of the user aircraft respectively.

When specifying PAPI/VASI characteristics, remember that, by checking the Don't Purge PAPI/VASIs item in the Options menu, you can have both stock and AFLT glideslope indications

Should you opt for this approach, for VASIs, specify the positioning parameters exactly as you would in ADE or other airport editor. AFLT automatically applies correction to ensure that its VASI lights and those of the stock data are very close together. Spacing between bars must be 700ft (213.4m). You will have to experiment with these values for other PAPI/VASI configurations. Don't be afraid to experiment. The worst that can happen is that you can't get simultaneous operation and you've got to choose between them.

Please note AFLT and FlightSim use slightly different reference points for placing PAPIs and VASIs. AFLT automatically adjusts the Offset from Centerline and Offset from Runway End so its lights appear at the same location as in Flightsim. Consequently, the values displayed in those fields on the PAPI/VASI dialog will differ from the values you would see in ADE or another airport editor.

Place Runway Threshold Light Bars



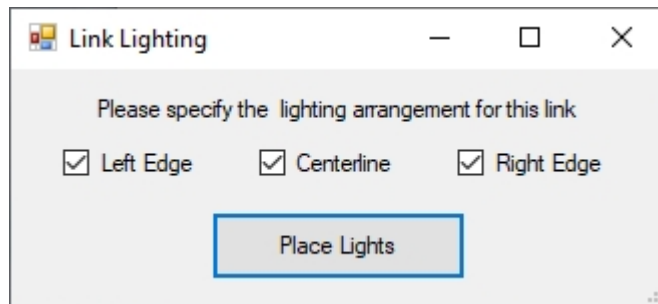
The dialog box is titled "Place End Lights on Runway 09/27". It contains the following fields and controls:

- Title: Text box containing "Threshold_Rwy_09".
- Intensity: Radio buttons for Low, Medium (selected), and High.
- Complexity: Dropdown menu showing "NORMAL".
- End: Radio buttons for Primary (09) (selected), Secondary (27), Single, and Dual.
- Model Name: Dropdown menu showing "Split".
- Color: Front (Green) and Back (Red) dropdown menus.
- Offset From C/L (Ft.): Text box containing "105.0".
- To: Radio buttons for Outer Edge (selected), Array Center, and Inner Edge.
- Distance Along Runway (Ft.): Text box containing "1.0".
- No. of Lights: Text box containing "5".
- Spread (Ft.): Text box containing "200.0".
- Spacing/Width: Radio buttons for Spacing (selected) and Width.
- Place Lights: Button at the bottom.

Place Runway End Lights

Threshold Light Bars always display a 3D model, even if they are on the runways surface. If the selected end of the runway has a displaced threshold, then similar entry fields for a second set of parameters appears below the first, together with a checkbox that allows you to select whether or not additional lights are to be generated.

Place Taxiway Edge and Centerline Lights

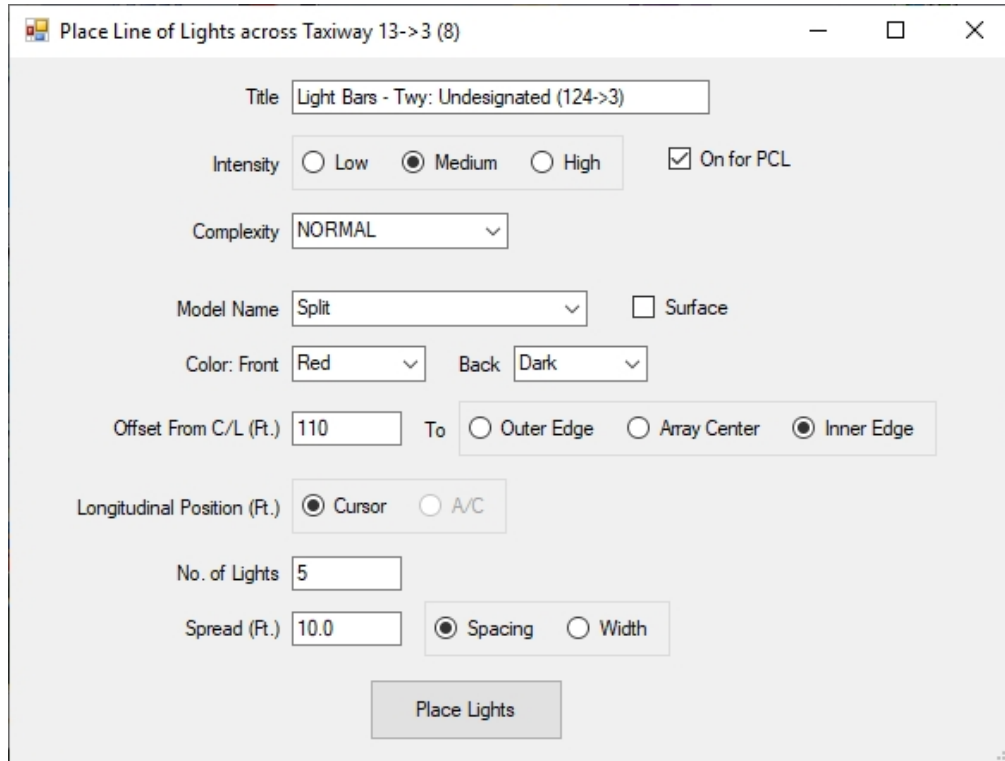


The dialog box is titled "Link Lighting". It contains the following fields and controls:

