Crop Duster X

Documentation

http://cropdusterx.weebly.com

Version 2.01
02.06.2017

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1. Overview

Crop dusting is back in flight simulator world, but this time not as a static mission.

This addon application for “Microsoft Flight Simulator X ®” and “Lockheed Martin Prepar3d® V2, V3 & V4” puts you in a completely dynamic environment.

- Generate fields randomly or in any specific place you like.
- Fields will suffer from different conditions that need individual remedies.
- Crop “health” will get worse over time.
- Fly low! Dusting agents lose effectiveness very fast at altitudes above 50ft.
- A score is calculated based on how fast you manage to dust the crops before they start degrading.
- Send out AI airplanes to assist you.
- Use any plane in your FS hangar.
- Refill your tanks and change your loadout at the airport.
- Handle the effects of weight shift when dropping dusting agent from your aircraft in large quantities.
- Tweak every aspect of the simulation to your liking.
- Save or load settings profiles.
- Save or load situations.

2. Installation

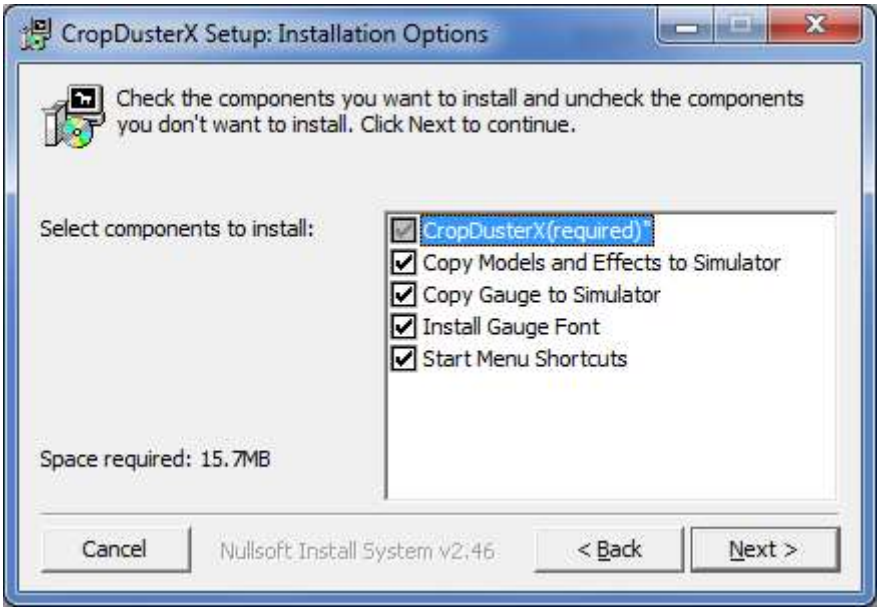
2.1 Distribution

CropDuster X is distributed as self-extracting installer packages.

2.2 Installation

- Please use the installer intended for your sim:
  - FSX Acceleration boxed or dual install with SE: *CropDusterX_Install.exe*
  - FSX SE stand alone: *CropDusterX_SE_Install.exe*
  - Prepar3D V2.5: *CropDusterX_P3D_Install.exe*
  - Prepar3D V3.x: *CropDusterX_P3D_V3_Install.exe*
  - Prepar3D V4.x: *CropDusterX_P3D_V4_Install.exe*

Running the installer:



On the first page you may select optional installation targets:

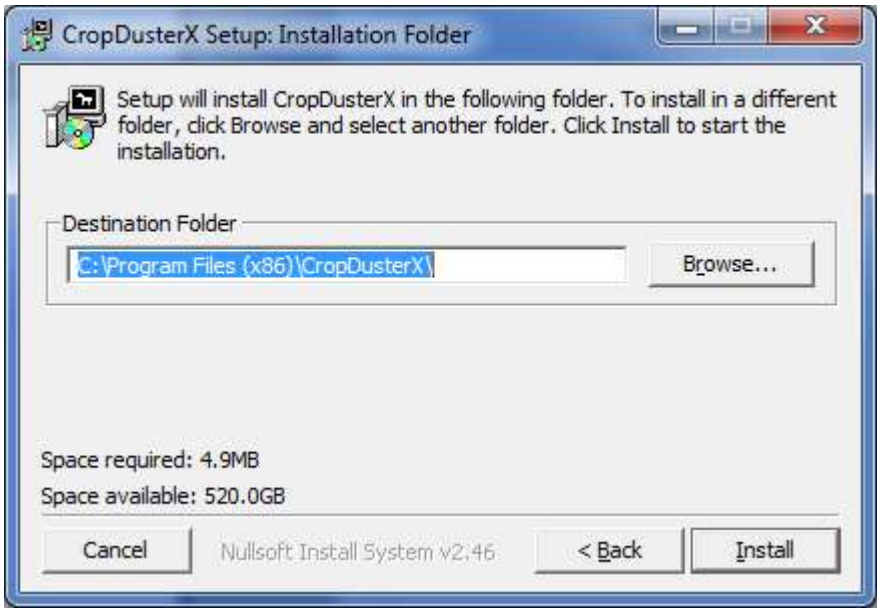
- "Copy Models and Effects to Simulator" (not for P3D V4) : The installer will read the default path to your simulator from the Windows Registry and copy the CropDusterX effects and SimObjects directly into it.

- “Copy Gauge to Simulator” (not for P3D V4) : copies the necessary files for the LiteStar 3 gauges to your simulator directory

- “Install Gauge Font”: automatically installes the necessary TrueType font file in your windows system.

- “Start Menu Shortcuts”: CropDusterX will be added to your Start Menu (advised)

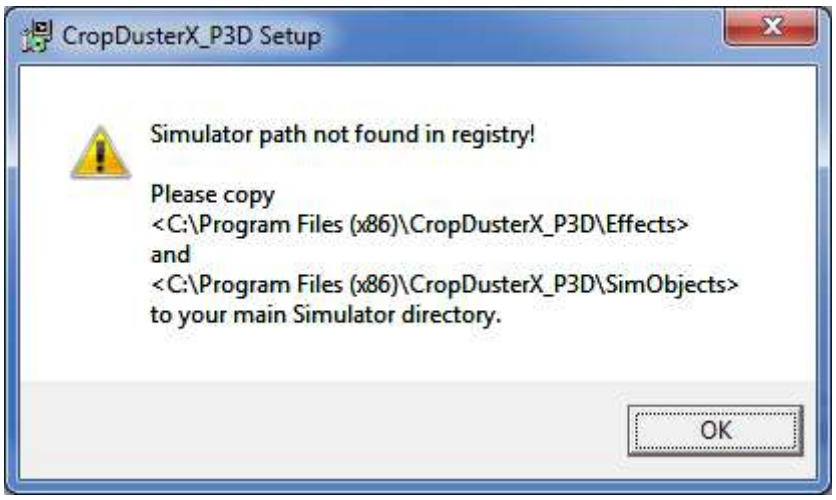
- On the next page you choose the installation path for CropDusterX. **THIS IS NOT THE PATH TO YOUR SIMULATOR DIRECTORY, IT IS USED EXCLUSIVELY FOR CropDuster X!**



- Selecting “Install” will begin the installation

Troubleshooting:

- If your simulator can not be detected in the registry, the installer will show an error message.



In this case, you will have to copy the necessary files to your main sim directory yourself.

2.3 Microsoft .Net 4.0

The CropDusterX requires that the .Net ("dot Net") library version 4.0 is installed and current on your PC. This will most likely be the case if you are running a modern PC with Windows 7 or if you are using FSX SE or P3D V2/3ff.

On older PCs it may be required to download and install Microsoft .Net 4.0. The download can be obtained here:
https://www.microsoft.com/en-us/download/details.aspx?id=17851

2.4 SimConnect

CropDusterX relies on SimConnect being installed correctly on your computer. SimConnect is a part of FSX/P3D and it is set up automatically when you first install the simulator. To save you the trouble of installing the SDK, the necessary SimConnect DLL for each sim is shipped inside CropDusterX and gets deployed in your Temp folder when CropDusterX is run.

FSX only: In case SimConnect is not installed, and CropDusterX does not start up, giving you an error message instead, you will have to install SimConnect manually:

- FSX boxed users can find the "SimConnect.msi" installation file either online or in the FSX SDK folder "..\Microsoft Flight Simulator X SDK\SDK\Core Utilities Kit\SimConnect SDK\lib"

- FSX SE users find it here:
  "..\Steam\steamapps\common\FSX\SDK\Core Utilities Kit\SimConnect SDK\LegacyInterfaces\FSX-SP1\SimConnect.msi "

SimConnect networked: it is possible to run CropDusterX on another computer, but considering the huge amount of data it needs to exchange with the sim it is not advisable to use a configuration like that.

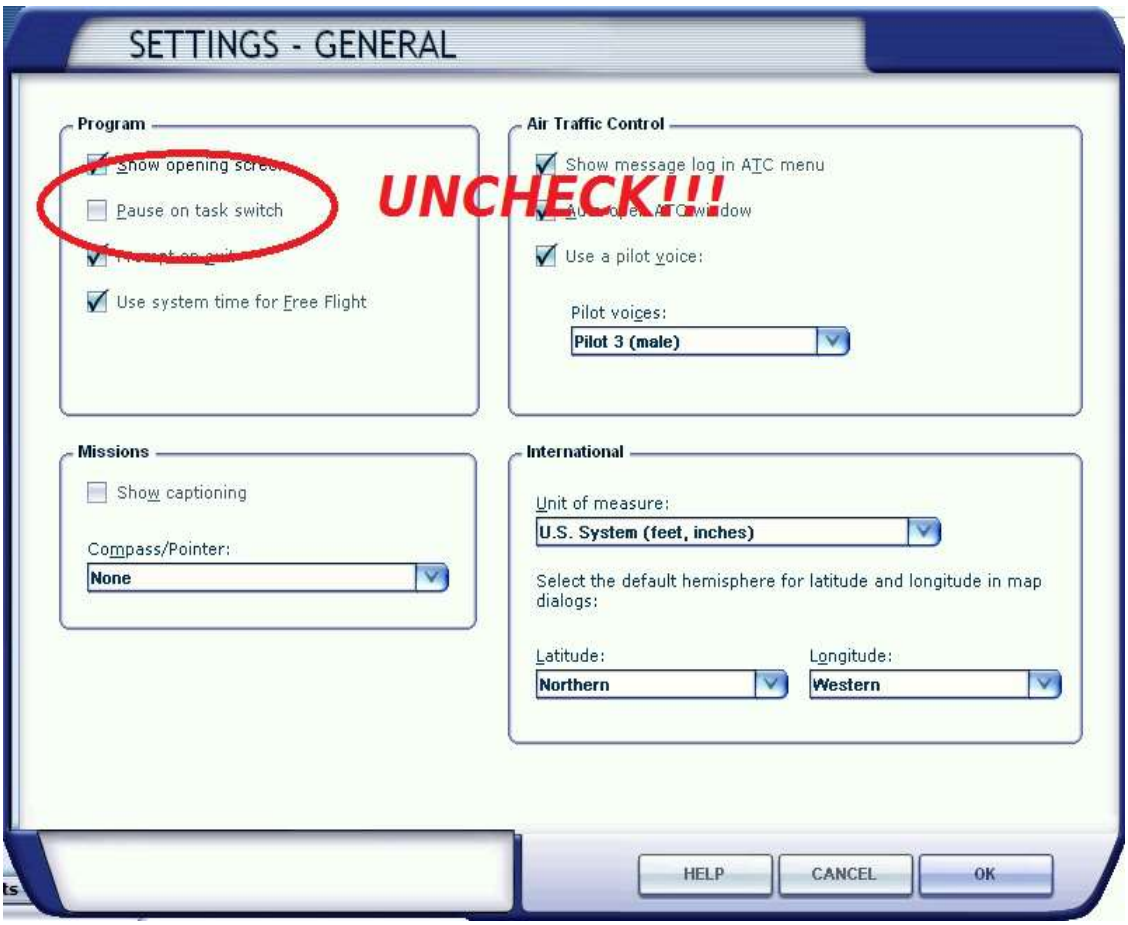
2.5 VSYNC

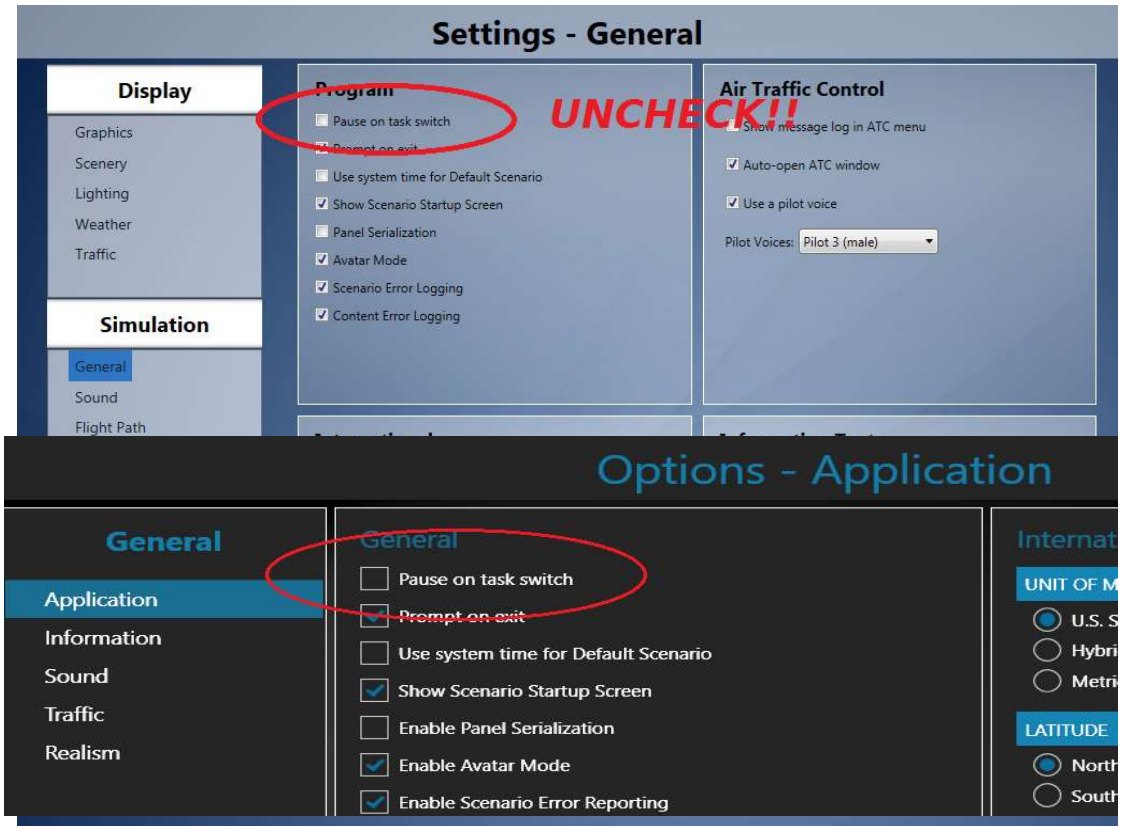
If Vsync is activated, either in the sim or externally (for example through Nvidia Inspector), the green status bar display may lead to periodic (one second) stutters in the sim. To counter this effect, an alternate status display has been implemented, using a window (similar to the ATC window). Using this will rid your sim of the stutters, but the window will gain focus every second, making it necessary to switch it off if other windows need to be operated. It does not affect gauges or panels though, neither in VC nor in 2D.
Please refer to the chapter "In the sim" for further information.

2.6 Pause on Task Switch

CropDusterX is a separate application, a task independent from your simulator.

It is therefore extremely important, that you switch the "Pause On Task Switch" option OFF in your simulator. If you leave it on, the CropDusterX will not work correctly!


SETTINGS - GENERAL
Program
Show opening screen
Pause on task switch
Prompt on exit
Use system time for Free Flight
UNCHECK!!!
Air Traffic Control
Show message log in ATC menu
Auto-open ATC window
Use a pilot voice:
Pilot voices:
Pilot 3 (male)
Missions
Show captioning
Compass/Pointer:
None
International
Unit of measure:
U.S. System (feet, inches)
Select the default hemisphere for latitude and longitude in map dialogs:
Latitude:
Northern
Longitude:
Western
HELP
CANCEL
OK


Settings - General
Display
Graphics
Scenery
Lighting
Weather
Traffic
Simulation
General
Sound
Flight Path
Program
Pause on task switch
Prompt on exit
Use system time for Default Scenario
Show Scenario Startup Screen
Panel Serialization
Avatar Mode
Scenario Error Logging
Content Error Logging
UNCHECK!!
Air Traffic Control
Show message log in ATC menu
Auto-open ATC window
Use a pilot voice
Pilot Voices:
Pilot 3 (male)
Options - Application
General
Application
Information
Sound
Traffic
Realism
General
Pause on task switch
Prompt on exit
Use system time for Default Scenario
Show Scenario Startup Screen
Enable Panel Serialization
Enable Avatar Mode
Enable Scenario Error Reporting

2.7 Airplanes

CropDusterX works with every airplane in your hangar. It will fill up the payload stations available with dusting agent of the weight you specify and it will drop it accordingly.

In some instances the airplane model you chose will not be able to carry the amount of dusting agent that you specified. In this case, please use the built-in payload manager to add payload stations.

2.8 Multiplayer and AI airplanes

In order for CropDuster X to show the correct airplane models in a multi-user environment or as AI crop dusters, these models need to be installed into your simulator first. Please refer to the documentation coming with these models for the correct procedure.

