Java Flight Simulator

A Six-Degree-of-Freedom Flight Simulator Developed in Java

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# Introduction

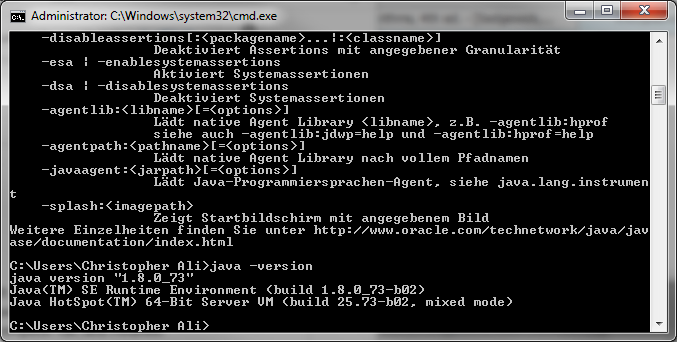
# Capabilities and Limitations

# Requirements

## Java

Java Flight Simulator was developed entirely in Java 8, and as a result users wishing to run this software must have at least Java 8 SE installed on their computer. Many computers have Java already installed as part of other software or browser requirements. To verify that your computer has Java installed:

1. Open the Command Prompt
2. Type *java -version* and press ENTER
3. *java version “1.8.x.x”*should be displayed in the window



If some similar output is not shown, or an error is returned, Java can be downloaded from the following website:

<https://java.com/en/download/>

The simulator is currently compiled as a Windows executable, as only Windows machines were available for testing, so only Windows operating systems (7, 8, 8.1 and 10) are currently supported.

## Additional System Requirements

* Processor: Dual Core (3.0+ GHz) or better
* RAM: 4GB or higher
* Hard Drive Space: 200 MB free
* Graphics: At least 512 MB VRAM
* Display Resolution: 1440 x 900 pixels or more
* Input Devices: Mouse and Keyboard

## Controllers

Although at least a keyboard and mouse are required for controlling the simulation and navigating the menus, a joystick or flight controls such as a yoke, rudder and throttle quadrant are strongly recommended to improve the experience and increase controllability.

Flight controls in Java Flight Simulator are optimized for use with the CH Flight Sim Yoke, Pro Pedals and Throttle Quadrant ( <http://www.chproducts.com/> ), although any joystick or controller setup should provide similar functionality

# Installation

Java Flight Simulator is installed by extracting the ZIP archive to a folder of choice. The application can run anywhere on the computer as long as the folder structure within the Java Flight Simulator folder is unchanged.

## Folder Structure

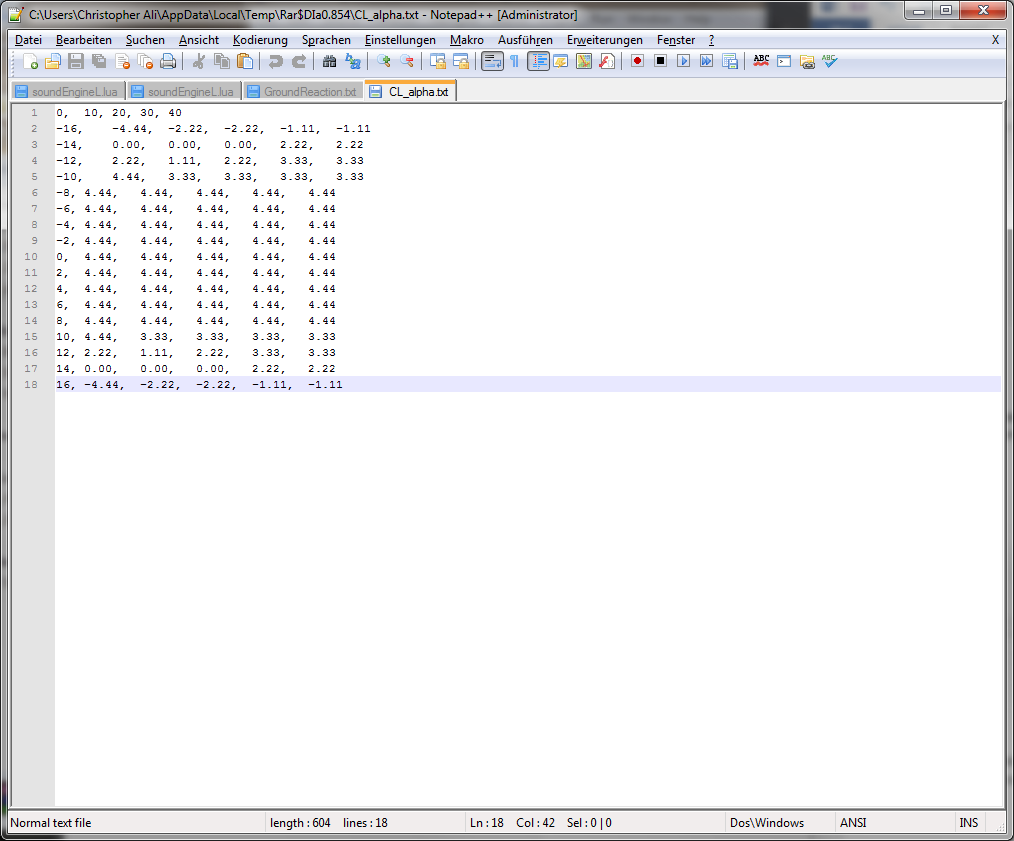
The root directory of Java Flight Simulator should contain the following:

* **./Aircraft/** Contains all aircraft for the simulation to use, each in their own folder. For more information about the contents of each aircraft folder, see *Custom Aircraft*
* **./SimConfig/** Contains all configuration files for the simulation. Each line of each file has the following structure: *\*setting\_name\** = *\*value\**
  + *AudioSetup.txt* Volume settings for various types of sounds (engine, systems, etc)
  + *DisplaySetup.txt* Display settings for the out-the-window display, such as resolution and anti-aliasing
  + *InitialConditions.txt* Initial heading, airspeed, position and altitude values for the simulation
  + *InitialControls.txt* Initial flight control deflections for the simulation
  + *IntegratorConfig.txt* Settings for the numerical integration, which drives the simulation
  + *SimulationSetup.txt* Core settings for the simulation, such as using a joystick, displaying raw data results, running in Analysis Mode, etc
* **./Resources/** Contains models, textures and audio for the out-the-window display for the simulation
  + **Audio/** Audio files for the simulation (engine, systems, environment, etc)
  + **Entities/** Modelsand texture files for model entities (trees etc)
  + **Fonts/** Font files for text displayed on screen
  + **Particles/** Texture files used for particle effects (clouds, smoke etc)
  + **Terrain/** Texture files and blend maps used to texture the terrain
  + **Water/** Textures for dynamic water
* *Documentation.docx*
* *JavaFlightSimulator.exe* Main executable to start Java Flight Simulator
* *license.txt*

## Custom Aircraft

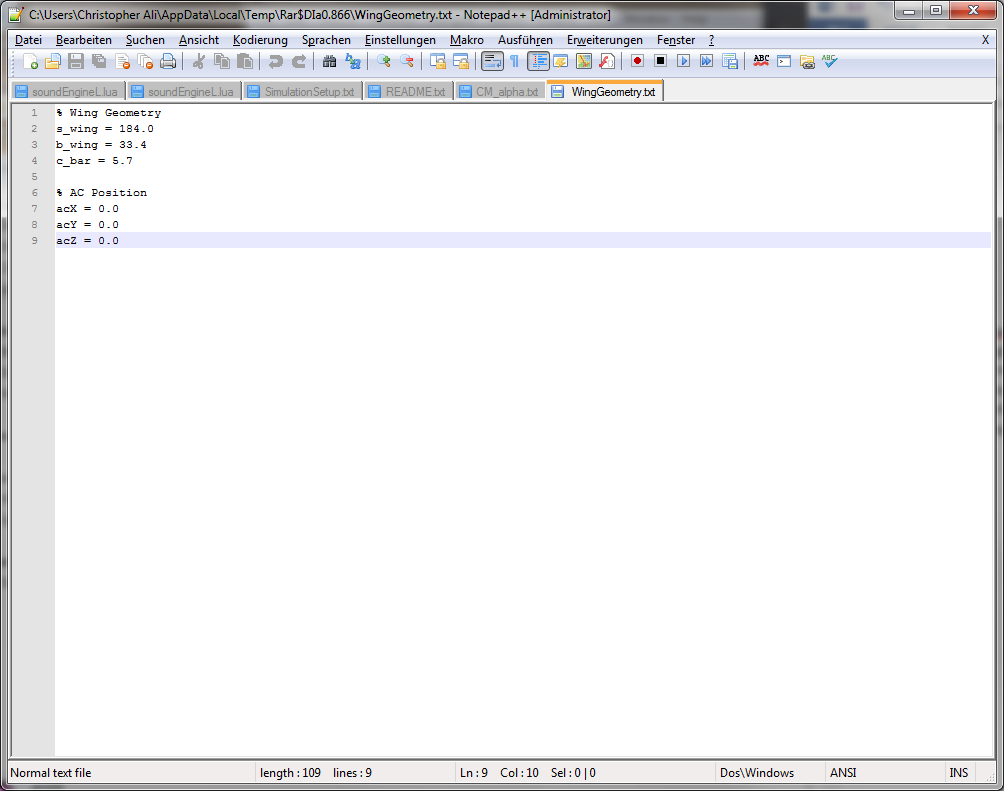
Inside of each aircraft folder in **./Aircraft/** is the following folder structure:

* **./LookupTables/** Several stability derivatives are nonlinear with respect to variables such as angle of attack and flap deflection. These derivatives are best defined with a lookup table, an array of values, where a value of this array is interpolated using breakpoints. An example of a lookup table for this application:

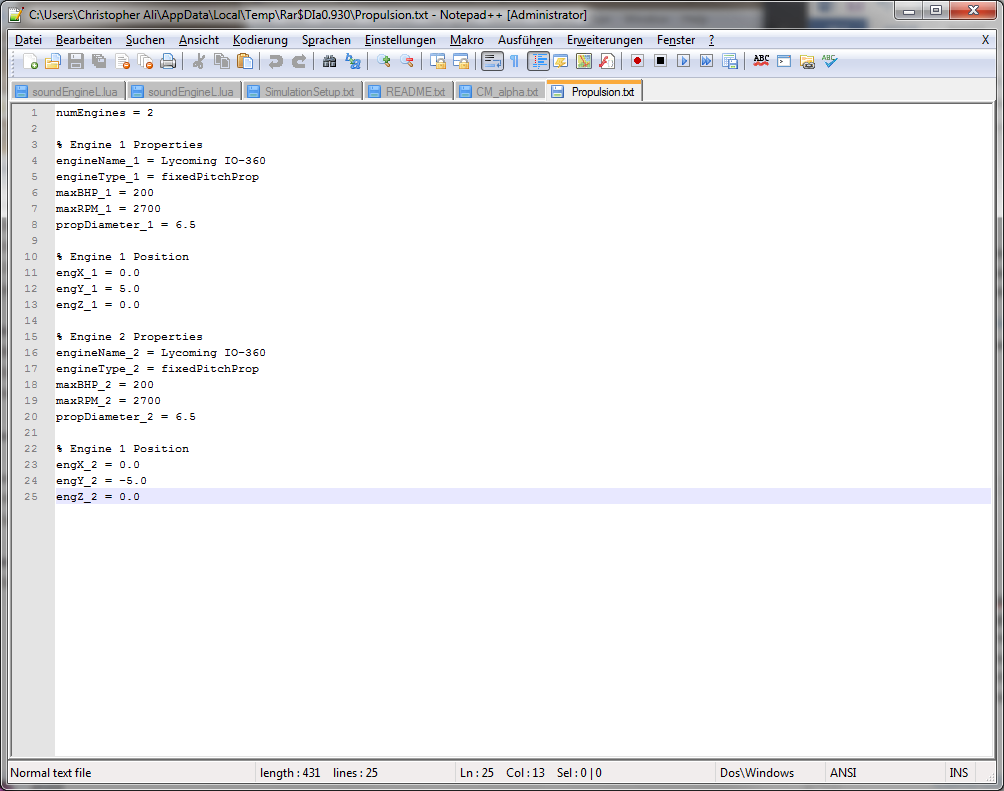


The break points here are the first row (flaps [deg]) and first column (angle of attack [deg]) of the array. The other values are potential values of CL\_alpha for a given angle of attack and flap deflection. All values in the lookup table are comma-tab separated.