- Please specify the lighting arrangement for this link: Instructional text.
- Left Edge: Checked checkbox.
- Centerline: Checked checkbox.
- Right Edge: Checked checkbox.
- Place Lights: Button at the bottom.

Place Taxiway Lights

Place Taxiway Dual Light Bars



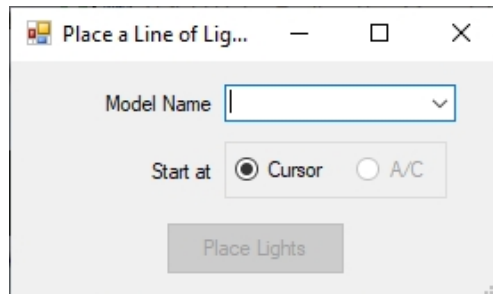
The dialog box is titled "Place Line of Lights across Taxiway 13->3 (8)". It contains the following controls:

- Title: "Light Bars - Twy: Undesignated (124->3)"
- Intensity: Radio buttons for Low, Medium (selected), and High.
- On for PCL: Checked checkbox.
- Complexity: Dropdown menu set to "NORMAL".
- Model Name: Dropdown menu set to "Split".
- Surface: Unchecked checkbox.
- Color: Front (Red) and Back (Dark) dropdown menus.
- Offset From C/L (Ft.): Text box with "110".
- To: Radio buttons for Outer Edge, Array Center, and Inner Edge (selected).
- Longitudinal Position (Ft.): Radio buttons for Cursor (selected) and A/C.
- No. of Lights: Text box with "5".
- Spread (Ft.): Text box with "10.0".
- Spacing/Width: Radio buttons for Spacing (selected) and Width.
- Place Lights: Button at the bottom.

Place Dual Light Bars on a Taxiway

Add/Edit Individual Light or Line of Lights

You are first greeted by:



The dialog box is titled "Place a Line of Lig...". It contains the following controls:

- Model Name: Dropdown menu.
- Start at: Radio buttons for Cursor (selected) and A/C.
- Place Lights: Button at the bottom.

Place Individual or Line of Lights

and then, once you specify the name of the model you wish to place, a dialog similar to one of the two below will appear. If Flightsim is running, the Start at A/C radio button will be enabled and, if checked, the line will start at or the light will be placed at the position of the user aircraft. The actual format of the new dialog will vary, depending on the type of light being placed, i.e., additional fields may appear and others shown may be missing.

Place a Single Light

Model Name: Split ☐ Surface ☐ On for PCL

Color: Front: Green Back: Red

Intensity: ☐ Low ☒ Medium ☐ High

Place at: ☒ Cursor ☐ A/C

Heading: 0.0

Elevation (Ft.): 0.0 ☒ AGL

Place Lights

Place a Single Light

Place a Line of Lights

Model Name: Edge ☐ Surface ☐ On for PCL

Color:

Intensity: ☒ Low ☐ Medium ☐ High

Complexity: NORMAL

Start at: ☒ Cursor ☐ A/C

No. of Lights: Nominal Spacing (Ft.):

Heading: Light(s): 0.0 Line:

Elevation (Ft.): 0.0 ☒ AGL

Place Lights

Place Line of Lights

You may enter either No. of Lights or Nominal Spacing. When all selections have been made, click Place Lights. The dialog will close and AFLT will enter the “hot cursor” mode, (i.e. each left click will place a line node).

If No. of Lights has been entered, that number of lights will be placed in a line after the first left-click and AFLT will exit the “hot cursor” mode. Otherwise, following each left-click, the required number of lights will be evenly placed between the current and previous cursor positions based on the Nominal Spacing entry. Either double-click when placing the final node in the line or right-click after placing the final node to exit the “hot-cursor” mode.

Please note that, when placing aeronav beacons, the Elevation field refers to the height of the tower whereas, for other light types, it generally refers to the elevation of the model base.

CREATING A LIBRARY OF ELEMENTS

Clicking Compile Data (Project menu) brings up the Make Object Library dialog.

The top line of the dialog will reflect which versions of Flightsim are installed on the system. Select the version to which the library about to be made is to apply.