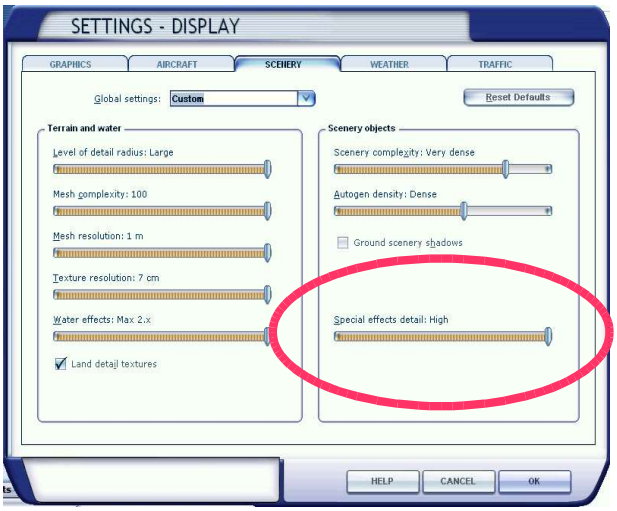
The default plane for AI initially is the Piper Cub of the stock aircraft, as that one is present in every version of the ESP based sims.

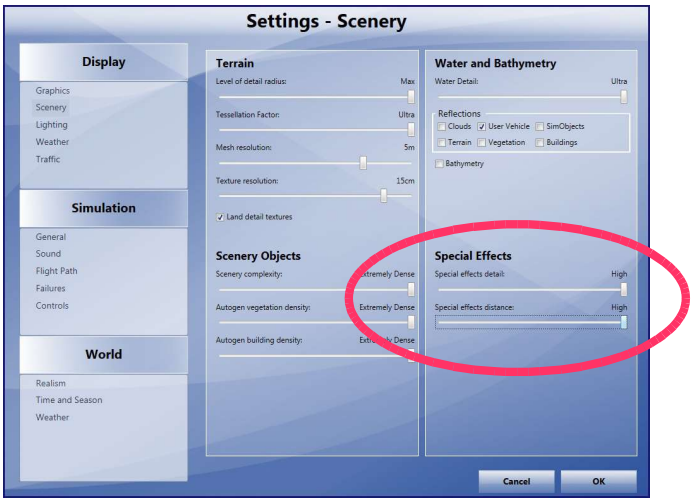
Networked: CDX will automatically try to find the other player's airplane in your sim. If it cannot find it, it will use the default airplane model.

AI will always use the default model until you add others.

More about adding AI models or player aircraft in the Settings chapter below.

2.9 Effects settings





To get the most out of the drop effects, make sure you set "Special effects detail: High"

2.10 Network

To use the multi-user features of CDX, two or more computers have to be connected over a network. The version or make of simulators used are of no consequence, as CDX uses its own protocol for multi user operation. You can connect any number of FSX boxed, SE or Prepar3D in the same multi user session through CDX.

CDX does not have a dedicated "server" program, instead every CDX installation can be used both as a server (hosting the fields) or as a client connecting to that server.

The depiction of the other player's airplanes by CDX can be turned off too, so as an alternative you can additionally use the multiplayer features built right into the simulator or any external multiplayer application (for example like FSHost).

Network parameters:
Port (6076):
CDX wants to communicate over a single UDP port (initially 6076), so you need to allow passage through this port in your firewall and/or router.

IP-Address:
For the clients to connect to the game “master”, the connections to the relevant IP addresses have to be allowed too in firewall and router.

If your computer is located behind a router, you will have to add a port forwarding rule to your router for this to work. This mostly is not needed if all the computers running the simulators are connected to the same local network (LAN). But port forwarding is always needed, if you are connected to the internet by a local router and want to use multiplayer features over the internet.

Please refer to the documentation or online resources about

- How to allow a specific UDP port in your Windows firewall
- How to allow access for specific IP-addresses in your Windows firewall
- How to add a port forwarding rule to your router

2.11 Object collisions

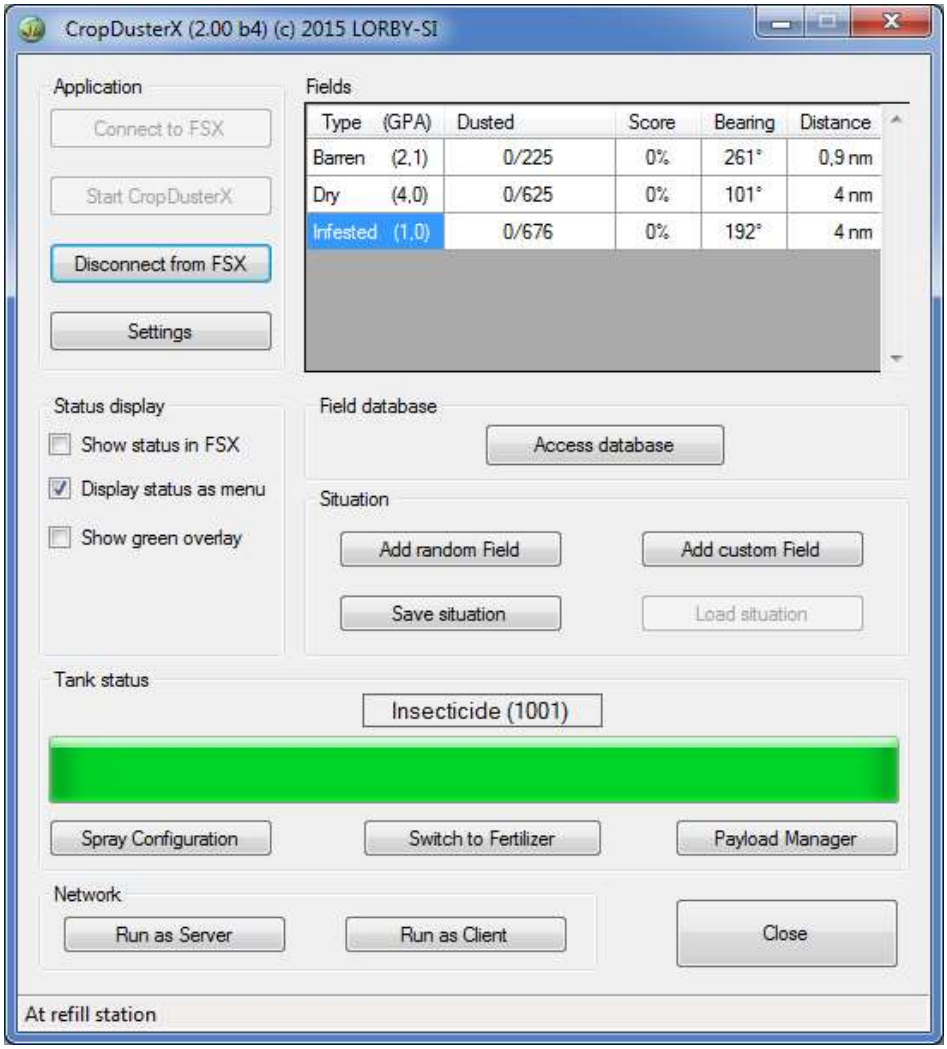
The visual drop effect is made of a multitude of simple objects. Unfortunately these objects are solid, as all objects are in the sim. Due to this restriction you may run into “Object collisions” with your plane crashing while pulling extreme manoeuvres during the drop.
If this happens frequently, please move the visual effect away from your plane, by using the height and length adjustments in the Settings window “Drop configuration”. Another method is to turn off crash detection completely in the sim (Aircraft->Realism Settings->Ignore crashes and damage).

3. Quickstart

Jumping right into the action is easy:

1. Start up the simulator
2. Go to “Free Flight”
3. Select any airport you like
4. Select the Cessna 208 Grand Caravan or similar aircraft
5. Click on “FLY NOW!”
6. Wait until you are sitting in your aircraft
7. Start CropDusterX by double-clicking the “CropDusterX.exe”
8. Click on “Connect to FSX”
9. Click on “Start CropDuster X”
10. In the sim go to the menu “Aircraft → Fuel and Payload” and reduce the fuel load until the weight of the aircraft is correct (leaving about 30% in the main tanks should do it)
11. In the “Fields” window three locations will pop up
12. Select the proper dusting agent for the field you want to fly to (dry = water, infested = insecticide, barren = fertilizer)
13. Fly the indicated heading until you are on top of the field
14. Fly really low... 25 feet AGL is a good value
15. A field is indicated by striped marker poles along its borders and by a green ground overlay effect.
16. Press “Shift+D” (release droppable objects) to start dusting
17. ...good luck
18. To refill the tank return to your starting position. Refilling starts automatically.

4. Main Window



The main window of CropDusterX will activate/deactivate buttons as appropriate.

Elements of the “Fields” list:

- *Type*: shows the type of condition the field is in
  - *Dry*: needs to be sprayed with water
  - *Infested*: needs insecticide dropped on it
  - *Barren*: is in need of fertilizer
- … and the average condition in required gallons of dusting agent per acre (GPA)
- *Dusted*: shows how many crops have already been dusted out of all present

- *Score*: a score of 100% means that you managed to dust all crops in time. If crops start to degrade or die down after a while this score will be reduced and you won't be able to achieve 100% even with all crops dusted
- *Bearing*, *Distance*: where to find the field

Other Elements:

- *Button "Connect to FSX"* initializes SimConnect

- *Button "Start CropDusterX"* starts the simulation

- *Button "Disconnect from FSX"* terminates SimConnect

- *Section "Status display"*
  - *Checkbox "Show status in FSX"* shows or hides the status line in FSX
  - *Checkbox "Display status as menu"* changes the depiction of the status bar in the sim.
  - *Checkbox "Show green overlay"* displays a sheet of green tiles on the field to make it easier to spot. This feature is connected to the "Launch bar (extend/retract)" event of the simulator, so you can bind it to a joystick button or keyboard combo (default: Shift+U)

- *Section "Field database"*
  - *Button "Access database"* opens the field database dialog

- *Section "Situation"*
  - *Button "Add custom Field"* creates a field at any coordinate point you specify
  - *Button "Add random Field"* creates a new field at a random location
  - *Button "Save Fields"* saves the current situation to disk
  - *Button "Load Fields"* loads a situation from the disk

- *Section "Tank Status"* shows how much dusting agent of which type you have left in your tanks (label and progress bar)
  - *Button "Switch to Water" / "Insecticide" / "Fertilizer"* lets you change the loadout type

  - *Button "Spray Configuration"* opens the spray configuration panel
  - *Button "Payload Manager"* opens the payload manager dialog

- *Section "Network"*
  - *Buttons "Run as Server", "Run as Client"* switch the program to the respective MultiPlayer mode

- *The status bar at the footer of the window* shows bearing and distance to your refill station plus the number of AI airplanes currently in the air.

- *Button "Close"* ends the program

5. Operations

5.1 Simulation startup

CropDusterX relies on a certain sequence of actions to work properly

!!Always start your flight (and let it finish loading) before connecting to FSX with CropDusterX!!

After connecting to FSX you can start the simulation by either

- Using the button “Start CropDusterX” to generate fields at random positions
- or loading a (previously saved or manually created) situation from the disk

The application will then create the fields and fill your tanks according to the settings you specified in the “Settings” window.

5.2 Performance considerations

Using large numbers of effect files and 3D objects in FSX or P3D comes at a price. The more fields you have in the sim, and the larger they are, the slower the sim will run. It is for this reason that the 3D crops on the fields come in two variants (tiles or single plants) and that they can be turned off, so that only the fence of striped pylons remains.

The visual drop effect is very taxing for the sim too. In case this leads to an unacceptable drop in FPS, you can switch it off completely in the Settings, by setting “0” for “Reduce visual drop density by” on the page “Drop config”.

To find the sweet spot for your system, use the Settings – you can define the maximum number of fields and their components to suit your particular sim installation.

5.3 Payload manager

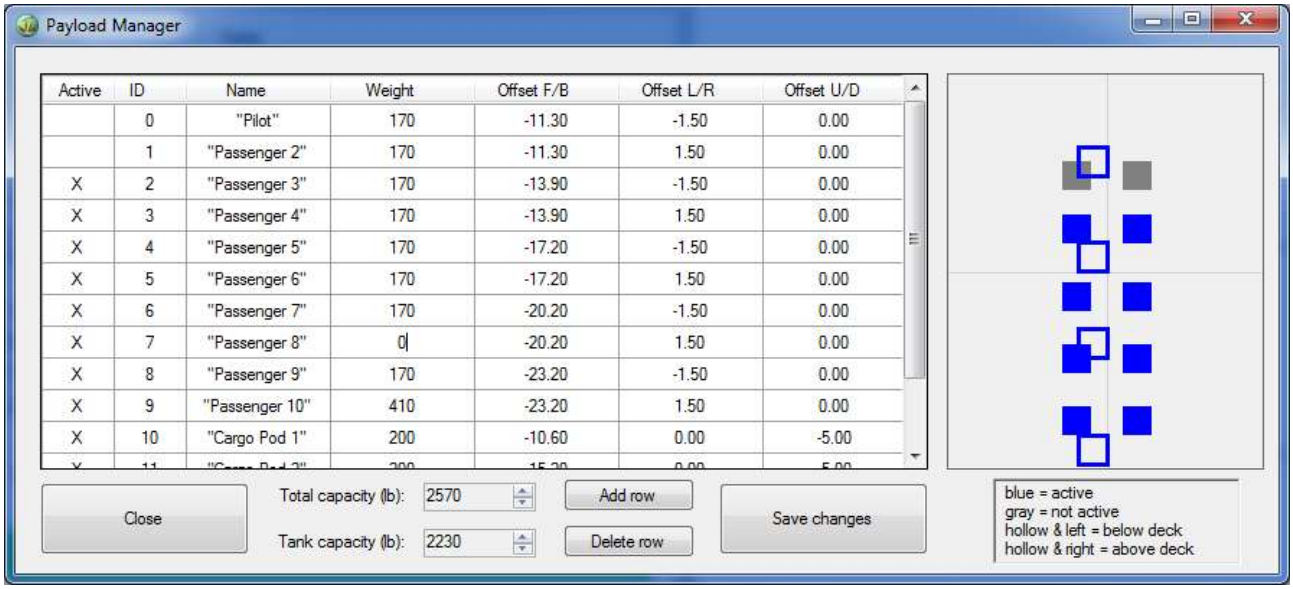
CropDuster X automatically loads the dusting agent on your plane and drops it accordingly.

When starting up the CropDuster X after connecting to the sim, it will analyse your aircraft's carrying capabilities, and fill each payload station of the aircraft with dusting agent until your desired tank size has been achieved.

If the total weight of your aircraft exceeds the maximum gross weight allowed for it, you will get a warning message.

To adjust the fuel load, please use the “Fuel and Payload” menu in the sim.

To adjust the payload, CropDuster X has a built-in payload manager. This dialog shows the actual payload configuration of the current aircraft:



- Activate or deactivate payload stations to carry retardant by clicking in column “Active”
- Adjust Weight and Positions by clicking into the cell once, then rolling the mouse wheel up or down
- Adjust the station name by double clicking and editing it directly in the cell.
- Add new payload stations with the “Add row” button
- Remove payload stations by selecting the row first, then clicking on

“Delete row”.

The graphic display on the right shows you roughly where the payload stations are in relation to your aircraft.

- Blue icon means the station is activated to carry retardant
- Gray icon means that this station is ignored by FFX
- A hollowed icon means that the station is above (depicted right of the center line) or below (depicted left of the center line) of the central point of the aircraft.

The changes that you make will be persisted, as soon as you click “Save changes”.

Persistence:
FireFighter X will remember
- the active payload stations and the tank size for every individual aircraft livery, using an internal database
- the total amount and the size of the payload stations for each aircraft model, saved in the aircraft.cfg file

5.4 Crops Lifecycle

The crops in CropDuster X “live”. The are built from “Elementals”, basically a single assembly of crops of a certain size.

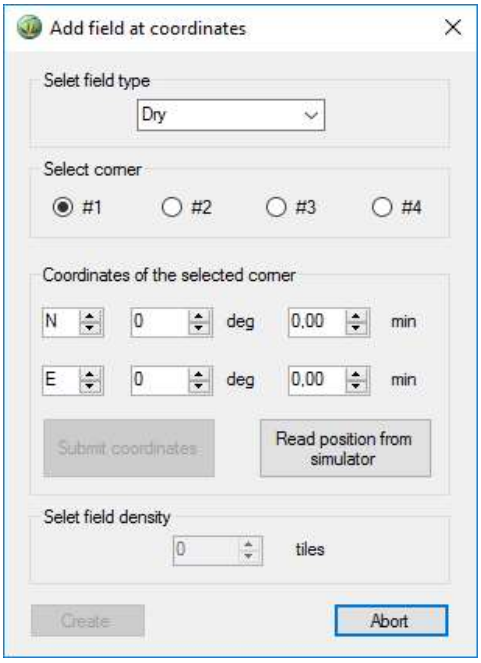
The Elementals come in four conditions: “Fresh”, “Damaged”, “Suffering”, “Dead”. If left alone, they will degrade over time, until they are dead. The timings for this cycle can be adjusted in the Settings.

5.5 Adding or removing a Field

Fields in unknown conditions and in random places can be added with the button “Add random Field”.

Fields in specific places can either be added by editing a saved situation XML file or by using the “Add custom Field” button.