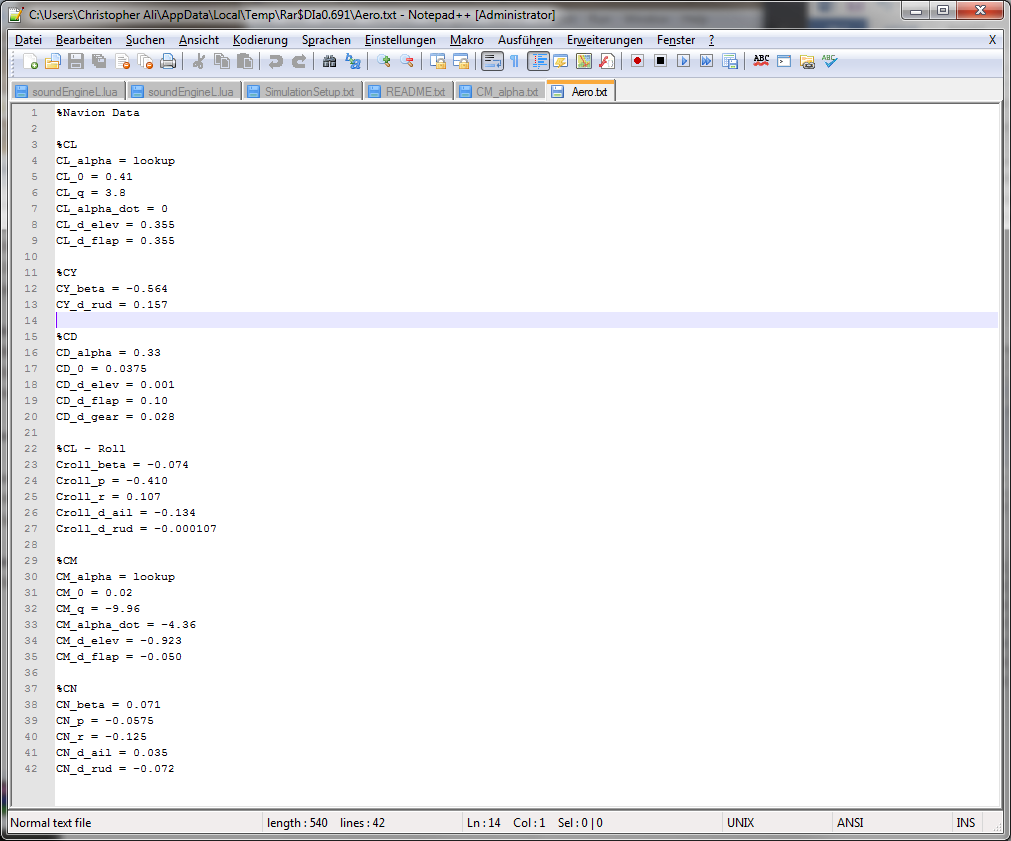
* *WingGeometry.txt* Defines the aircraft’s wing span [ft], mean aerodynamic chord [ft] wing surface area [ft2] and aerodynamic center position relative to the center of gravity



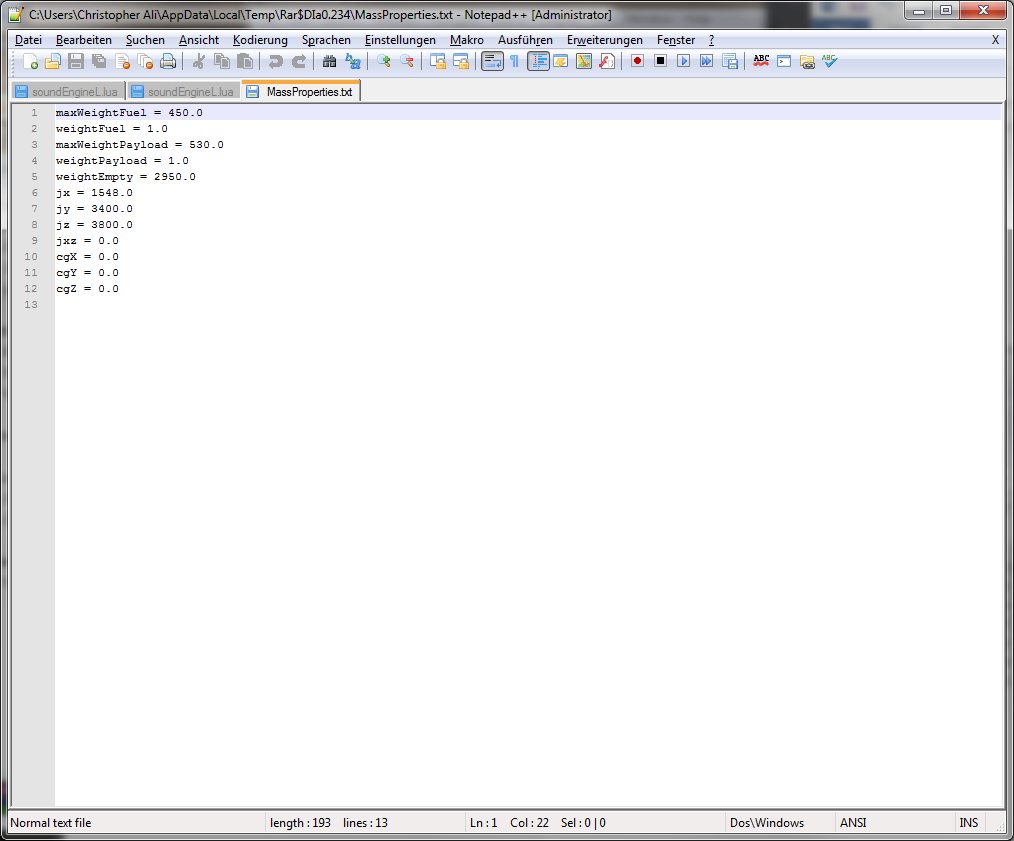
* *Propulsion.txt* Defines the properties of each engine on the aircraft:



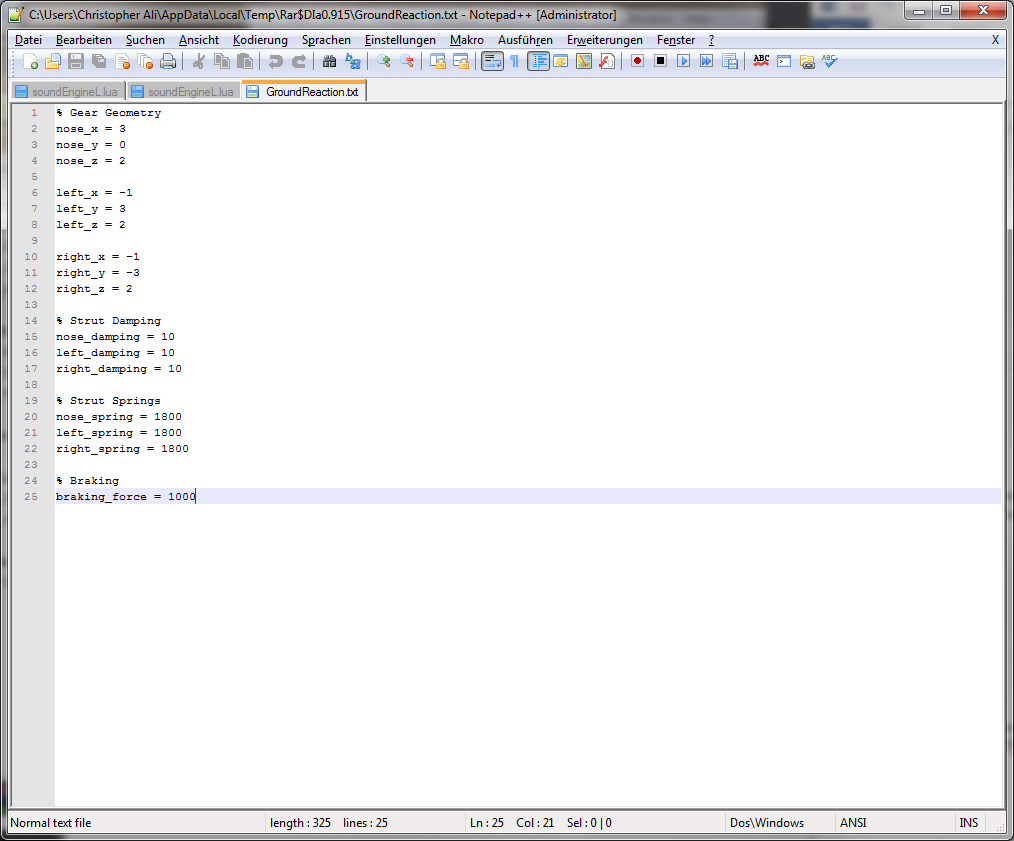
* *Aero.txt* Contains stability derivative values for the aircraft [1/rad]. Any derivative with a value of *lookup* must have a lookup table text file of the same name in **./LookupTables/**



* *MassProperties.txt* Contains weight [lbf], center of gravity [ft] and inertia [slug/ft3] values for the aircraft



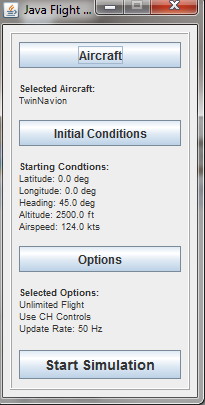
* *GroundReaction.txt* Contains landing gear position relative to center of gravity [ft], spring [lbf/ft], damping [lbf/ft/sec] and braking data