For FS9 and FSX, the object libraries and required textures will be copied to the Scenery Folder if that folder is specified in the Scenery Folder Path textbox. If the Scenery Folder is a sub-folder of FlightSim's *Addon Scenery* folder, you need only specify the path relative to *Addon Scenery*. (The full path name for each Flightsim version will be automatically derived.) Otherwise, you must specify a fully-qualified path for the selected Flightsim version. If the specified path ends with "\scenery", AFLT assumes a companion *texture* subfolder. If the path does not end with "\scenery", AFLT assumes a folder containing both the *scenery* and *texture* subfolders. If either anticipated subfolder does not exist, AFLT will create it/them on the first save. Once a Scenery Folder is specified, the same folder will be used for all Flightsim versions unless changed.

Airfield Lights Toolbox - Make Object Library

Save Library for: ☐ FS9 ☒ FSX ☐ FSX-SE ☐ P3Dv3 ☐ P3Dv4

Scenery Folder Path (may be relative to Addon Scenery): CYYJ (Dev)\CYYJ

Pilot Control: Control [v] Freq./Code: Auto-Off (min.): 0

Airport Operates: ☒ 24 hrs. - OR - From: 00:00 Until: 00:00 UTC Offset (hr.): 0.0

Light Source: ☒ BGL_LIGHTs ☐ Standard Effects ☐ Inverse-Mipped Effects ☐ LOD-Variable Size

☐ Kill Shadows ☐ Lights Only

Create/Save Library

Make Library Dialog

For P3D, a P3D add-on package containing all the required files is generated, a folder named "AFLT for P3D" is created in the appropriate *Documents\Prepar3D v n Add-ons* folder and the add-on package copied into that folder.

AFLT supports pilot-controlled lighting (PCL), i.e. the ability for pilots to turn on airport lights outside normal hours for the airport. In real-life, usually this is done by keying the COMM transmitter a certain number of times. Unfortunately, there is no way for Flightsim to report depression of the "mic-key". So, AFLT offers several (albeit unrealistic) alternatives. Instead, you may use a certain transponder code or tune one of the COMM, NAV or ADF system to a frequency of your choice. You may also control how long the lights stay on after you trigger PCL. If you don't set an auto-off value, the lights will go off immediately upon you deselecting the specified transponder code or frequency.

If pilot-controlled lighting (PCL) is required at your airport, select a pilot-controlled lighting control from the Control/Variable combo box (radio/navigational systems). Then, specify the "lights-on" value for the control/variable in the Freq/Code textbox. Enter the value exactly as the value will appear on the control (e.g., 1234 for the transponder or 123.70 otherwise). If COMM is selected, please note PCL is only triggered if the COMM unit then-currently selected for transmit is tuned to the specified frequency. Note that runway and taxiway lights are automatically selected as being operational under PCL. Other types of lights must have been manually designed as being operational under PCL when they are created/edited in AFLT.

If you want to be able to deselect the PCL lights-on criteria once PCL has been invoked but have the lights remain on, enter the number of minutes after which the lights will automatically be turned off in the Auto-off (min.) text box.

For airports having 24 hr operation, check the 24 hrs. checkbox. Otherwise, enter the operating hours (i.e., the hours outside of which the lights will normally be off) in local time and the airport's UTC offset in hours (decimal hours if necessary). **Please be aware, pilot-controlled lighting based on airport operating hours is "expensive" in processing overhead and should be used only if required.**

The same light source is used for all lights in an object library. As noted earlier, you have a choice of four sources: standard effects, inversely-mipmapped effects, for FS9 and FSX, BGL_LIGHTs and for P3D, LOD-variable-sized 3-plane lights. (BGL_LIGHTs are not supported in P3D; FS9 cannot generate satisfactory 3-plane lights.) AFLT generates all required effect (.fx) files on-the-fly. Consequently, the archive contains only the file *BaseEffects.fx* which AFLT uses as the basis for all generated .fx files.

Shadows are also expensive in terms of FPS. (Shadows are essentially 2D models.) Shadows are automatically suppressed for lights mounted on towers. (3D tower models are usually of a fixed (long) length. Consequently, the bottom of a tower generally will be well below ground level. However, Flightsim displays a shadow for the full length of the tower, generating shadows that should not be there.) To suppress all shadows, check the Kill Shadows checkbox.

If you have a FPS-challenged system but still wish to realize some of the benefits of AFLT, try suppressing the display of the 3D models by clicking the Light Only checkbox. You can also use this feature to check the FPS-impact of the 3D lights.

Finally, click the Create/Save Library button. If no Scenery Folder has been specified, a warning will be issued. Whether or not a Scenery Folder is specified, the object libraries and .mdl files are also saved in */Files* subfolder of the Project Folder. As well, if effects

(either type) are used, all required effects are normally generated on-the-fly and copied to the `Effects` subfolder in the case of FS9 or FSX, or to the add-on package if P3D. However, users may specify a custom effect be used instead by including that effect's name in the appropriate line(s) of *Colors.txt* (see Appendix "B") and ensuring that effect exists in the Effects folder of the relevant Flightsim version(s). If you've specified a custom effect be used and wish to revert to the default, simply delete its name from *Colors.txt* and re-generate the library.