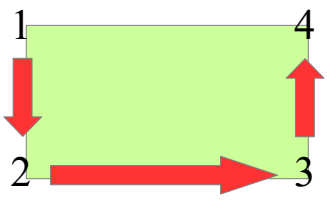
After you are connected to the sim and CDX is started, this button will become active. Clicking on it will open an additional window:



First, select the type of field that you want to create.
Then the corners of the field are created as follows:

- Position your aircraft on the first corner (1), for example in slew mode
- Press “Read position from simulator”
- The coordinate fields are populated with your current position.
- You can now edit the values or use them like they are
- Press “Submit coordinates” when you are satisfied
- The dialog will switch to corner (2)
- Proceed to that corner in the sim, repeat the procedure.
- Repeat until all corners have been set, then “Create” the field
- You can adjust the density of crops in the field if you want. The default value is calculated automatically.

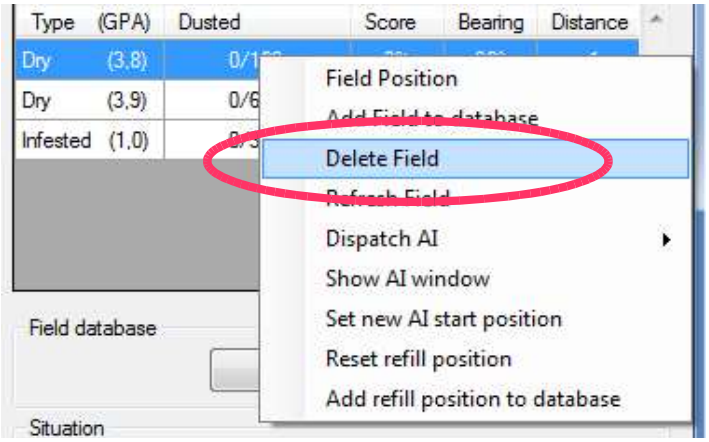
The corner definition sequence is:



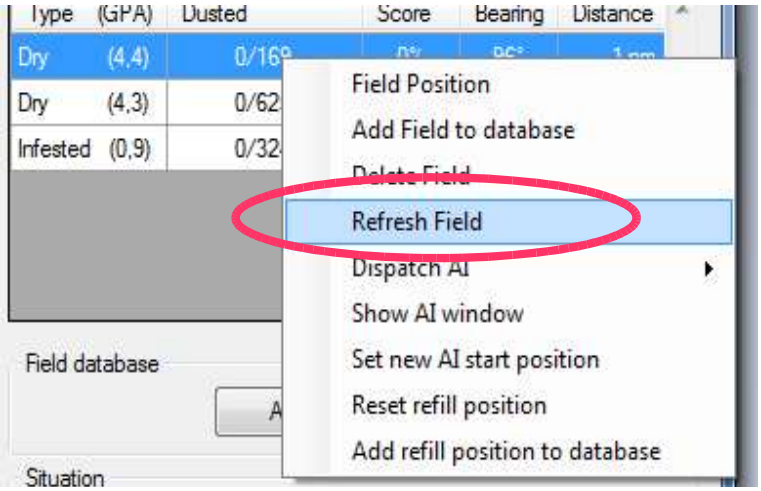
Limitations:
Crops can not grow everywhere, and CropDuster X will only generate fields and elementals on fertile surfaces.

Hint:
Remember to save your field with the button on the main dialog, when you have created it.

To **remove** a field from the list, you can move your mouse over the entry in the list and click on it with the right mouse button. A context menu will pop up, and if you click on “Delete Field” , that field will be removed from the list and from the sim. Note: The maximum number of fields in the Settings will be reduced as well.

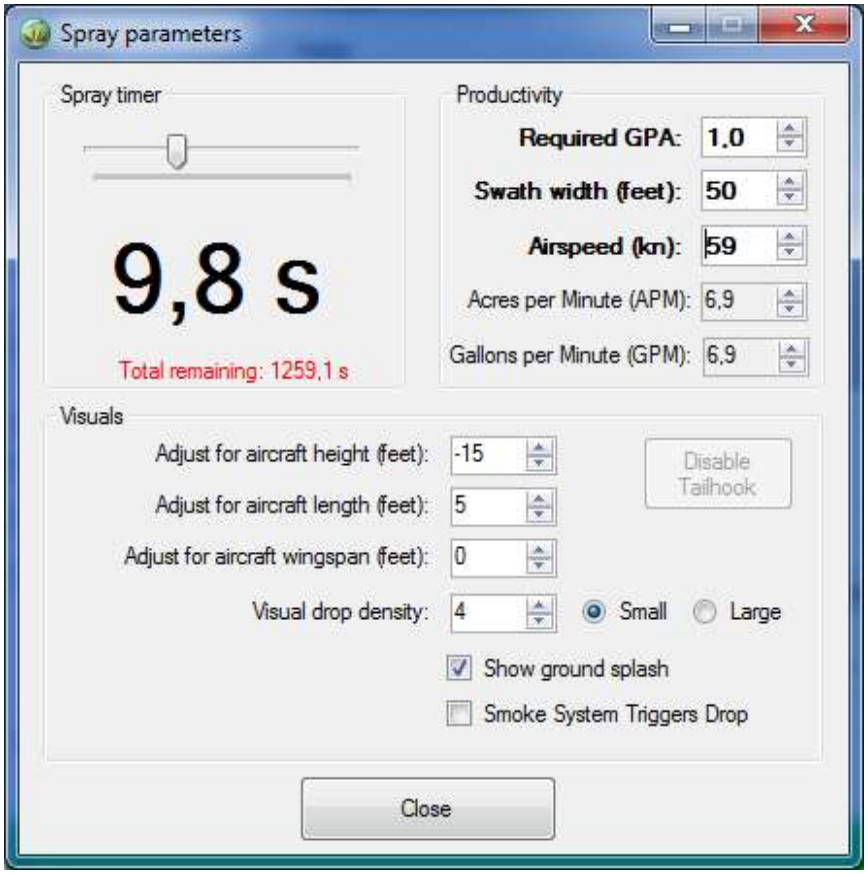


To **reset** a field to its original “fresh” state, use the “Refresh field” option from the context menu.



5.6 Spraying and spray configuration

In the “Spray Configuration” dialog you specify the key elements of the crop dusting simulation:



First, select a timer value – this should correspond to the time that it takes your aircraft to fly along one swath of the field.

Pressing the trigger once will start the release of dusting agent at the rate specified. The dispersal will continue until either the selected timer value has been reached, or until you press the trigger again,

The amount of dusting agent necessary to dust crops of a certain condition can be adjusted with the calculator on the right:

- Set the GPA (gallons per acre) value that is required for the field that you want to spray (the list of fields on the main window will give you an average value for the GPA)
- Adjust the swath width that your aircraft will spray. This number is usually something between 50 an 80 feets, depending on aircraft

model
- Set the airspeed that you will hold when spraying the field

All of these parameters will influence the amount of dusting agent that is dispersed per minute, and this will determine for how long you can keep spraying until your tank is empty ("Total remaining: xx seconds")

The application will calculate the points on the ground where the dusting agent "cloud" will hit, and it handles all Elementals according to the amount that hit them.

Crops "remember" the amount of dusting agent dropped on them. Depending on their size and condition, it may take several passes until a patch of crops is registered as being completely covered.

The dusting properties of your drops diminish with altitude – you will have to fly really low (25 feet or less – can be adjusted in the Settings) for them to have maximum effect. The dusting agents will lose effectiveness quickly when you fly above 25 ft, and multiple passes may be required to dust the crops.

Visuals settings

- *Adjust for aircraft height (feet):* curiously, some airplane models in FSX show the current altitude relative to a point on the top of the visual model. **If not corrected, the visual drop effect will begin somewhere inside the airplane model!**
- *Adjust for aircraft length (feet):* This is a visual setting too, and it determines the point on your fuselage the retardant effect objects will appear when dropped.
- *Adjust for aircraft span (feet):* Setting this to a value above 0 will generate two visual drops, one to each side of your aircraft instead of a single one. The value of the setting determines the distance these drops are apart when generated.
- *Visual drop density:* this controls the density of the visual drop effect (5 = very dense, 1 = sparse, 0 = off). This will help performance if the visual effect is too demanding for your system resulting in low FPS.
  Setting this to "0" turns off the visual effect completely (the fires will

still get put out though, even if you can't see the water falling)
- *Small/Large*: determines the size of the visual drop effect elements.
- *Show ground splash*: Turn the ground splash depiction on or off. The ground splashes are only visible for a limited amount of time, but with this checkbox you can turn them off completely.
- ***Smoke System Triggers Drop*: If this checkbox is activated, CropDuster X will trigger the retardant drop if the "Smoke System On/Off" toggle is sent. Use this, if you prefer aircraft that have their own drop effect built in and you don't want to use the visual effect of the CropDuster X. If you set "Reduce Visual drop Density" down to "0", the visual effect from CropDuster X will disappear.**

Bound simulator events

The timer and the percentage can be adjusted remotely by sending these simulator event Ids:

- EGT3_INC, EGT3_DEC: to increase/decrease the timer value

The values of the controls are transmitted back to the simulator as the values of:

- the "WATER RUDDER HANDLE POSITION" for the timer (multiplied by 10)
- the "TAILHOOK POSITION" for the current fill level of your tanks in percent

Note: the TAILHOOK POSITION variable may not work correctly, if your aircraft actually has a tailhook. In that case you can disable the tailhook entries in the aircraft.cfg with the button "Disable Tailhook" (otherwise it is disabled)

5.7 Refilling your tank

CropDusterX will initially use the coordinates where your plane is located as the position of your refilling station. This happens when you press the button “Start CropDusterX” or load a situation.

The position of the refill station can be changed to your current position at any time by selecting “Set new refill position” from the field context menu

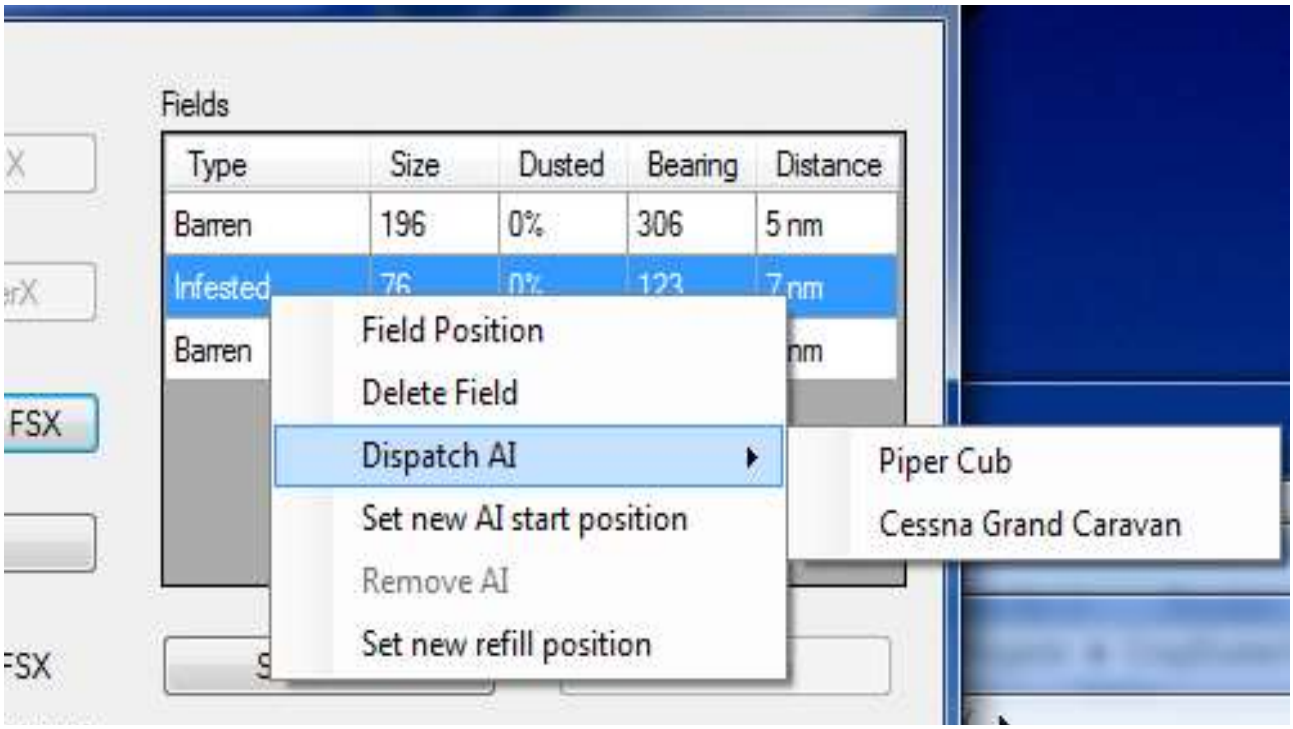
To mark the refill position visually, CropDuster X creates a standard fuel or utilities truck model at your right wingtip.

Refilling is easy: just return to your refill station by using the information in the status display and pull up to the truck. Refilling will begin automatically. You can adjust the time the refilling takes in the “Refill/Scoop” Settings.

In case you just want to keep dropping water, the “Instant Refill Cheat” can be activated in the “Refill” Settings. If your tank is empty, keep triggering the drop until you get the “Instant refill” button – clicking the

button or just pressing the trigger again repeatedly will refill your tank immediately.

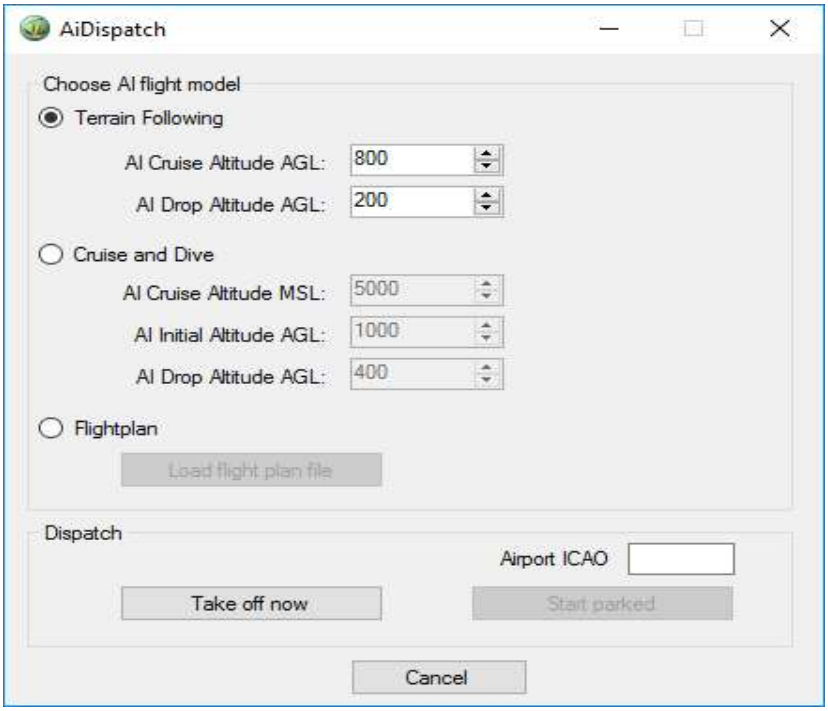
5.8 AI Traffic



You can send out AI aircraft to every field on the list, by right-clicking on the field, then first selecting “Dispatch AI” followed by left clicking on the desired model.

5.10.1 Flight model

Next you choose the flight model that AI uses to approach the field:

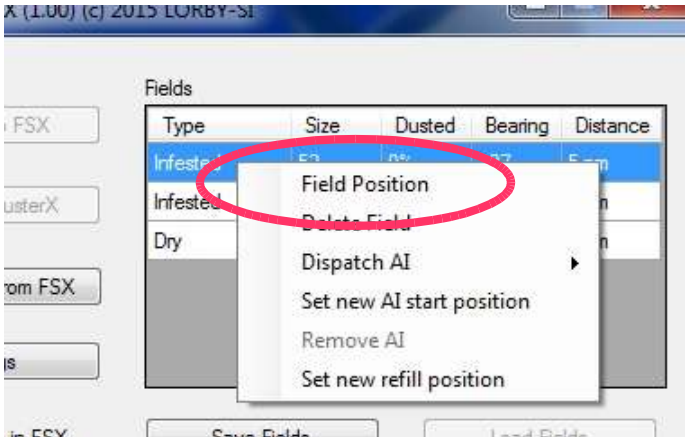


There are three flight models available:

Cruise and Dive:
These airplanes will take off, climb out to the cruise altitude, fly towards the fields, dive & turn at the Initial, drop the dusting agent and climb back out. This mode is designed for the fast and the heavy, as they need time to make their turns and get aligned. It works best for fields that are farther out, depending on airplane type.

Terrain Following:
These airplanes will take off, fly out to the field at the specified cruise altitude above ground, make their run dropping dusting agent and then return home and land. This only works for fields closer than 20 miles, or else the internal flight plans get too long for the simulator too handle and the AI planes gets stuck on the runway.
Additionally, the aircraft cannot be too large or too fast, terrain “hugging” is not for the likes of DC-10 or F-18 (at least not under simulator AI control).

Flightplan:
This will open an Explorer window for you to choose a flight plan file. This file you have to prepare in advance, by using the internal flight planner in the sim or any flight planning software at your disposal (FSX/P3D flight plan format required). The AI aircraft will then start at a parking position at the designated airport in the file and fly to the destination. If it flies right over a field, it will drop dusting agent too, so make sure to include at least one waypoint at the fields position. Use the "Field Position" option in the context menu to get the exact coordinates.