* *Description.txt* Short description of the aircraft, displayed in the Aircraft menu when selected
* *PreviewPicture.jpg* Picture of the aircraft displayed in the Aircraft menu when selected. The size of the image must be roughly 430 x 230 pixels

# Menus

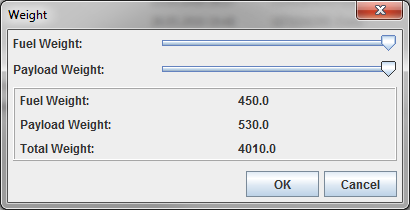
Upon starting Java Flight Simulator, the following main menu will appear:



The main menu of Java Flight Simulator contains buttons to select an aircraft, initial conditions, configure simulation options and start the simulation.

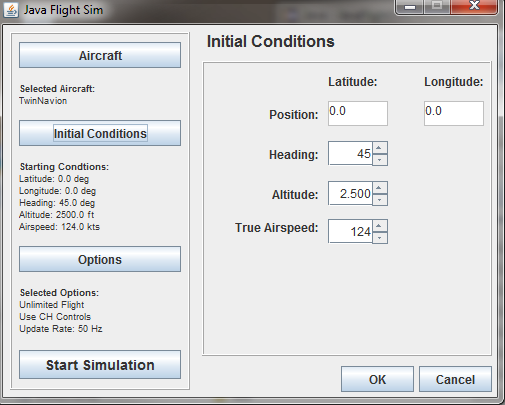
## Aircraft

Select an aircraft from the available aircraft the dropdown window. The weight of fuel and payload can be configured by selecting **Configure Weight**:



The fuel weight and payload weights are adjusted by moving the sliders, which then recalculates the total weight for the aircraft.

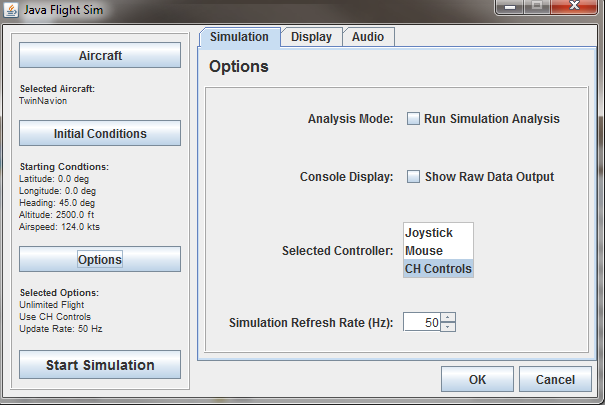
## Initial Conditions



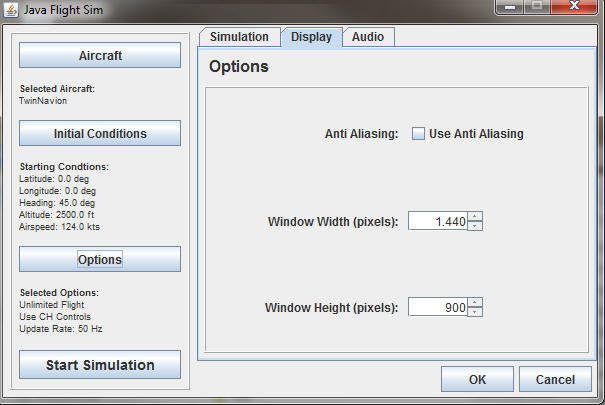
Initial values for the aircraft’s ~~position [deg]~~, true airspeed [kts], altitude [ft] and heading [deg] are specified here.

## Options

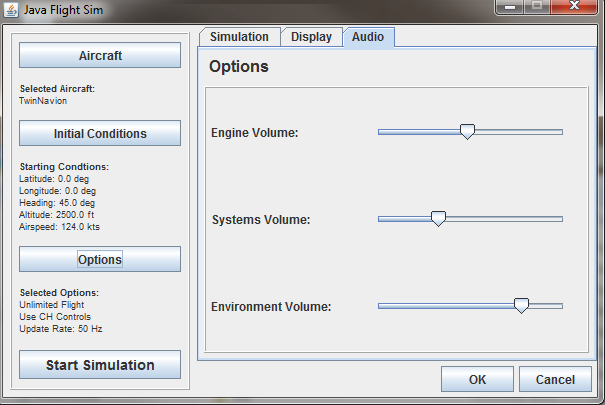
### Simulation



### Display



### Audio



# Controls and Hotkeys

# Simulation Modes