When compiling for FS9 or FSX, you'll see window flashing on and off rapidly. That's the compiler, which cannot be hidden.

Run the relevant FlightSim version to see the results.

PURGE AIRPORT STOCK DATA FUNCTION

If you simply add AFLT library .bgl's to an airport's scenery folder, you will see not only the AFLT lights/models but also the stock lighting. The Purge Airport Stock Data function creates an airport .bgl or .xml file (whichever you defined as the airport reference file) "purged" of all the stock lighting which has been used/replaced by AFLT. Note you may designate in the Options menu that PAPI/VASIs not be purged. You would then use the "purged" file to replace the earlier airport .bgl or .xml file.

If you created the project with a .bgl file, that file will have been compiled for a particular version of Flightsim. Its use, therefore, will be limited to other compatible Flightsim versions. Consequently, AFLT's Purge Airport Stock Data function asks for a Flightsim version specification before purging the lighting specifications.

If you started with a .xml file, its use too is restricted because it may contain data not compatible across all Flightsim versions. If you are creating lights for use with several Flightsim versions, you may have to load the airports .xml for one or more of the versions currently loaded in order to create "purged" .xml files for each version.

In either case, the purged file name is suffixed with the entered version.

Purged files are always saved to the Project Folder. You would normally replace the airport .bgl file in your scenery folder with the purged .bgl. If a .xml file, you would normally load it back into your airport editor to create a new version of your airport .bgl without the stock lights you replaced.

At the time a bgl file is purged, if the specified version of FlightSim is installed, you are given the opportunity to have that file saved to your scenery folder. (The original airport .bgl file name will be suffixed with ".xxx" to disable its processing). If you choose not to have AFLT so save the file for you, you will have to apply it appropriately, manually, later.

AFLT will not let you purge the airport reference file, since doing so would defeat AFLT's ability to (re)generate custom lights. If you have chosen the .bgl in your scenery folder as the airport reference file, make a copy of that file and select the copy as your reference file. Similarly, if you've chosen an .xml file as the reference file, make a copy of it and "purge" the copy.

SPECIAL CIRCUMSTANCES

Lights in Close Proximity - It appears that FS9 has difficulty initializing the rendering of certain lighted models in very close proximity when approaching from a distance, resulting in a “crash”. Given the complete absence of diagnostic information at the time of the “crash”, the precise cause of the problem is not known. FSX does not appear to be similarly affected.

In the case where the problem was discovered, when the light source was BGL_LIGHTs, two strobes 2.5'/0.7m apart triggered the crash, but two others 5'/1.5m apart were OK, suggesting a minimum separation of 3.5'/1m. When effects were substituted for the BGL_LIGHTs, the latter two strobes also resulted in a crash, indicating FS9 is less tolerant of effects. On the other hand, steady lights as close as 1'/0.3m were rendered without difficulty, suggesting that blinking lights, e.g., strobes and, aeronav beacons, are most susceptible.

So, should you experience a unexplainable FS9 crash when approaching an airport with AFLT custom lighting, review the spacing of the lights - especially that of strobes and aeronav beacons.

Large Number of Effects - From our testing on large airports, it appears there is an internal (to Flightsim) limit to the number of effects that can be displayed. The version of KLAX we were testing had nearly 7000 lights. (Each light requires an effect) Flightsim had difficulty when effects were used as the light source at KLAX. Exactly where the limit is has not been determined - and it may be dependent on processing power and/of FPS. If your airport has lights numbered in the thousands, you may experience similar difficulty. Should that occur, try a light source that doesn't involve effects.

TWEAKING AND FINE TUNING

AFLT ships with a set of default values for all functions. These are commonly used values for the respective airport lighting features. However, these defaults may not be the most appropriate value for a given airport. Consequently, virtually all aspects of AFLT are “fine tunable”. That includes airport surface parameters, e.g. runway edge light offset, light characteristics.

AFLT attempts to duplicate exactly the outline of airport taxiways so that, when you specify, say, a 5' offset for taxiway edge lighting, you get 5' in the sim as well as on the AFLT display – even in curves. Doing so required a great deal of effort in reverse-engineering of Microsoft's taxiway generation algorithms. While I think I have discovered most of the “tricks” and shortcuts, there are still a few situations - primarily where there are very short intersecting links of varying widths - where AFLT is unable to accurately duplicate the Flightsim display. Fortunately, AFLT “knows” when it doesn't succeed.

Under the View menu is an option to display “Failed Taxiways”. These are taxiway segments that AFLT knows are incorrect and, when this option is selected, those segments are displayed in yellow, making them quite apparent. (If the menu item is disabled, there are no Failed Taxiways.)

AFLT does not attempt to place lights along Failed Taxiways (since it doesn't "know" where the taxiway edges are). In those cases, you'll have to place taxiway light manually. Fortunately, at most airports, Failed Taxiways will be a rarity.