5.10.2. Dispatching AI

There are two options to dispatch AI

5.10.2.1 "Take off now"

This will create an AI aircraft at the designated starting position. Initially this is right in front of your own aircraft. The AI will then speed away, taking off into the direction you yourself are facing.
You can set this starting position anywhere where you can position your aircraft, the best place would be right on the active runway. Once set, this starting position will be remembered, so every subsequent dispatching of AI aircraft will start in this spot.

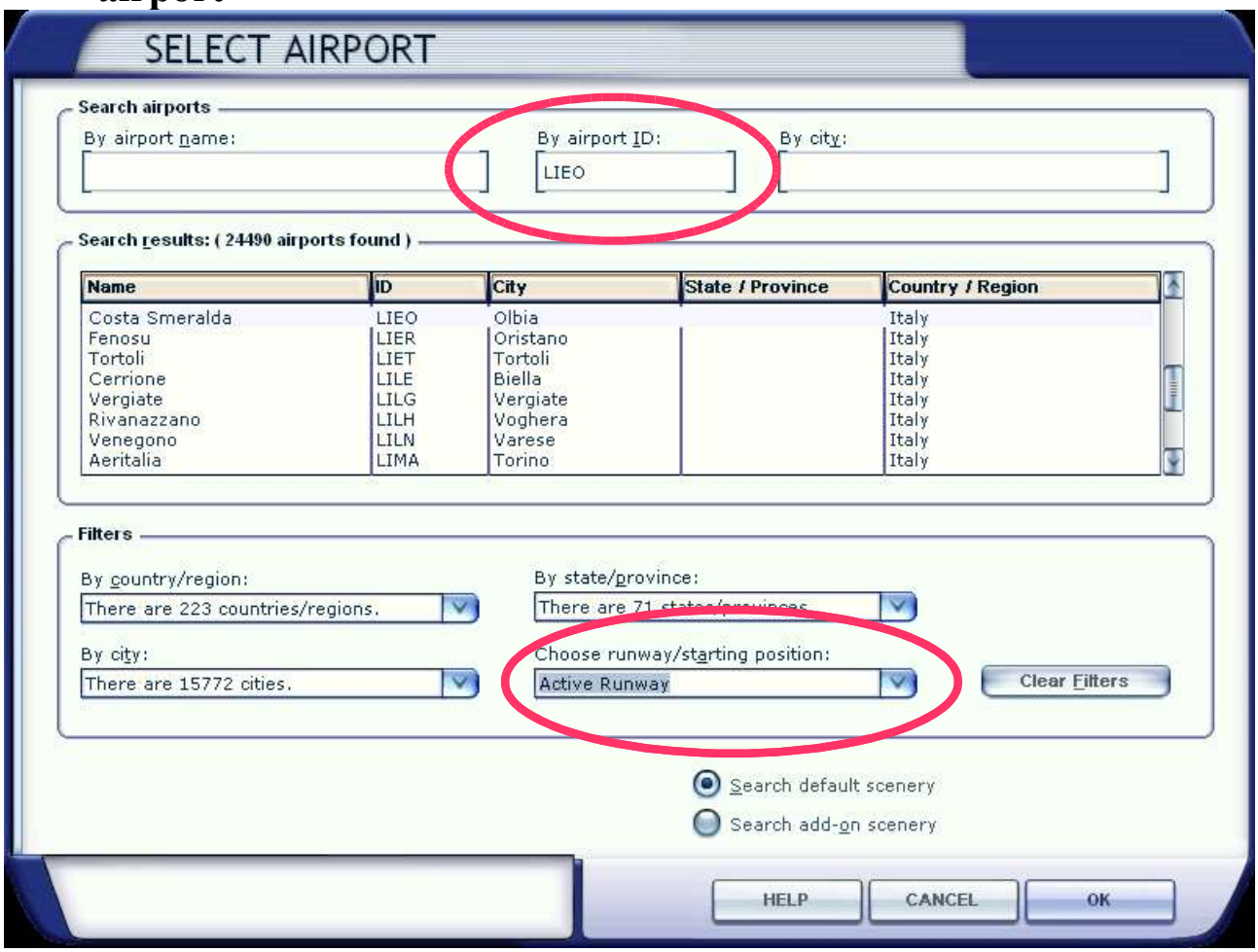
Unfortunately, due to shortcomings of the simulator's AI logic, AI planes of this type cannot taxi from a parking position to the runway.
It is imperative to set a correct starting position for them, or they will end

up taking off in any odd direction.

The easiest way to set the AI starting position for “Take off now” is to start the simulation on the active runway. Unfortunately then your refilling station will be in this spot too, which might not be desirable.

If you want to start your flight on a parking position instead of the runway

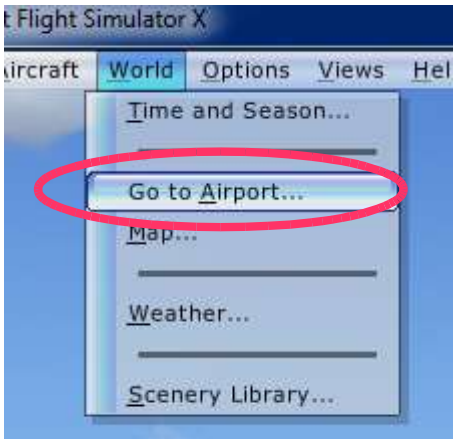
- **Start your flight selecting “Active Runway” in the dropdown selection box “Choose runway/starting position” for your current airport**

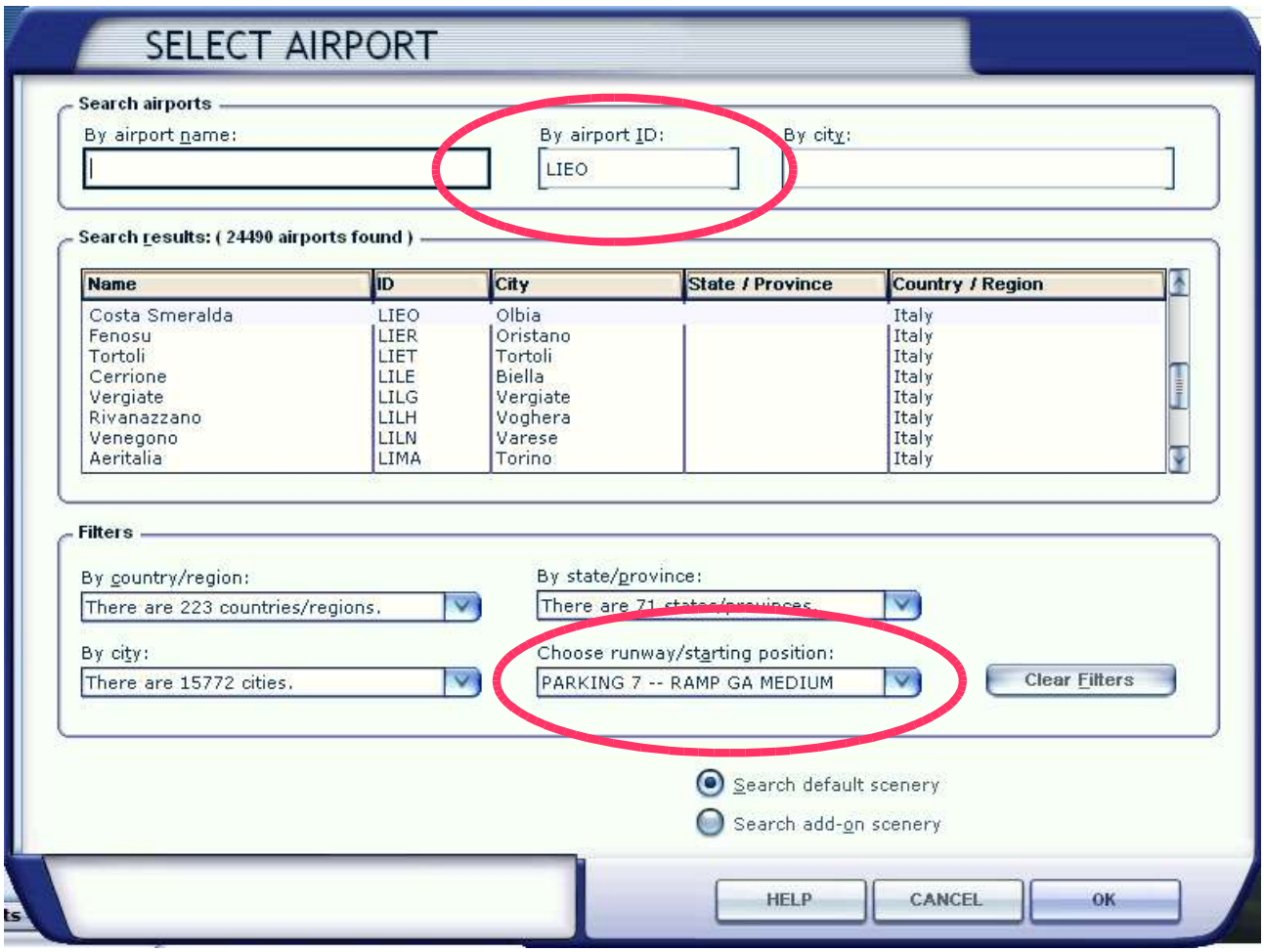


- **Once the loading of your flight is complete, open CropDuster X, Connect to the sim, Start the simulation**

- **Right-click on one of the fields and select “Set new AI start position”**

- **Return to your simulator again, select “World-> Go to Airport” and return your aircraft to the desired parking position**



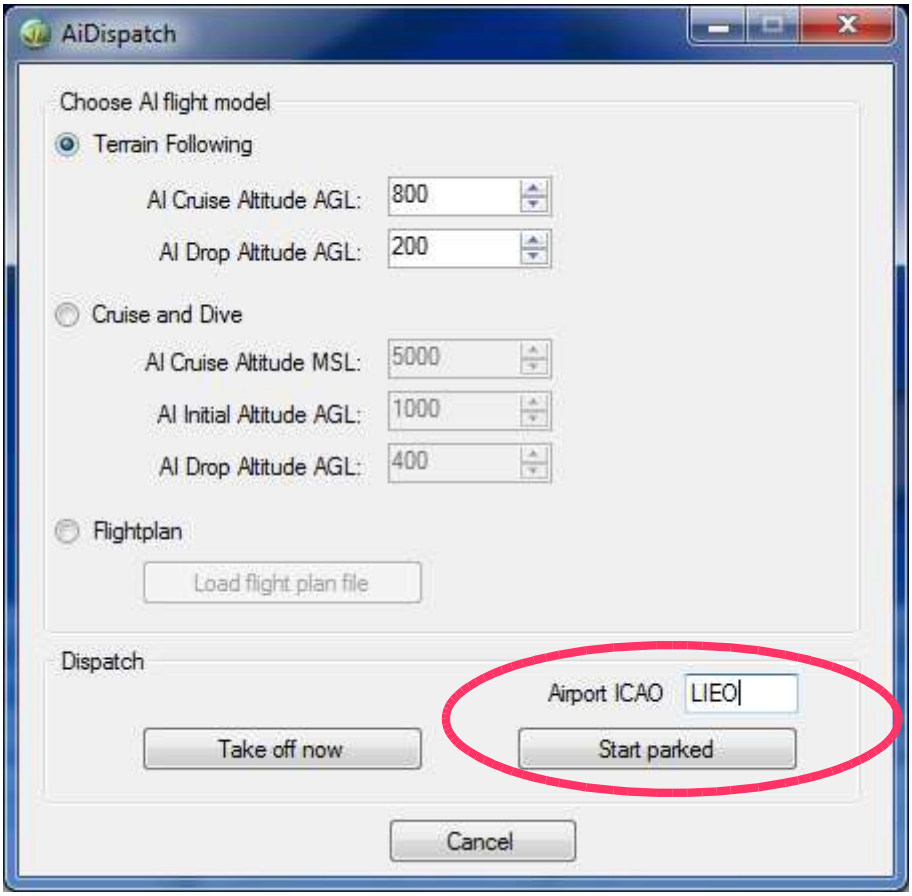

SELECT AIRPORT
Search airports
By airport name:
By airport ID:
LIEO
By city:
Search results: (24490 airports found)
Name
ID
City
State / Province
Country / Region
Costa Smeralda LIEO Olbia Italy
Fenosu LIER Oristano Italy
Tortoli LIET Tortoli Italy
Cerrione LILE Biella Italy
Vergiate LILG Vergiate Italy
Rivanazzano LILH Voghera Italy
Venegono LILN Varese Italy
Aeritalia LIMA Torino Italy
Filters
By country/region:
There are 223 countries/regions.
By state/province:
By city:
There are 15772 cities.
Choose runway/starting position:
PARKING 7 -- RAMP GA MEDIUM
Clear Filters
Search default scenery
Search add-on scenery
HELP
CANCEL
OK

- **In CropDuster X, open the field context menu by right-clicking on any field. Select “Set new refill position”.**

- **Now the starting position for AI and your refill position are set correctly.**

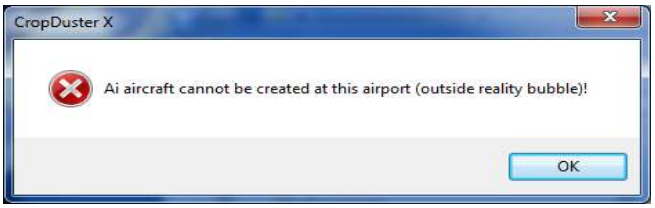
5.10.2.2 “Start parked”

If you provide the ICAO code for your current airport in the text field, the button “Start parked” will be activated.



When pushing this button, the CropDuster X will create the desired AI aircraft on a parking position of this airport, provided there is a free spot large enough for that aircraft. The AI will then request VFR clearance and taxi to the active runway, take off and fly out to the field.

Note: Unfortunately there is no method to directly determine the current airport via SimConnect (most addons use their own database or the “makerunways” tool for this). So the departure airport has to be entered manually - either the airport you are currently positioned on yourself, or one very close by. If you choose an airport outside the current reality bubble, CropDuster X will display an error message.



5.10.3 Landing

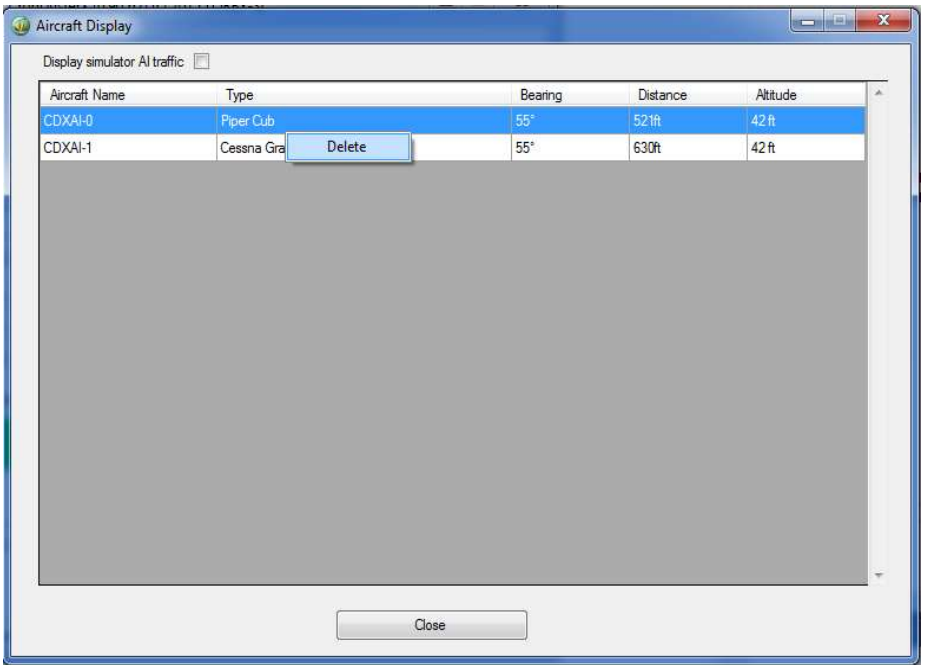
Due to limitations of the sim the AI aircraft are unable to taxi in to a parking position once they have landed.

By selecting “Remove AI after landing” in the “AI” Settings, all AI aircraft that you dispatched will be instantly removed once they come to a stop. Otherwise the aircraft will speed on, take off again and repeat the flight.

5.10.4 Displaying and Removing AI

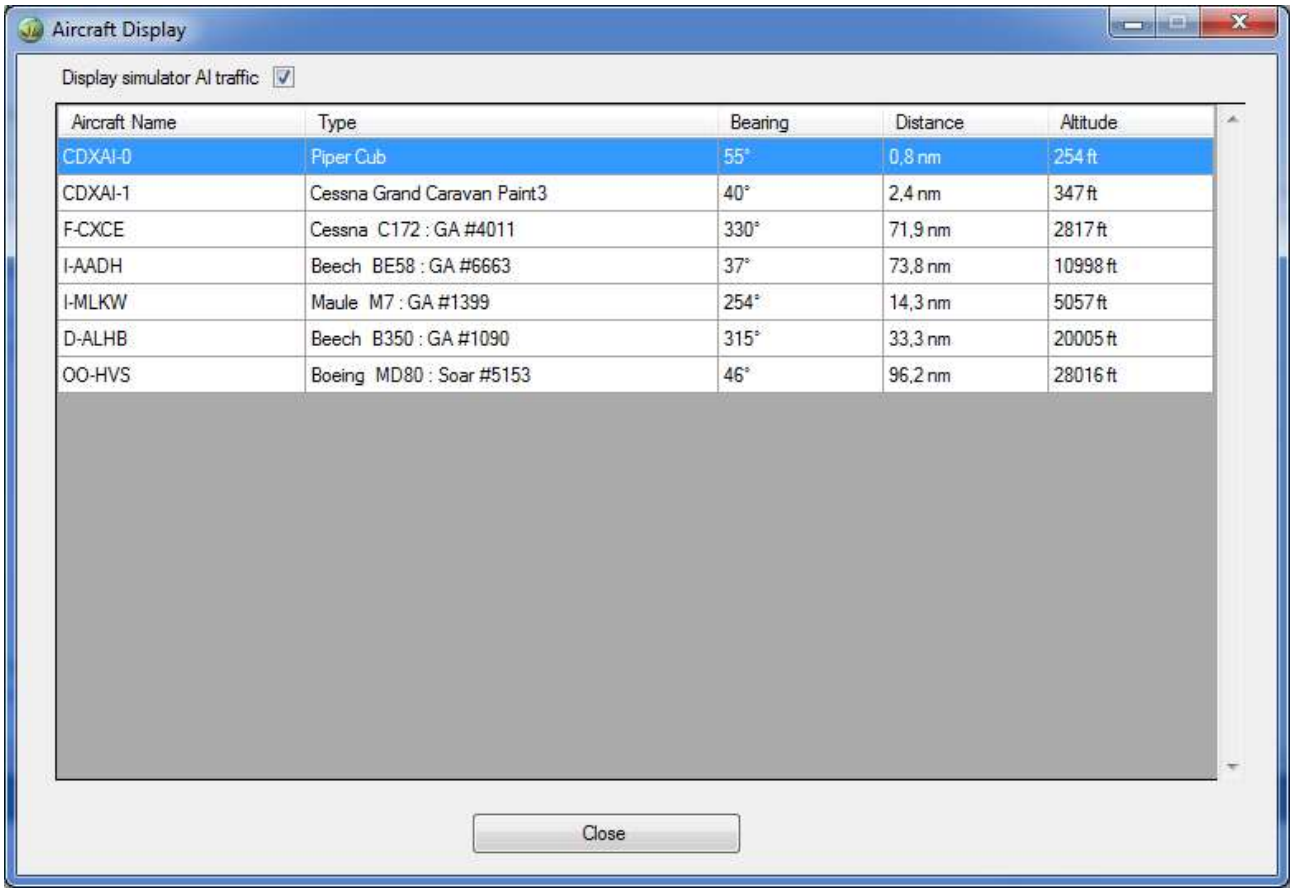
To display the exact position of the AI aircraft relative to your own and if you want to remove them, use the “ShowAI Window” option from the popup menu:

This opens the aircraft display window:



By selecting “Delete” from the popup menu you can remove individual AI planes.

If you activate the checkbox “Display simulator AI traffic” the CropDuster X will add all airborne aircraft inside your “reality bubble” (approx. 80nm) to the list:



Aircraft Name	Type	Bearing	Distance	Altitude
CDXAI-0	Piper Cub	55°	0,8 nm	254 ft
CDXAI-1	Cessna Grand Caravan Paint3	40°	2,4 nm	347 ft
F-CXCE	Cessna C172 : GA #4011	330°	71,9 nm	2817 ft
I-AADH	Beech BE58 : GA #6663	37°	73,8 nm	10998 ft
I-MLKW	Maule M7 : GA #1399	254°	14,3 nm	5057 ft
D-ALHB	Beech B350 : GA #1090	315°	33,3 nm	20005 ft
OO-HVS	Boeing MD80 : Soar #5153	46°	96,2 nm	28016 ft

5.10.5 General notes on AI aircraft

The built-in logic in the simulator handling AI aircraft is powerful, but not very intelligent. As the AI crop dusters in Terrain Following or Cruise&Dive cannot follow regular flight plans, they are created as “Non-ATC” or VFR aircraft. For some reason the simulator does not take care of those in the same way that it does with ATC- and flight plan controlled aircraft.

These planes with VFR waypoint lists have no “survival instinct” whatsoever, they will fly straight into a mountain if it is in their way. And this will happen a lot, you will frequently lose fellow AI pilots to their

inability to read the terrain.
Care has been taken to map the waypoint lists as detailed and harm-free as possible. But crop dusting can be a dangerous business, and many an AI pilot will pay the price for the simulators' shortcomings.

You can adjust the AI parameters to help them out, set higher cruise or drop altitudes and make the cruise AGL or MSL.

5.10.6 Stuck AI planes

AI planes may get stuck, circling seemingly forever or not departing from the runway at all. Best option then is to delete them, as they may not recover.

If an AI plane does not depart, this means an error has occurred with its waypoint list – you will have to change Settings before you try again. The most common problem is sending out AI planes over large distances (20 miles or more) and letting them fly AGL. This results in a list of thousands of calculated waypoints, that the simulator just cannot cope with. In that case, uncheck AGL and let them fly at MSL altitude, this reduces the waypoint list to manageable proportions.

5.10.7 AI Aircraft models

You can use any aircraft that is installed in your simulator, either flyable or non-flyable as AI. All you have to do is to find out the name (=title) of the aircraft model in its aircraft.cfg and add it to the list in the Settings window. See chapter 6 for details.

Note: Unfortunately it is not possible to use helicopters unless you massively alter their .air file and turn them into airplanes.

5.9 In the sim


Microsoft Flight Simulator X
Barren - (2.1) (Dusted 5/841, Score 1%) @ 179°, 377ft - Fertilizer: 99% - Refill station at 201 degrees 0.84 nm
L 1 133 146 R99
-> Timer
GPA
8.8
N208EH
SATLOC
LiteStar III


Microsoft Flight Simulator X
Flights Aircraft World Options Views Help Tools Add-ons
Outside View:
Locked Spot
0.50 Zoom
CropDuster X
Status
1 - Close
2 - Barren (2.1) (Dusted 27/841, Score 3%) @ 63°, 500ft
3 - Fertilizer: 96%
4 - Refill station at 220 degrees 0.87 nm
L 1 114 140 R99
-> Timer
GPA
6.6
SATLOC
LiteStar III

Status display
When activated, either a status line at the top of the screen or a menu type window are displayed. These will show you the necessary information to guide you to your refuel station or to the fields. They also show you the amount of dusting agent left in your tanks.

The display can be toggled on or off with the “Tow rope (release)” - event, either by using the defined keys (default is “Shift + Y”) or any external control bound to this event (like a joystick button).

There are no actions associated to the menu items, except “1 – Close”. The menu items are selectable, but doing so will also only close the window.

Caution:
The menu-type status display will refresh every second, pulling away the focus of any other active windows (like ATC). It should best be deactivated with the toggle key described above, when other windows need to be operated.

Field visual effect
To make fields easier to spot, a green terrain tile overlay can be activated. The marker pole objects and there distribution density along the borders of the field can be changed in the Settings menu page 1.

Drop release
To release a drop you need to trigger the “Release Droppable Objects” event in the sim, either by using the defined keys (default is “Shift + D”) or any external control bound to this event (like a joystick button).

Pausing
The application reacts to pausing the sim. As long as your flight is paused, the crops lifecycle and other “live” functions are disabled too.

Weight and balance
It is crucial to check your weight before takeoff. After you start CDX, take a look at the “Fuel and Payload” menu in the sim and adjust fuel so that the plane is not overweight (less than 30% should do it).

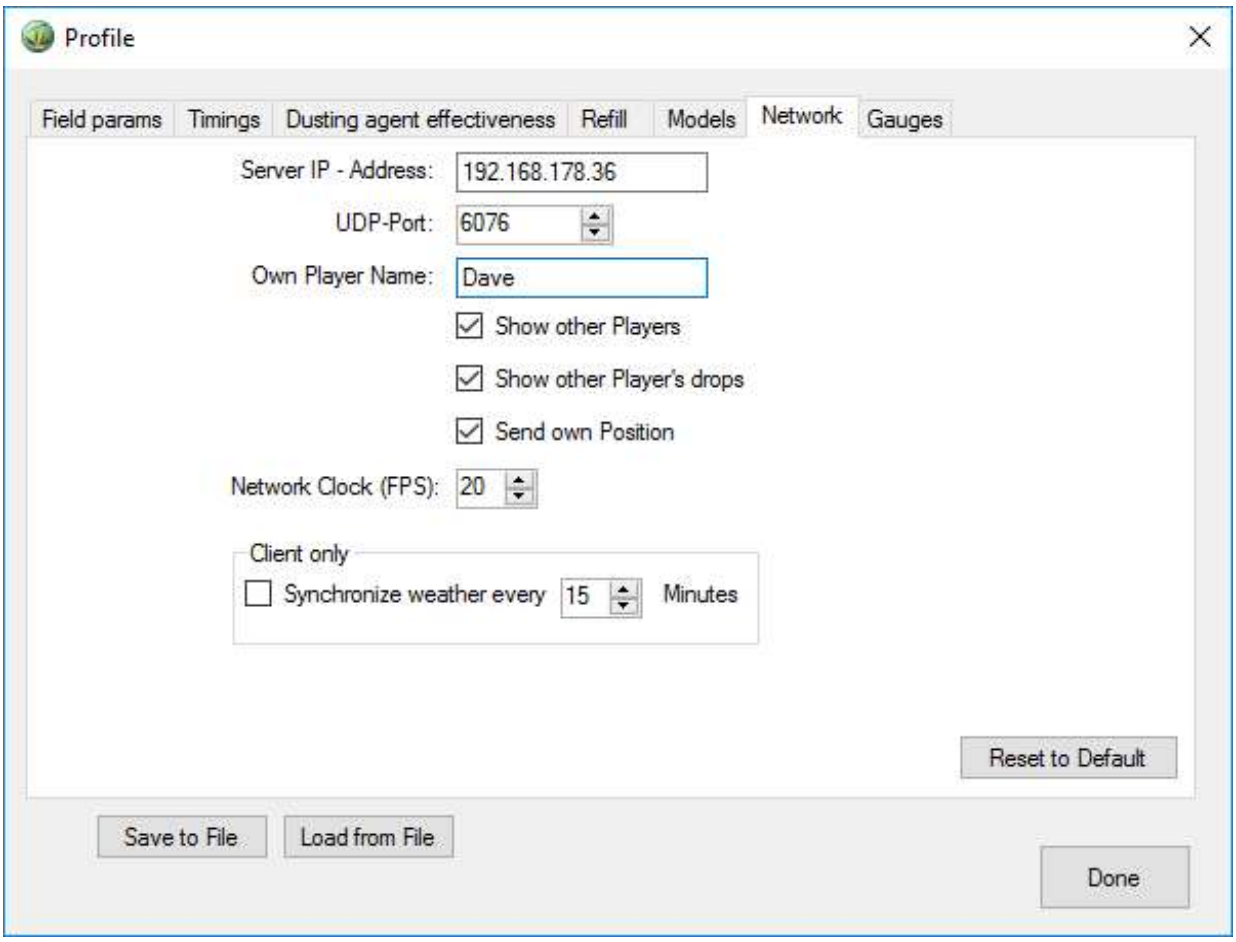
5.10 Multiplayer operations

CropDuster X was designed to work either as a server or as a client in a multi user setup, no additional software is needed.

In case you already have a multiplayer product (like FSHost) or are using the multiplayer functions built into the sim, CDX allows you to disable its own depiction modes for the other players aircraft. In that case, only the fields and dusting agent drops will be shared between the different CDX installations.

Settings
Before you start, you need to set up the network prerequisites as described in the installation chapter above.

You then enter the settings as shown in the example below:



- *Server IP-Address*: IP address of the CDX running as server to connect to

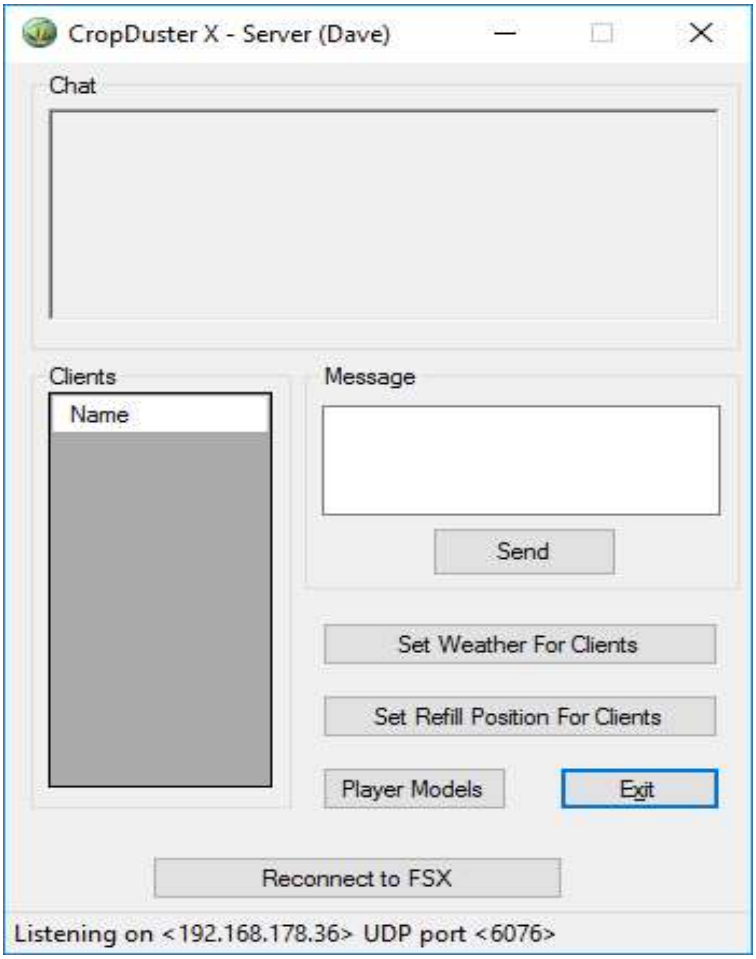
- *UDP-Port*: port for connecting
- *Own Player name*: Your name as displayed in the sim
- *Show other players*: use this to switch the depiction of the other player's airplanes on or off. Useful if your computer is not fast enough to allow fluent gameplay when multiple complex objects are visible at the same time
- *Show other player's drops*: use this to switch the depiction of the other player's dust drops on or off.
- *Send own Position*: uncheck this to make your plane disappear from the other player's sims. Again useful for slower computers or networks.
- *Network Clock (FPS)*: Frequency with which the network communication will occur. The higher this value, the more fluent the depiction in the sim will be – but be mindful of slower computers in your setup and network bandwidth considerations. If your IP connection is very slow, setting this to higher values will make no difference. But if your connection is very fast, like in a LAN, you can limit the communication frequency with a lower value, to free up bandwidth for TeamSpeak etc.

The “Show other Players” and “Send own Position” options only influence the depiction mode in the sim. The central simulation in the server- CDX will still continue, and all players will share the effects of your retardant drops, even if they cannot see your airplane in their sim.

It is important to dial down the visual density of the dust drops in the “Drop config”. If this is set on too high a value, FPS on clients and server will suffer greatly. It is recommended to set this as low as possible (1-2) or to turn it off.

Server

If you decide to run your CDX as a server, the following window will appear:

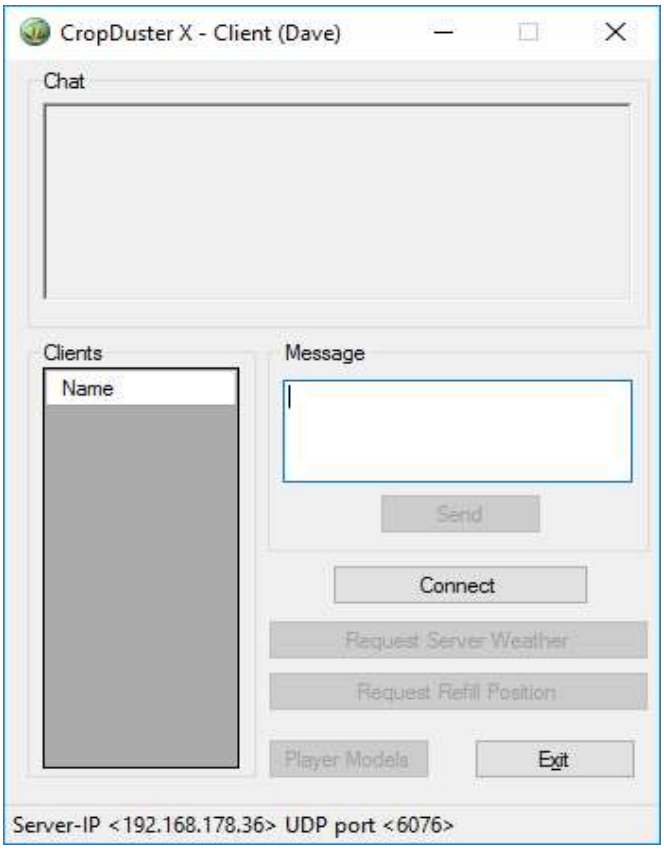


- *Chat*: view all messages from other players and technical notes from CDX
- *Clients list*: displays all players present in the network session
- *Message & Send*: type in a message and send it to all players
- *Set Weather For Clients*: Forces the current time of day and weather on all connected clients.
- *Set Refill Position For Clients*: Forces the position and sim model of the refill stations on all connected clients. Note: If clients do not have the SimObjects in your simulator to depict the refill stations, that model will not be displayed – but the position of the refill stations will change anyway. You will have to exchange the models to be used, for example via email.
- *Player Models*: opens the aircraft assignment window, where you can change the model displayed for a player (described in more detail below)

- *Exit*: shut down the server.
- *Reconnect to <sim>*: on occasion it may happen that SimConnect stops working and does not tie into CropDuster X any more. The application will continue to run and the network protocol remains active, but all models, airplanes and fields disappear from the simulator on the server. If this happens, you can reconnect the CropDuster X to the sim by using this button. All clients will be forced to disconnect and have to join again, but the situation and results will be preserved.