Familiarity with Appendices "B" and "C" will be an asset in understanding the balance of this section.

AFLT supports four types of lights:

- BGL_LIGHTs (FS9 and FSX only)
- Standard effects
- Inverse-mipmapped effects
- LOD-Variable lights (P3D only)

AFLT's default light size is about 1m/3ft in diameter – approximately the size of a BGL_LIGHT. Appendix "C" specifies the size of each type of light relative to this default size. As you can see from Appendix "C", the default size for stobes and PAPI/VASIs is somewhat larger. For all but BGL_LIGHTs, you may change these relative size values as necessary. This size can be further adjusted:

- based on the Light Size Adjustment specified in appendix "C" for the color of the light, and
- to reflect light intensity (effects for higher intensity lights being large than those for lower-intensity light).

BGL_LIGHTs are very processing-efficient - more so than effects. BGL_LIGHTs together with simple 3D models have a minimal affect on FPS. However, the size of BGL_LIGHTs is fixed. Their brightness is a function of the specified intensity for the light. BGL_LIGHTs are rendered in FS9 only. In FSX, a light element specified to use BGL_LIGHTs is rendered as an automatically-created effect the same color as specified for the BGL_LIGHT. BGL_LIGHTs cannot be used in P3D.

Both standard and inverse mip-mapped effects may be used with any version of FlightSim. AFLT creates all required effects "on-the-fly". Other than size, their characteristics reflect the file *BaseEffect.fx* in the archive *Effects* folder. If you wish to change any other parameter of these effects, you can do so by editing *BaseEffect.fx*. Any changes you make will be reflected in all AFLT lighting elements using effects. Be sure to backup the stock file before making any changes to it. In general, however, the range of effects cannot be extended beyond 10000m (about 7 nm).

AFLT's inverse mipmapped effects use a special texture with inversely-sized mipmaps, i.e., the relative size of the image in the mipmaps *increases* as the distance from the light increases, increasing the visible range of small effects. They are used primarily in FSX to extend the visible range of small standard effects – but the 7nm limit noted above still applies.

For P3D, effects for omni-directional lights will always face the user whereas other effects are unidirectional and face only in the direction of the heading of the light. In other versions of Flightsim, lights will always face the user due to the inability to create uni-directional effects.

The other alternative for light source is variable-sized 3-plane models. These are not lights *per se*; rather, they are brightly-colored simple models comprising 3 circular planes in the X, Y and Z axes. They are designed so that their size varies inversely proportionally to Flightsim's internal level of detail (LOD) of the model at any time, i.e., the lights are rendered at minimum size at LOD_100 and at maximum size at LOD_1. Light size increases or decreases in small increments as the user aircraft moves towards or away from the light. This concept was pioneered by Christian Bahr. These lights can be made visible up to 18 nautical miles (the distance at which Flightsim begins to discard scenery models) by adjusting the Range entry in *Lights.txt* (see Appendix "C"). The minimum size of each light is controlled by the Light Size (Medium Int.) – Bahr entry in *Lights.txt*.

AFLT's settings in *Colors.txt* and *Lights.txt* give a reasonably uniform appearance of lights across all light sources and Flightsim versions. However, these settings may not be ideal in your application. If the color of a light is not to your liking (in particular the blue taxiway lights), experiment with the RGB and Light Intensity Adjust values in *Colors.txt*.

The size of effects and LOD-variable lights in *Lights.txt* controls the approximate size of the bright section light bloom at very close range. It is a trade-off between close-up appearance and the way the lights fade as the user aircraft moves away. Some experimentation will be required to achieve the most suitable size. So, when judging the close-up size, view the light from a representative distance, recognizing that the user aircraft will seldom be VERY close to a light.

As shipped, AFLT displays all colors at their maximum intensity. This may result in certain lights appearing too bright. The brightness of each color may be reduced by adjusting the Color Intensity Adjust setting for the color in *Colors.txt*. Depending on the color and the magnitude of the change, this adjustment might also be useful in reducing the apparent close-up size of lights.

It should be noted that LOD is calculated differently in P3D than in the earlier versions of Flightsim. In P3D, LOD is calculated as a multiple of the model radius (RADI block in the .mdl file) whereas in the earlier versions of Flightsim, LOD is a function of the rendered object size relative to the vertical pixel count of the display window. Thus, the maximum range may differ in each case. So, you may need to use different size and range values to get consistent results across all Flightsim versions. It can do no harm to experiment.

SUBSTITUTION/ADDITION OF BASE MODELS

You may replace the provided base models and add new ones. But, before doing so, you should examine the stock textures *obj_AF_Lights*, *obj_AF_Lights_Dayglo* and *obj_AF_Lights_LM* (found in the *Base Models\Textures* folder) to appreciate how they are used and their inter-relationship.