Client

If you want to connect to a server, use the "Run as Client" button



- Button "*Connect*": tries to connect you to the server address and port you specified in the Settings/Network window.
- *Chat*: view all messages from other players and technical notes from CDX
- *Message & Post*: Type and send out a message to all players
- *Request Server Weather:* sets the global weather and time of day to the same settings as the Server

- *Request Refill Position:* sets the position and model of the refill stations to the same settings as the Server. Note: If you do not have the SimObjects in your simulator to depict the refill stations, that model will not be displayed – but the positions of the refill stations will change anyway. You will have to exchange the models to be used with the user running the server, for example via email.
- *Player Models*: opens the aircraft assignment window, where you can change the model displayed for a player (described in more detail below)
- *Exit*: shut down the client.

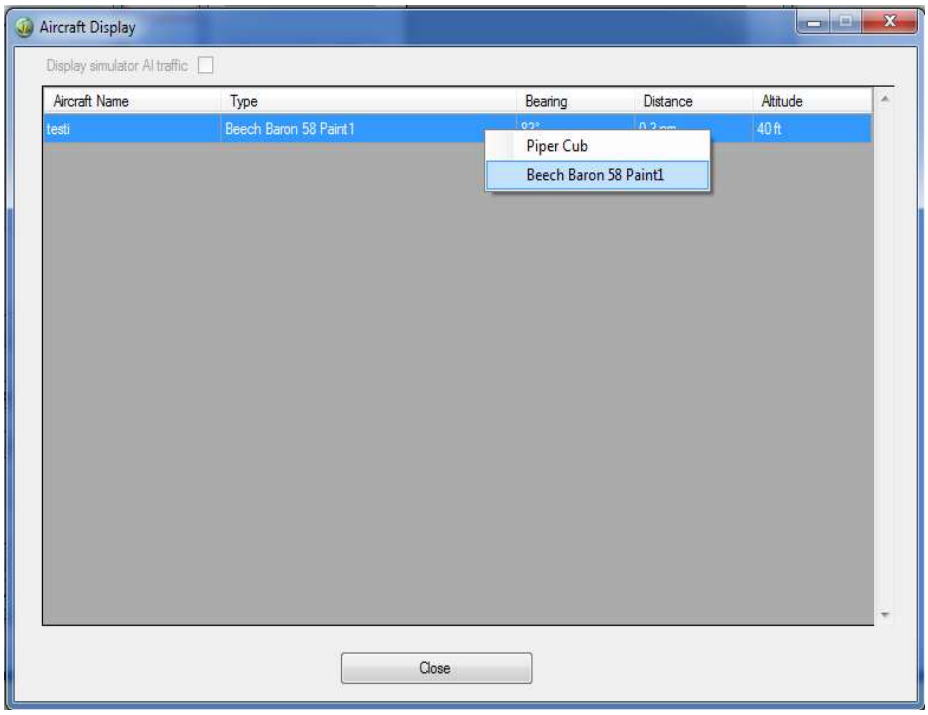
Weather on the server

Please note that the CropDuster X reads the current weather report only once every minute. If you change your weather in your "server" simulator, please wait for one minute before sending it to the clients.

Player Aircraft assignment window

When you connect two CDX installations via network, they will try to display the aircraft model that the other player is using.

The best course of action is to exchange the aircraft models you plan to use beforehand, so both simulators have the same aircraft installed. If this is not possible or not really working (like old FS aircraft in P3D) you can assign the same aircraft to the other player that you use for AI operations.



Right click on the plane that you want to change and choose a model from the drop down list, and it will change instantly in the sim. Bear in mind, that not all functions will be available for all aircraft. If for example the other player is using a single engine plane, assigning a twin prop in your own sim to him will result in one engine not turning.

Network protocol

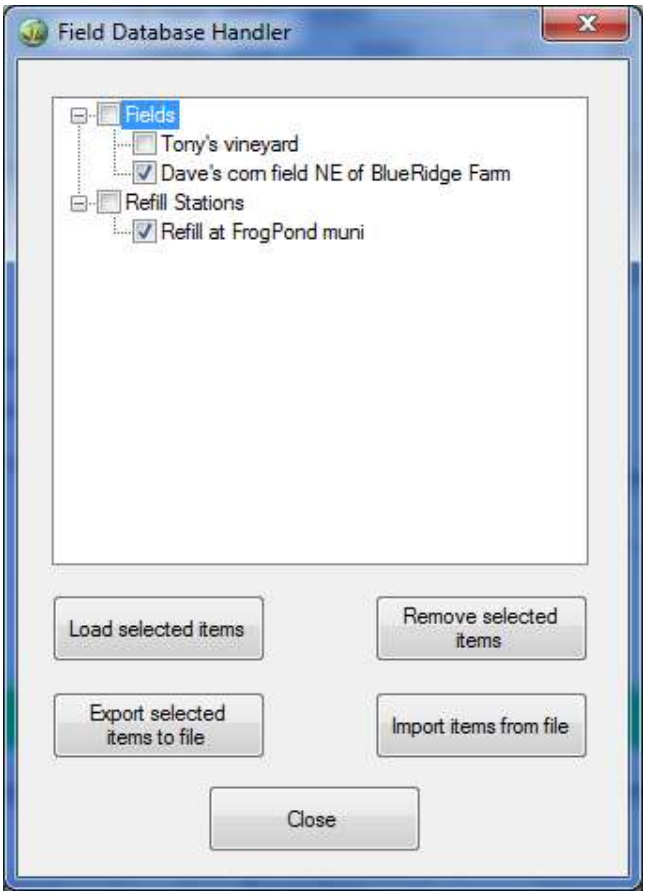
Apart from aircraft movement and orientation, the following events are transmitted over the network:

- Aircraft lights
- Throttle position
- Control surface positions
- Gear
- Flaps
- Smoke effect toggle

Note: Due to creative use of the simulator events by some developers, these events may not fully work.

5.11 Field database

With the field database dialog you can manage your favourite fields and refill spots by giving them an individual name and saving them to an internal database of CropDuster X

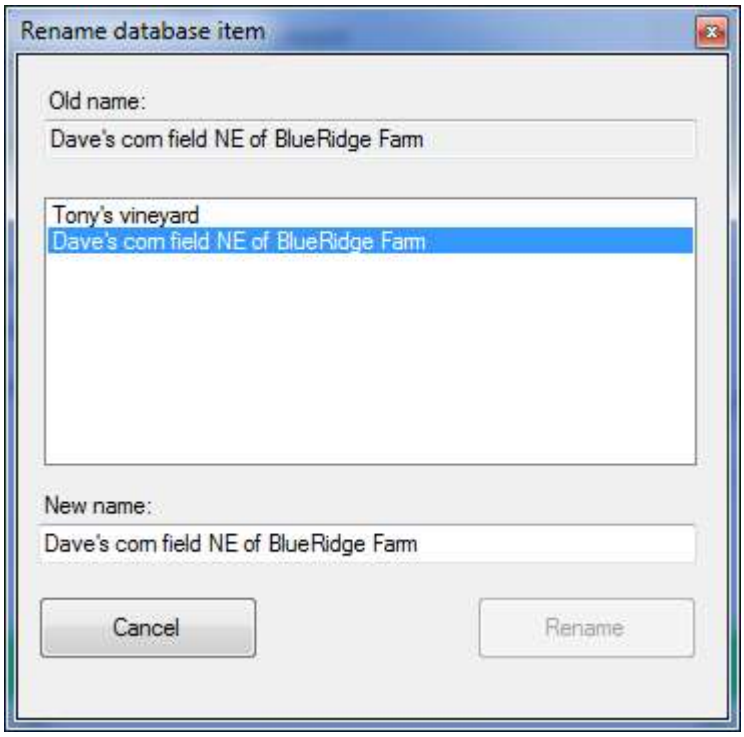


- Select items to be handled with the checkboxes in the treelist
- *Button "Load selected items"* will create the selected fields and refill stations in CropDuster X.
- *Button "Remove selected items"* will delete the selected items from the database
- *Button "Export selected items to file"* will write the selected items to a CropDuster X situation file that you can load with "Load situation" on the main dialog
- *Button "Import items from file"* will load a previously exported field list into the database.

5.11.1. Renaming an item

Items can be renamed by right-clicking on them and selecting “Rename” from the context menu:

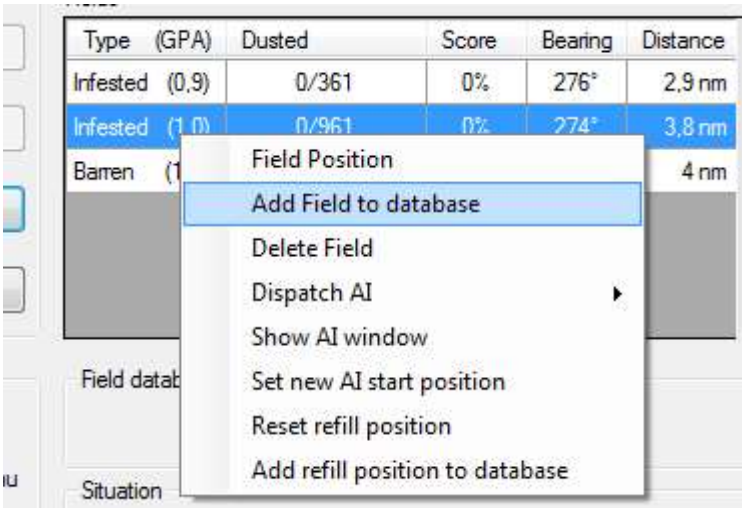
This will open the rename dialog:



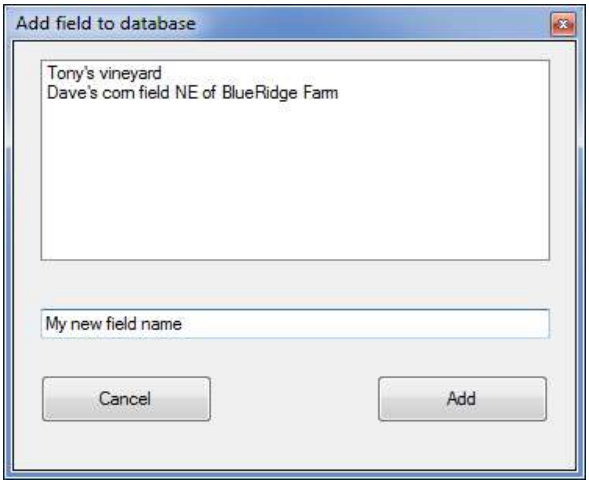
- You can preselect a name from the list by double-clicking on it.
- A name can only be saved when it is different from those already in the list

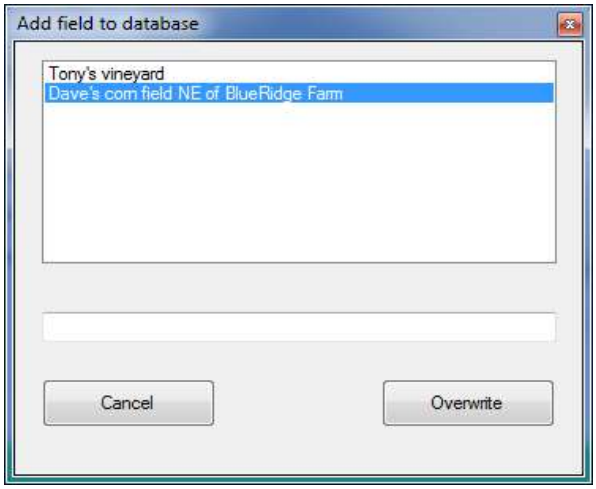
5.11.2. Adding fields to the database

A field can be added to the database with the context menu on the main list:



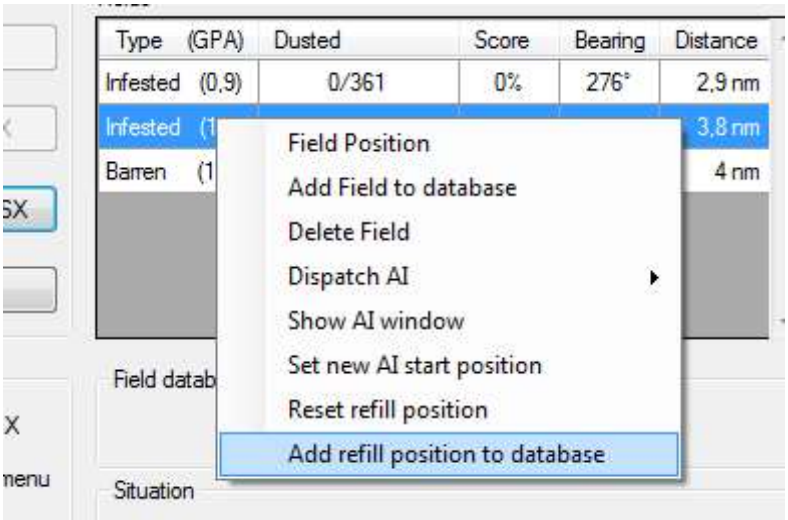
A dialog will open to input the name of the field or to overwrite an existing one:



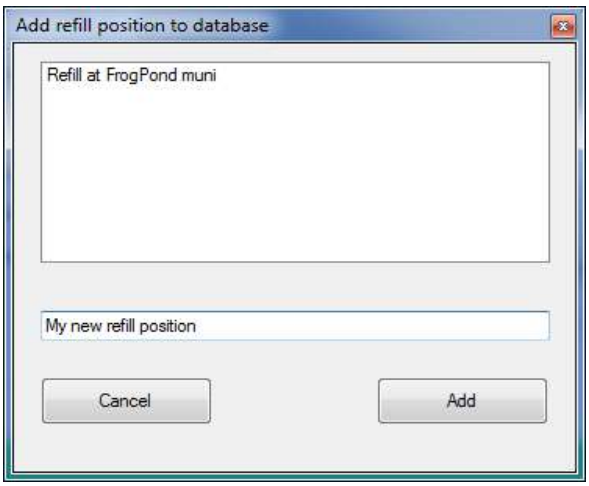


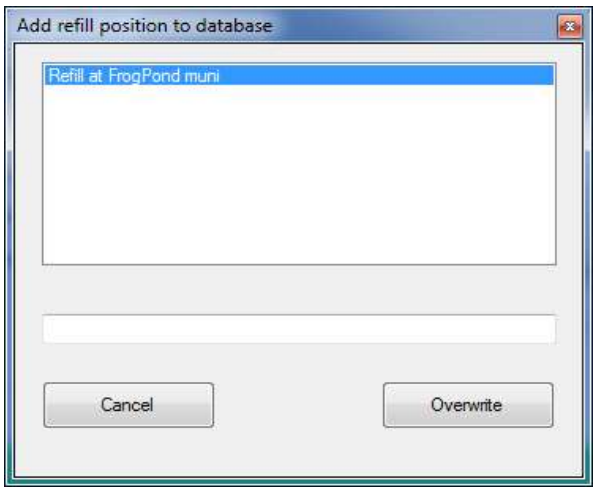
5.11.3. Adding the current refill station to the database

You can add the refill station that you are currently at to the database with the context menu on the main list:



A dialog will open to input the name of the refill position or to overwrite an existing one:





5.12 Saving and loading situations

By using the “Save Fields” and “Load Fields” buttons, you can preserve a current situation or generate a situation of your own. These buttons open the standard Windows Explorer to navigate and choose files. The files generated have a simple XML layout, so you can easily define situations by providing lat/lon for the fields and their elements.


```
<?xml version="1.0" encoding="utf-8"?>
<FieldList xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <refills>
    <RefillPosition>
      <latitude>40.892659</latitude>
      <longitude>9.506163</longitude>
      <altitude>41.980823</altitude>
      <heading>58.231939</heading>
      <truckModel>VEH_Air_CateringTruckGrey_sm</truckModel>
      <truckLat>40.892584</truckLat>
      <truckLon>9.506225</truckLon>
    </RefillPosition>
  </refills>
  <fields>
    <Field>
      <elementals>
        <Elemental>
          <latitude>40.898436</latitude>
          <longitude>9.462762</longitude>
          <stage>fresh</stage>
          <type>CROP</type>
        </Elemental>
        <Elemental>
          <latitude>40.898378</latitude>
          <longitude>9.462926</longitude>
          <stage>fresh</stage>
          <type>CROP</type>
        </Elemental>

(...)
        <Elemental>
          <latitude>40.89697</latitude>
          <longitude>9.463058</longitude>
          <stage>dead</stage>
          <type>OVERLAY</type>
        </Elemental>
        <Elemental>
          <latitude>40.896796</latitude>
          <longitude>9.463551</longitude>
          <stage>dead</stage>
```

```
          <type>OVERLAY</type>
        </Elemental>
      </elementals>
      <type>Barren</type>
      <corners>
        <Corner>
          <latitude>40.898436</latitude>
          <longitude>9.462762</longitude>
        </Corner>
        <Corner>
          <latitude>40.897069</latitude>
          <longitude>9.461919</longitude>
        </Corner>
        <Corner>
          <latitude>40.896432</latitude>
          <longitude>9.463726</longitude>
        </Corner>
        <Corner>
          <latitude>40.897799</latitude>
          <longitude>9.464569</longitude>
        </Corner>
      </corners>
      <density>-1</density>
      <initialSize>362</initialSize>
    </Field>
  </fields>
</FieldList>
```