Other than for wigwags, the only firm requirement is that a custom base model contain a single, empty attachpoint. Both the attachpoint and the model can be named as you wish. The location of the attachpoint is not important. But it will be necessary to specify in *BaseModels.txt* offsetting information for the light sources.

You may use any texture for the model and lens – or different textures for each. But, if you wish the light lens to be colored to match the light, you must either use the stock texture *obj_AF_Lights* or implement a similar scheme on your own texture.

For FS9 models, if you use the stock texture *obj_AF_Lights.bmp* for the light lenses, AFLT will automatically apply *obj_AF_Light_Dayglo.bmp* whenever the lights are on. If you use your own texture, AFLT will look for a file (.bmp or .dds) named “*texture_Dayglo*” and use it when the lights are on. If it doesn’t find a “dayglo” texture it will complain, but the model will still be useable (however, of course, the lens will not “illuminate” in the daytime). Unfortunately, “dayglo” textures cannot be used with FSX models. If you provide it, a “_LM” texture will be applied as usual.

For custom wigwag models, in addition to the attachpoint, the two light lens must be:

- a separate element of the model,
- displaced negatively in the Y-dimension sufficiently far from other portions of the model to avoid flickering,
- displayed unconditionally (no LOD assignment), and
- textured with a file whose name ends with “_WigwagLens”.

For FS9 models only, AFLT will alternately apply the noted texture and one whose name ends with “WigwagLens_On” – which should be more brightly colored than *texture_WigwagLens* but otherwise identical. Please refer to the stock “WigWagLens” textures.

Place each version (FS9/FSX) of your model in the applicable Base Models folder and, if you use non-stock textures, place a copy of your new texture (32 bit, DXT and/or DDS formats as necessary) in the *Base Models\Textures* folders.

If you are simply replacing a stock base model (using the same name) and your attachpoint is in the same location as in the stock model, you need do nothing further. However, if you have moved the attachpoint, have renamed the file or are adding a new base model, you will have to make a new, or update an existing, entry in *BaseModels.txt* (see Appendix “A”) and perhaps also *Lights.txt* (see Appendix “B”).

DISTRIBUTING YOUR AIRPORT

You are permitted to distribute AFLT-generated custom lighting with your airport so long as your airport is made freely available and its distribution and use does not involve an end-user paying a fee of any kind.

With simobjects-based lighting, you need only include a copy of the *AFLT for P3D* folder AFLT has placed in your ...*\Documents\Prepar3d vn Add-ons*. If you have created custom lights for more than one airport but don’t intend to distribute them all, you may wish to delete from the included *SimObjects* and *XML* folders the sub-folders that apply to the airports not to be distributed. (Leaving them will do not harm other than possibly prompting your users to ask why they are there.) Your user need only copy this folder into his/her own should “*user\Documents\Prepar3d vn\Add-ons*” folder. P3D will detect it automatically.

For FS9 and FSX, you’ll need to provide your users with:

- the purged airport .bgl(s),

- the relevant AFLT_XXXX_Bases_v.bgl and AFLT_XXXX_Lights_v.bgl files, and
- all the effect files with names beginning "fx_AFLT4_" in your Flightsim *Effects* folder, collected in a folder named "Effects" (AFLT's effects are identical for each FlightSim version).

Your users must copy these effects into their own Flightsim *Effects* folder. The other files should be placed in an active scenery folder.

Of course, you should also include detailed instructions to your users for installing these files and for disabling their original airport .bgl file(s).

SUPPORT

Airfield Lights Toolbox's support forum is located in the [Scenery Design - Airport Design support area at http://www.fsdeveloper.com](http://www.fsdeveloper.com). Please direct your problem reports, suggestions for improvement and other comments there. When you report problems, please include relevant details. In particular, the AFLT version number, the exact error message and a summary of what you were doing at the time are likely to be particularly helpful. If you are asking for support with a particular lighting issue, please attach the complete Project sub-folder. Without it, it's unlikely I can be of much help.

I also have a support website at <http://stuff4fs.com> for all my airports and development utilities. (Navigate to the User Applications / AFLT page.) Among other things, the site lists all known problems with the latest release. The most recent release of Airfield Lights Toolbox is available from that site as are occasional development releases of new features.

While I can't promise to resolve every issue you report or include every feature addition you propose, I will undertake to support and enhance Airfield Lights Toolbox in a manner consistent with it becoming and remaining the tool of choice airfield lighting for Microsoft Flight Simulator and Lockheed Martin's Prepar 3D.

Enjoy,
Don Grovestine
don@stuff4fs.com

END USER LICENSE AGREEMENT

As used in this end user license agreement, the terms "Airfield Lights Toolbox" and "AFLT" shall be construed as encompassing the full contents of the downloadable archive (.zip) file created and/or posted for distribution on "download sites" by the author, including without limitation: the executables file AFLT.exe, AFLT(exe).exe and AFLT (Install).exe, the associated user manual, the files BaseModels.txt, Colors.txt, Lights.txt and any files proprietary to third parties including but not limited to the files BGLC_9.exe, bglcomp.exe, bglcomp.xsd and Ionic.Zip.Reduced.dll.

You are granted a free, non-exclusive right solely to install and use Airfield Lights Toolbox on your computer system(s) for your own personal enjoyment and, subject to what follows and the rights of others, to use and distribute work products created or modified with Airfield Lights Toolbox ("derivative files") as described in the section of this manual entitled DISTRIBUTING YOUR AIRPORT WITH SIMOBJECTS.

You may not:

- upload Airfield Lights Toolbox in whole or in part to any file distribution system,
- reverse engineer, disassemble or decompile any part of Airfield Lights Toolbox,
- incorporate Airfield Lights Toolbox in whole or in part into any commercial product or facility, "shareware" or "freeware", or
- use Airfield Lights Toolbox or any derivative files in the development, marketing or support of, or incorporate derivative files in, any commercial product

without the express written permission of the author. Use as may be permitted for commercial purposes may be subject to a license fee.

Your use of Airfield Lights Toolbox is entirely at your own risk. You assume and are responsible for any and all liabilities and damages arising therefrom no matter how caused.

By installing or otherwise using any part of Airfield Lights Toolbox, you are deemed to have agreed to the foregoing.

Airfield Lights Toolbox - Copyright © D. Grovestine 2013 - 2020

Appendix "A" - Base Models Supplied

Base models must fall into one of the following categories:

- *Approach* - uni-directional light intended as a threshold light in approach lighting configurations either as a threshold light or mounted on a tower.
- *Approach_T* – a simple horizontal mounting bar 1m. long, which will be adjusted on-the-fly as needed and to which will be attached one or more posts and one or more light heads. Two associated base models are required:
 - o *Approach_Post* – post to be attached to *Approach_T*
 - o *Approach_Head* –uni-directional light to be attached to *Approach_T*
- *Beacon* - a 50 m. high tower. You may choose to have a blinking light atop it or a blinking light at night and a strobe during the day
- *Edge* – a basic light mount intended primarily for taxiway and runway edge lighting applications
- *Obstruction* – dual obstruction light assembly on a 5' post
- *PAPI_VASI* – a simple box mounted on legs used in all PAPI/VASI configurations
- *Split* - bi-directional light primarily for runway end applications
- *Strobe* - strobe light mounted on a 5' pole
- *Strobe-T* - strobe light mounted on a 30' tower
- *WigWag* - typical wigwag with two alternately-blinking amber lights

AFLT includes a least one base model in each category. As well, a surface-mount .mdl, *Surface.mdl*, i.e., a single buried triangle (fulfilling the requirement for a surface to which things can be attached) used for lights element that do not include a 3D-model

Elements on towers or supports may be set to any height. The unneeded portion of the tower/support will be "buried".

None of these models will cast shadows normally. Custom shadows (provided - model file name suffixed with "_Shad") may be applied to all models except *Approach_T.mdl*, *Beacon_T.mdl*, *Obstruction.mdl*, *Strobe.mdl* and, *Strobe-T.mdl*. *Obstruction.mdl* is generally used in locations where a shadow would add little realism. In the other noted exceptions, a portion of the model usually will be buried but would still cast a full shadow.

BaseModels.txt includes four fields for each base model:

- Name – calling name
- Category –category in which the base model falls
- m/f – indicates whether the following field dimensions is feet or meters
- Light Positions – the x/y/z position of each light to be displayed relative to the models reference point. A separate x/y/z position must be specified for each light source. For example, for Splits and PAPI/VASIs, there must be two x/y/z positions.

You may add to this set of base models or replace individual models. It is recommended you not change the names of stock elements. If you do, or if you add new elements, you will have to add or edit the corresponding line in *BaseModels.txt* and *Lights.txt*.

Appendix "B" - Colors.txt Format

Colors.txt controls the displayed colors of all lights. It provides the RGB value for BGL_LIGHTs and effects and the texture sheet offsets for LOD-Variable lights. As well, it controls the displayed size of effects by color.

AFLT supports six user-specifiable light colors:

- amber
- blue
- dark (used for split lights on which only one side is illuminated)
- green
- red
- white

and five system colors:

- BEACON
- PAPI_RED
- PAPI_WHITE
- STROBE
- WIGWAG

Up to three “custom” colors may be added by the user. All colors may be adjusted by the user as desired.