XML values:

Elemental:

- Latitude/Longitude in degrees
- stage: fresh, damage, suffer, dead
- type: CROP, DUSTED, MARKER,OVERLAY

Refill position:

- Latitude/Longitude in degrees
- Altitude and heading
- Position and type of the refill station model

Corner:

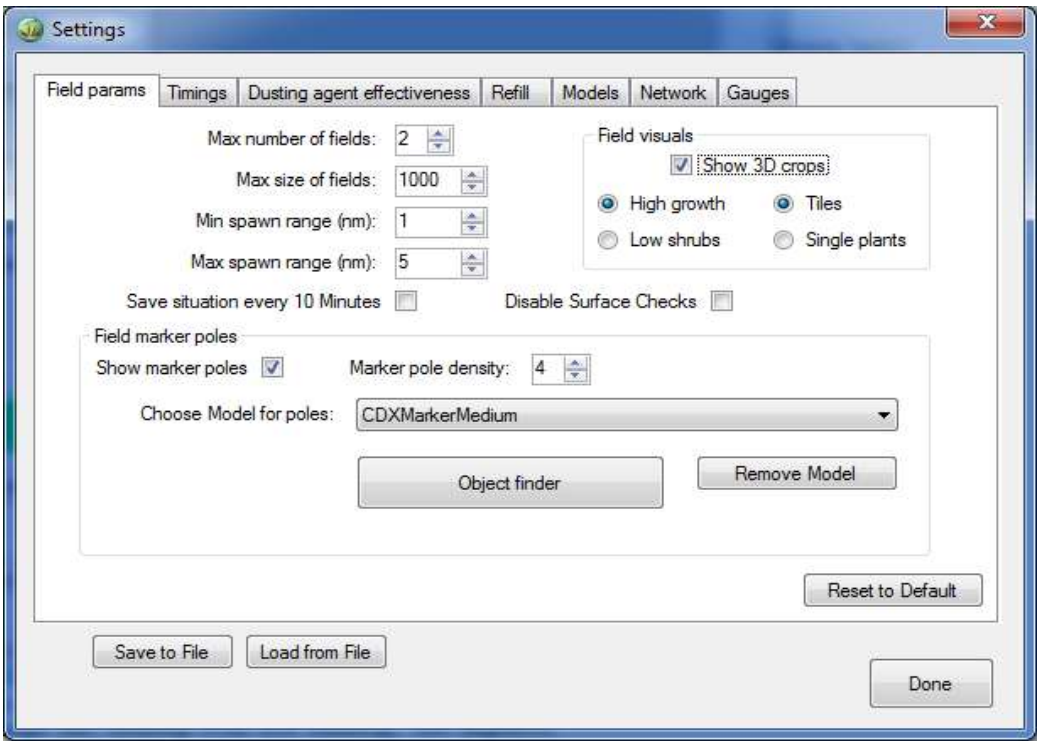
- Latitude/Longitude in degrees

6. Settings window

The settings window allows you to tweak all aspects of the simulation to your liking. Settings can be changed any time, even when the simulation is already running.

Note: all the settings that you make are automatically saved to the default config file and will be reloaded the next time that you start the program. You can reset the values visible on the selected tab to the pre-programmed default by clicking the button "Reset to Default"

6.1 Field parameters



- *Max number of fields*: defines the maximum number of fields the simulation is allowed to generate – turn this down to gain FPS

- *Max size of fields*: defines the maximum number of single effects objects (Elementals) that a field may consist of – turn this down to gain FPS

- *Min spawn range (nm)*: the distance in nm from your current position where the simulation will start generating the fields at random

- *Max spawn range (nm)*: fields will be not be generated further away than this distance from your current position.

- *Field visuals:*
  In this box you can choose what the 3D crops should look like on the fields:

  Checkbox "Show 3D crops" switches the 3D plants on the ground designating a field on or off. Use this if you have scenery that already has a superior depiction of crops on the fields or if you run into performance issues.

  → "High growth/Low shrubs" alters the size of the plants
  → "Tiles/single plants" changes the number of individual 3D objects

  Tiles are larger patches of plants. Use this for large fields or if your simulator struggles with performance. When spraying tiles or when the crops are degrading, the whole tile will change appearance (the field will look "checkered")

  Single plants will put every single beanstalk into the filed. The fields will be smaller, but the dusting action and depiction are more accurate, as every single plant changes color. Note that this type of depiction is very performance intensive and it will take the simulator quite a while to generate all those objects (especially P3D).
  A note to FSX users: these small objects depend a lot on zoom setting. If the zoom is set too a low value, then the depiction range of the objects decreases and vice versa. And that range is quite small.

  Change the maximum size! When switching between tiles and single plants, you should adjust the "max size of fields" parameter, so the size of the field does not get out of hand.

- *Disable surface checks:* Disables the automatic check if a new field is generated on fertile terrain. Useful, if you are using photoreal terrain, or some payware products, that may not report the surface

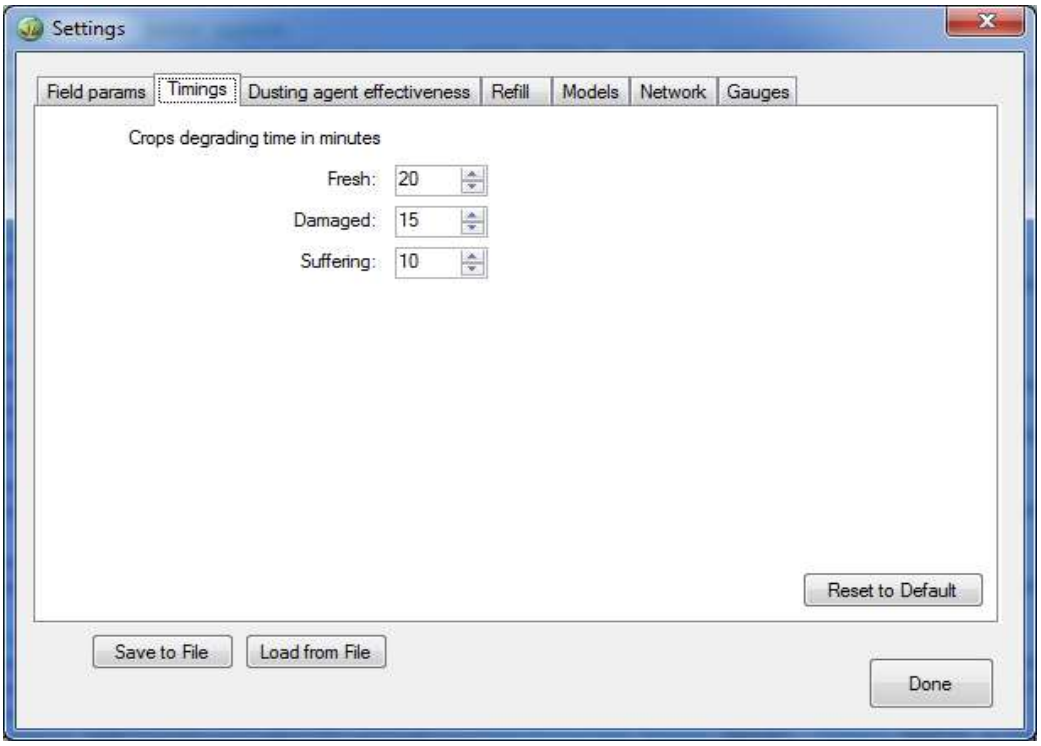
type of the terrain like it appears to be visually.

- *Save situation every 10 minutes:* this automatically saves the current situation every 10 minutes to a file called "CropDusterX_Autosave.xml" in your "Documents" folder. This can be useful if your sim is unstable and crashes frequently. Especially in multiplayer mode it may be advisable to activate this option on the user's application that is acting as Server, so the current situation is saved if the Server should crash. Please note though, that saving large fields takes a brief moment, and the sim may stutter while this is done.

- Field marker poles:
  - *Show marker poles*: switched the display of the marker poles along the borders of the filed on or off.
  - *Marker pole density*: changes the number of marker poles around the field from 5 (very dense) to 1 (very sparse)
  - *Choose Model for poles*: "Title" of the sim object to be used for the marker poles. If this setting is changed, you have to un-check and re-check "Show marker poles" to activate the new model.
  - *Remove Model*: removes the selected model from the list.

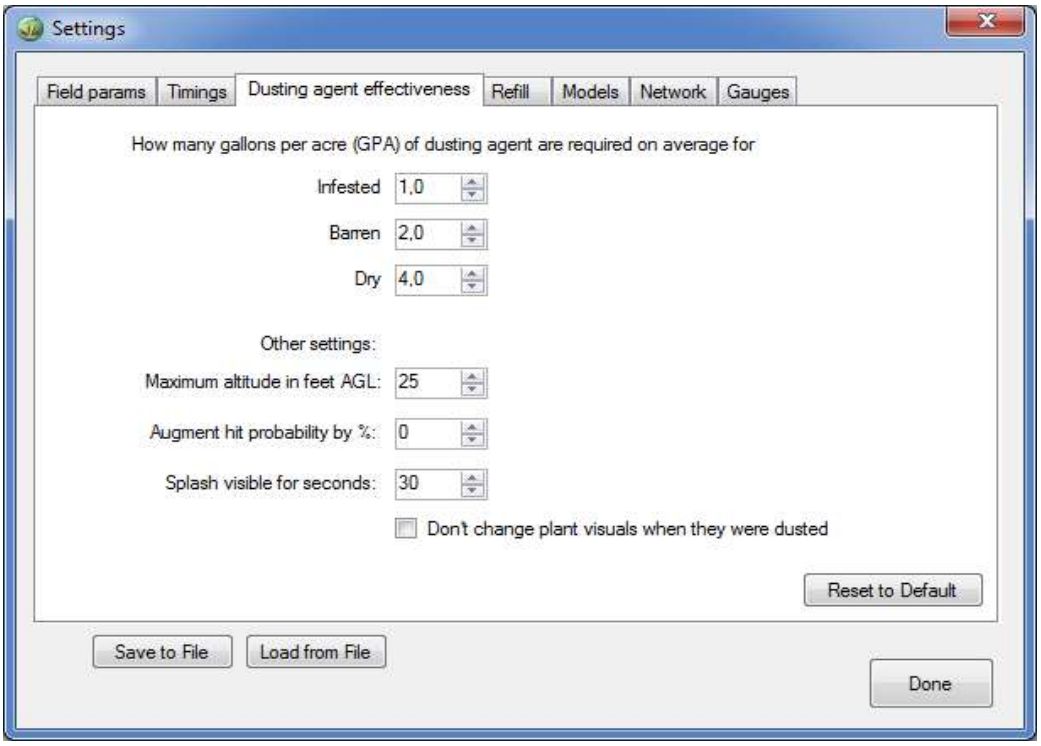
To add other models to the list, use the "Object Finder" button, this will open a SimObject Finder dialog (see chapter 6.10!)

6.2 Timings



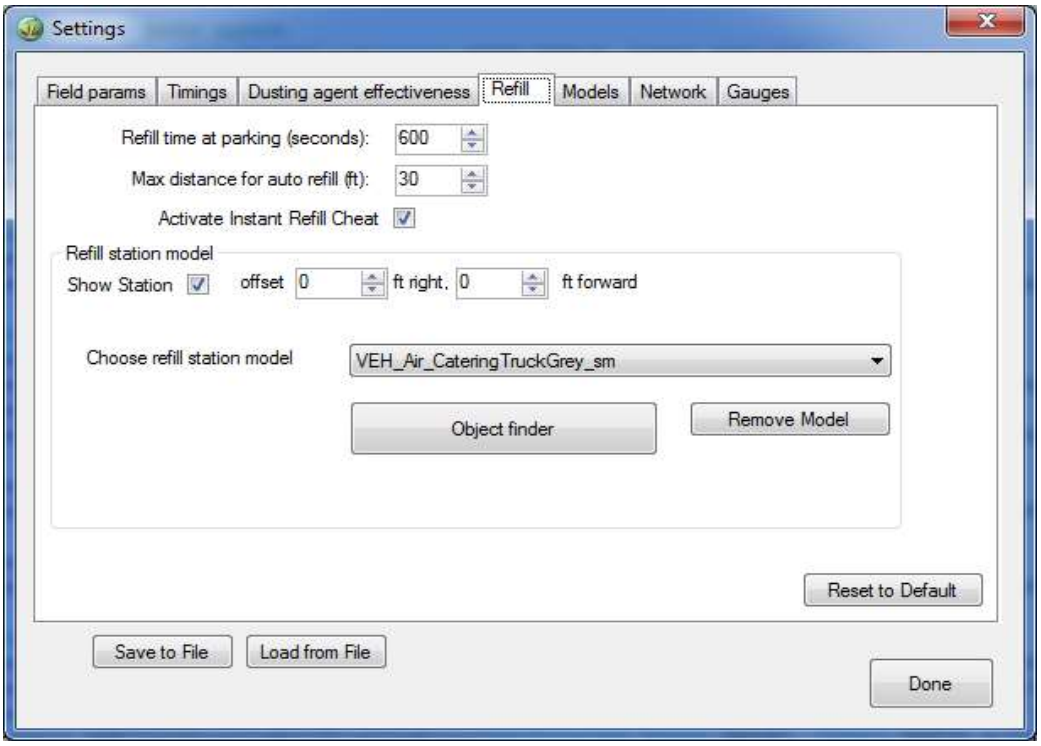
- *Crops degrading time in minutes*: define the time how long an Elemental of a certain size will live until it starts to degrade further

6.3 Dusting agent effectiveness



- *How many gallons per acre (GPA) of dusting agent are required on average for:*
  If an Elemental is hit by this much dusting agent it is considered to be “saved”.
  CropDuster X will take this value only as a baseline. When the field is created, the specific GPA is varied a little +/- around this value, so the resulting GPA is always individual for every elemental. Some might need more dusting than others, even when in the same field.
- *Maximum altitude in feet AGL:* Maximum altitude where the dusting agent is still effective when being sprayed. The higher you set this, the easier it is to spray the fields, as you can fly higher without losing too much dusting agent in the drop.
- *Augment hit probability by %:* increases the effective zone where the dust hits.
- *Splash visible for seconds:* number of seconds that the splash effect on the ground remains visible.
- *Don't change plant visuals when they were dusted:* If you don't like the visual “greying” of the plants when they were dusted, you can turn it off with this checkbox.

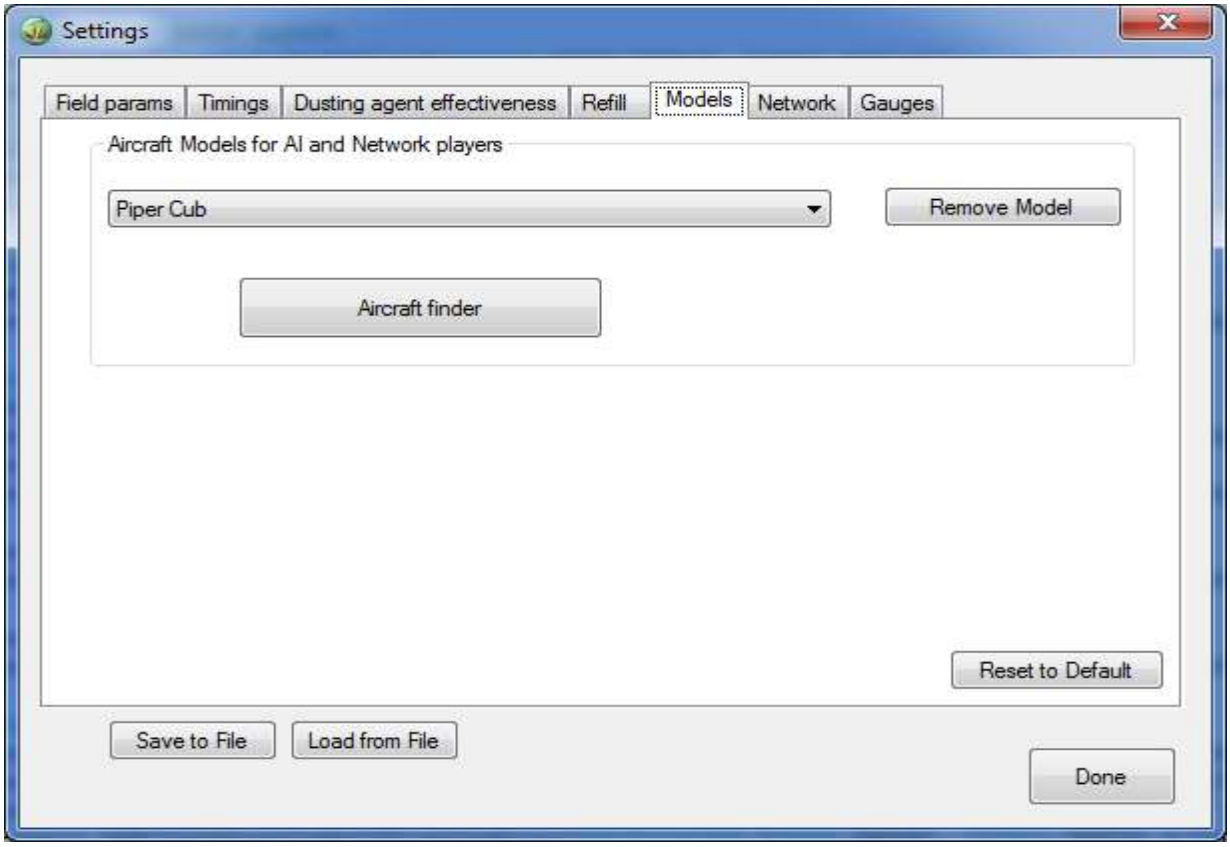
6.4 Refill



- *Refill time at parking (seconds)*: amount of time it takes to top off your tanks once you are at the refilling station
- *Activate instant Refill Cheat:* if this is selected, then you can refill your tank by repeatedly pressing "Release Droppable Objects". Turn this off for maximum realism – you will have to return to the airport if your tank is empty.
- *Show Truck*: add a refilling truck at your right wingtip. If this setting is changed, you have to use the field context menu and "Set new refill position" to add or remove the truck
- *Offset*: distance the truck is generated from your wingtip. If this setting is changed, you have to use the field context menu and "Set new refill position" to change the offset
- *Choose refill station model*: "Title" of the sim object to be used for the refilling station. If this setting is changed, you have to use the field context menu and "Set new refill position" to change the model
- *Remove Model*: removes the selected model from the list.