Each color has the following attributes:

- Name – the name by which the color is called
- The brightest RGB value that can be used to display the color:
- VERT (Bahr) coordinates on the LOD-Variable texture sheet *Lights_Bahr.dds*
 - o Umin - X-value for the lower left-hand corner
 - o Umax - X-value for the upper right-hand hand corner
 - o Vmin - Y-value for the lower left-hand corner
 - o Vmin - Y-value for the upper right-hand corner
- Color Intensity Adjust – The RGB value above is for the maximum intensity of the color. The displayed intensity of the color (not to be confused with the Lo/Med/Hi intensity setting of a light) will be the maximum intensity adjusted by this (%) value.
- Effect Size Multiplier - Visibility differs between colors and, hence, affects the visible range of lights drawn with an effects. This item is used to automatically increase or decrease the “standard” size of effects, thus increasing or decreasing the range of the effect
- Custom Effect Name – AFLT effects are named “fx_AFLT4_color_characteristics.fx” and are regenerated whenever the data for a given FlightSim version is compiled. If this field is not blank, AFLT will instead use the named effect. Users must ensure an effect so named exists in the Effects folder of the relevant Flightsim version or, in the case of P3D, in the Effects folder of that version’s Documents “addon” folder.

Appendix "C" - Lights.txt Format

Each line in Lights.txt applies to a specific model type, as follows:

- Column 1 - Name
- Column 2 - Name of base model used for this light
- Column 3 - True or False indication of whether the light is omni-directional
- Column 4 - Default horizontal spread of light(s) in degrees. A blank entry implies full (360 degree) visibility. No effect on omni-directional lights.
- Column 5 - Default vertical spread of lights, centered about light tilt if any. A blank entry implies full (90 degree) visibility. No effect on omni-directional lights
- Column 6-8 The size relative to AFLT's default of medium intensity LOD-variable lights and lights whose source is mipped-effects and "standard" effects, respectively. That base size will be automatically adjusted + or – 25% to reflect the specified intensity of the light. A relative size of 1.0 means that light will be drawn at AFLT's default size. To make a light twice as large, specify the relative size as 2.
- Column 9- The desired visible range (in nautical miles) of LOD-variable lights or, in the case of effects, a cut-off range. (Effects have a maximum range of 10000m)

Appendix "D" – Light Characteristics

AFLT supports four types of lights:

- BGL_LIGHTs (FS9 and FSX only)
- Standard effects
- Inverse mipmapped effects
- LOD-Variable lights (P3D only)

BGL_LIGHTs are very processing-efficient - more so than effects. BGL_LIGHTs together with simple 3D models have a minimal affect on FPS. However, the only control you have over the display of BGL_LIGHTs is their brightness – which is adjusted by varying the applicable RGB value in *Colors.txt*. Their maximum range is sometimes a problem – particularly when used in VASI/PAPI applications. BGL_LIGHTs are rendered in FS9 only. In FSX, a light element specified to use BGL_LIGHTs is rendered as an automatically-created effect the same color as specified for the BGL_LIGHT. BGL_LIGHTs cannot be used in P3D.

Both standard and inverse mipmapped effects may be used with any version of FlightSim. AFLT creates all required effects “on-the-fly”. The size of these effects is automatically adjusted as their color is controlled by entries in the file *Colors.txt* (see Appendix “B”) and can be adjusted by the users. Otherwise, their characteristics reflect the file *BaseEffect.fx* in the archive *Effects* folder. If you wish to change any other parameter of these effects, you can do so by editing *BaseEffect.fx*. Any changes you make will be reflected in all AFLT lighting elements using effects. Be sure to backup the stock file before making any changes to it. In general, however, the range of effects cannot be extended beyond about 7 nm.

AFLT’s inverse mip-mapped effects shipped use a special texture with inverse-sized mipmaps, i.e., the relative size of the image in the mipmaps *increases* as the distance from the light increases, increasing the visible range of small effect. They are used primarily in FSX to extend the visible range of small standard effects – but the 7nm limit noted above still seems to apply. Inverse mipmapped effects are of limited use in FS9 because of the difficulty in creating uni-directional lights of this type.

The other alternative for light source is variable-sized 3-plane models. These are not lights *per se*; rather, they are brightly-colored simple models comprising 3 circular planes in the X, Y and Z axes. They are designed so that their size varies inversely proportionally to FlightSim’s internal level of detail (LOD) of the model at any time, i.e., the lights are rendered at minimum size at LOD_100 and at maximum size at LOD_1. Light size increases or decreases in increment of 10% as the user aircraft moves towards or away from the light. This concept was pioneered by Christian Bahr. These lights can be made visible up to 18 nautical miles (the distance at which FlightSim begins to discard scenery models) by adjusting the applicable LOD-Variable Max (size) entry in *Lights.txt* (see Appendix “C”). The minimum size of each light is controlled by the LOD-Variable Min (size) entry

It should be noted that LOD is calculated differently in P3D than in the earlier versions of FlightSim. In P3D, LOD is calculated as a multiple of the model radius (RADI block in the .mdl file) whereas in the earlier versions of FlightSim, LOD is a function of the rendered object size relative to the vertical pixel count of the display window. AFLT

addresses this difference in technique as best it can. But, you may need to use different size and range values to get consistent results across all Flightsim versions. It can do no harm to experiment.