To add other models to the list, use the "Object Finder" button, this will open a SimObject Finder dialog (see chapter 6.10!)

6.5 Models



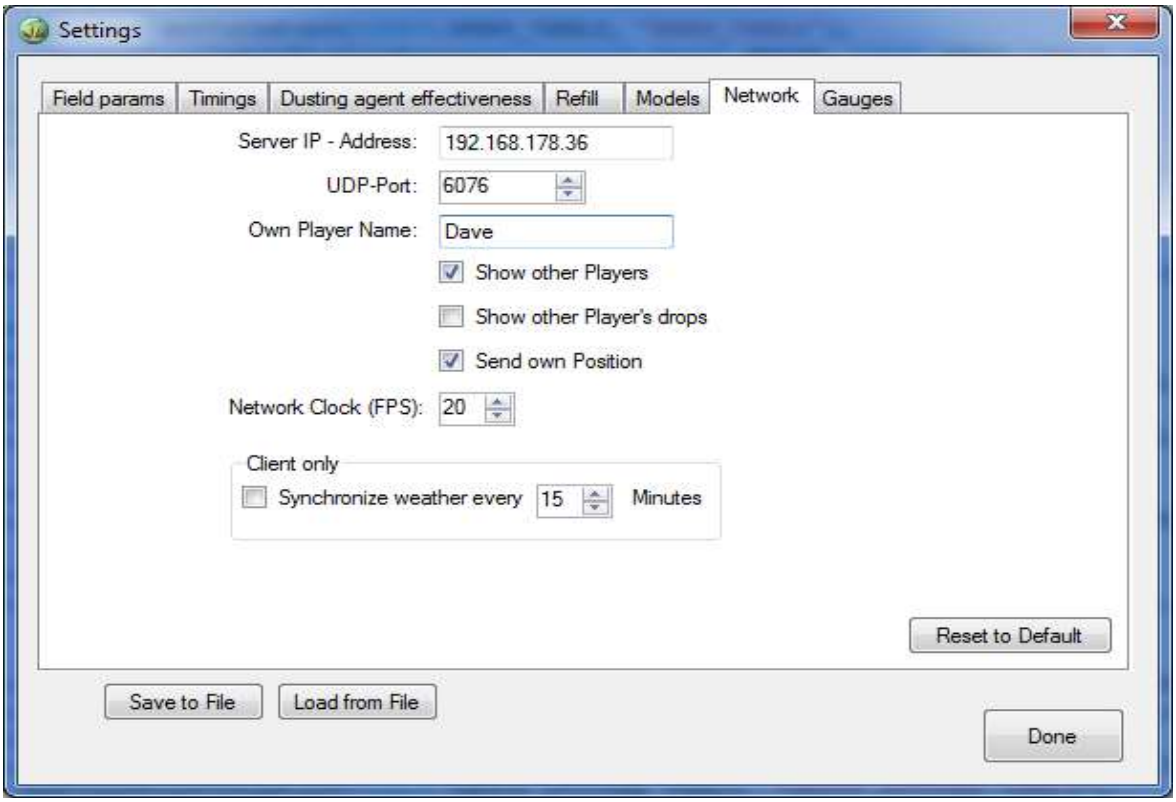
You can add additional aircraft models here.

These models will be used

- To provide the selection for choosing AI crop dusters
- To assign different models to other players in the sim when in multiplayer mode

To add models to the list, use the “Aircraft Finder” button, this will open a SimObject Finder dialog (see chapter 6.10!)

6.6 Network

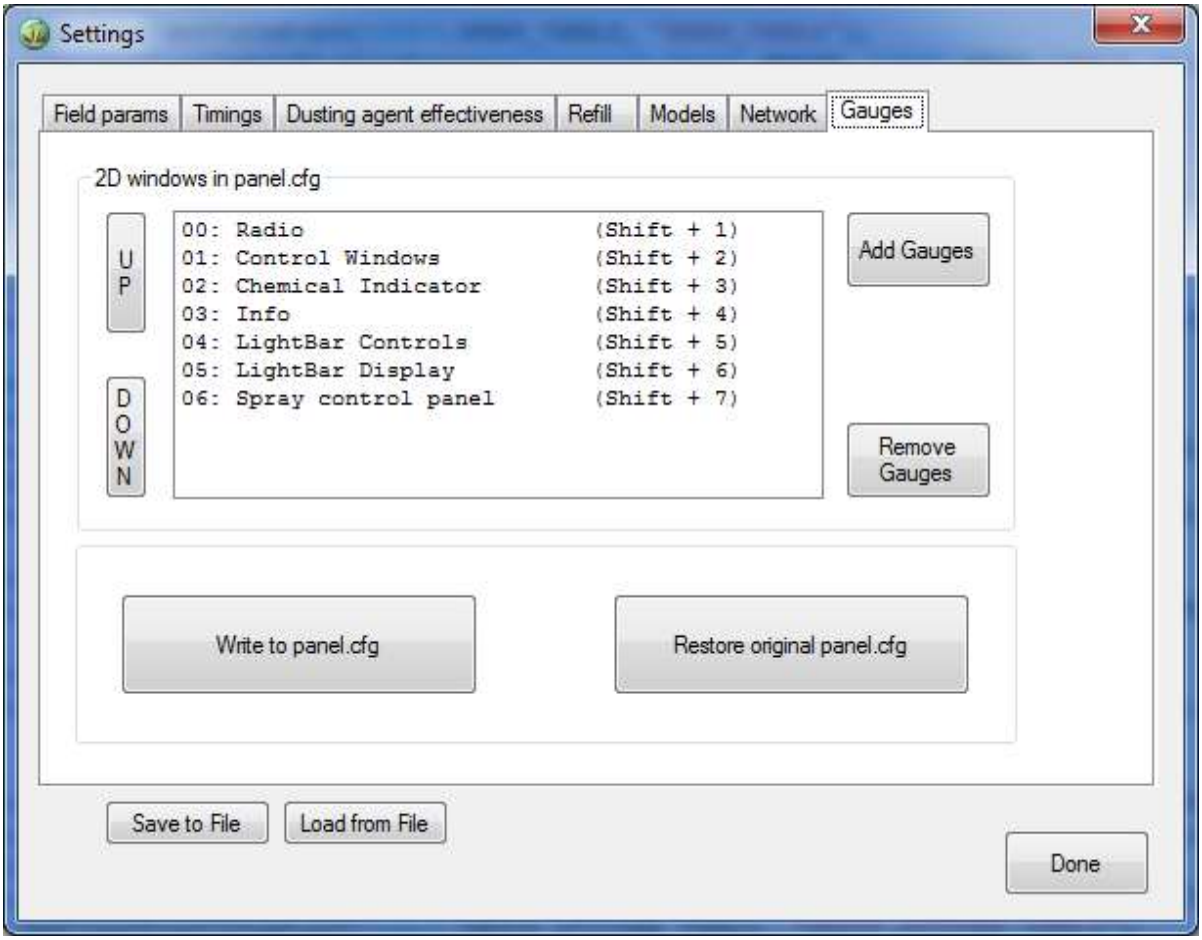


- *Server IP-Address*: Address of the CDX installation that is used as the server.
- *UDP-Port:* The port that you configured in the firewall.
- *Own player name:* Your name that you want to appear in the sim
- *Show other players:* display the other players' aircraft. **Turn this off if you are using an external multiplayer software like FSHost**
- *Show other players' drops:* display the other players dropping dust. If your computer struggles with low FPS when displaying the drops, turn this off.
- *Send own Position:* display your aircraft in the other players' sim. **Turn this off if you are using an external multiplayer software like FSHost**
- *Network clock (FPS):* Frequency the CDX installations communicate with each other. Select lower values for slow connections
- ***Sychronize weather:* When selected on an CDX client, it will synchronize the global weather with the server every (15) minutes. Weather sync may fail the first time it is called, in that case request the first sync with the "Request Server Weather" button on the client window.**

6.7 Gauge installer

As soon as the CropDuster X is connected to the sim, you can install the SatLoc LiteStar gauge and the Spray control panel with this dialog.

For the gauges to work, installing additional Microsoft runtime components may be required – see chapter 7.2.



- *2D windows in panel.cfg*: This is a list of all 2D window definitions in the panel.cfg of the aircraft that you are flying in your sim.
- *Add Gauges*: This will add the necessary gauges for the SatLoc lightbar and the spray control panel.
- *Remove Gauges*: This will remove the CDX gauges.
- *UP/DOWN*: Move the selected item in the list up or down. This way you can change the keyboard assignment and sequence of the gauges.
- *Write to panel.cfg*: This will write a new panel.cfg file for your aircraft and reload the aircraft in the sim afterwards – that way you

can use the gauges immediately.
Please note that CropDuster X is writing a new file with different formatting. None of your original definitions will be lost.

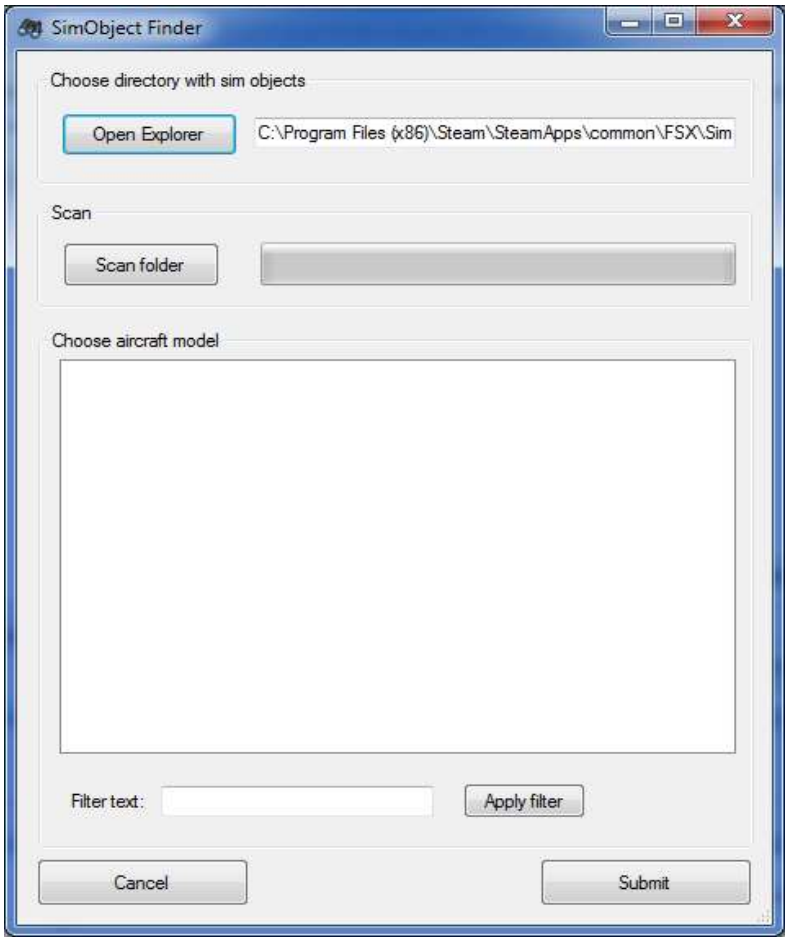
- *Restore original panel.cfg*: This will restore your original panel.cfg file, before the gauges were installed.

6.8 Saving and loading settings

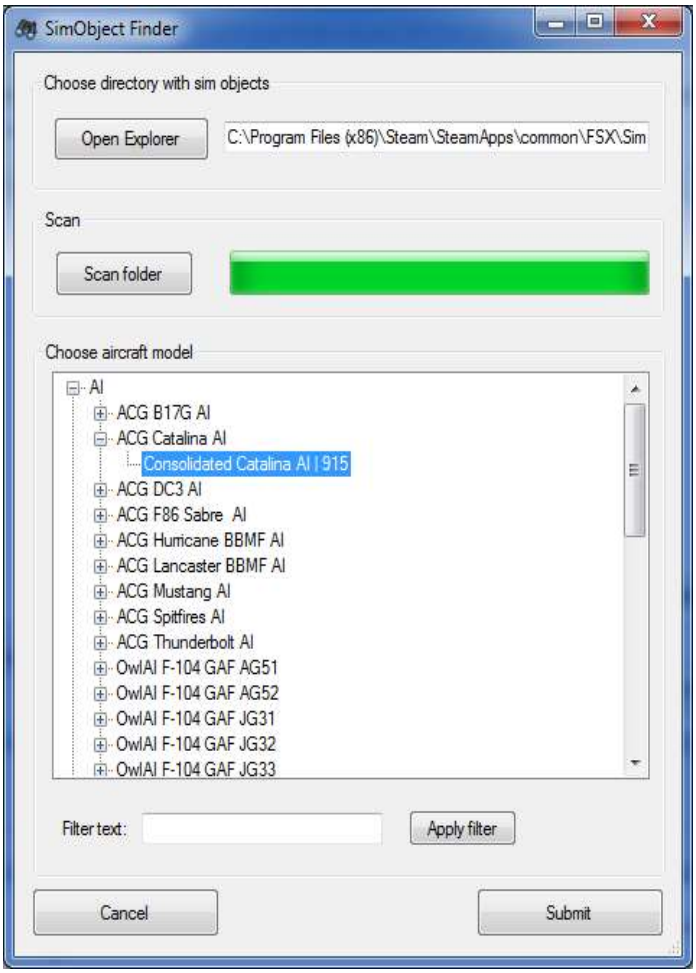
Use “Save to File” and “Load from File” to preserve a profile for later use. These buttons open the standard Windows Explorer windows to navigate and choose files.

6.9 Using the SimObject Finder dialog

You can add objects to the internal databases (AI aircraft models, Refill station models, marker models) with this dialog:



- If this dialog has never been used before, the textbox on top will be empty. Otherwise it will contain the path that you selected last time.
- To select a path, use the “Open Explorer” button, a standard Windows Explorer window will open.
- Navigate to the folder containing your simobject models:
  - Navigate to your main Simulator directory
    for example
    “C:\Program Files (x86)\Microsoft Games\Microsoft Flight Simulator X”
    “C:\Program Files (x86)\Steam\SteamApps\common\FSX”
  - Open the sub folder “SimObjects” and inside there the folder “Airplanes”
  - Click “OK”
- Now press the button “Scan folder”
- After scanning is complete, the treeview “Choose … model” will be populated:



Filtering the list: by entering a filter text (for example “737”) and clicking on “Apply filter”, the list will be reduced to all aircraft descriptions containing that text.

Select an object model from the list, and either double-click on it or press “Submit” to transfer it to the Settings dialog. The Object Finder window will close automatically.

Note: you can only make use of models that are visible to your simulator too. The paths have to be part of the SimObjects paths in the simulator's configuration files.

7. The CropDuster X gauges

7.1. The Satloc LiteStar III

Thanks to the generous support from the **SatLoc Air Products Division**, it was possible to implement an artistic simulated rendition of their "**LiteStar III**" product.

A lightbar is an invaluable help to all crop dusters, as it guides you to every swath of a field, using GPS navigation. When flying crop dusting sorties, accuracy is of the essence, and a lightbar offers the necessary guidance to fly precise patterns. It does this by providing crucial information and optical cues on a large LED display, often mounted right on the nose of the crop duster aircraft.

The LiteStar III device has been implemented for FSX/P3D by using the real world user's manual, so you can operate it just like the real thing. Some aspects of the device cannot be simulated faithfully, because of the restrictions in the simulator world. These are mostly GPS related, as GPS data is always perfect in the simulator. The special guidance systems WAAS and e-Dif are there only in name, but not in function.

Note: in addition to the original functionality, the LiteStar gauge can display AGL altitude on Disp 2 and 3.

Please visit the SatLoc and AG Junction websites at
http://www.satloc.com/
http://www.corp.agjunction.com/

7.2. The Spray control panel

The spray control is a simple panel, incorporating the timer/GPA value gauge, the current tank level gauge and an indicator lamp that lights up, when the spraying system is active.

- Switch between “Timer” and “GPA” by clicking on the appropriate label in the upper display
- Change the value with the mouse wheel or left/right mouse button clicks in the lower display.

7.3. Installation

The LiteStar III instrument consists of two separate gauges:

- the lightbar displaying
- the controller buttons

In preparation for using them, you may need the VC2013 redistributable files from Microsoft, in case they are not already installed on your computer. Please check the Software tab in your Control Panel for these entries:

If no version of the “Visual C++ 2013 Redistributable” is present, please download and install the runtime from the Microsoft website:

https://www.microsoft.com/en-us/download/details.aspx?id=40784

Automatic installation

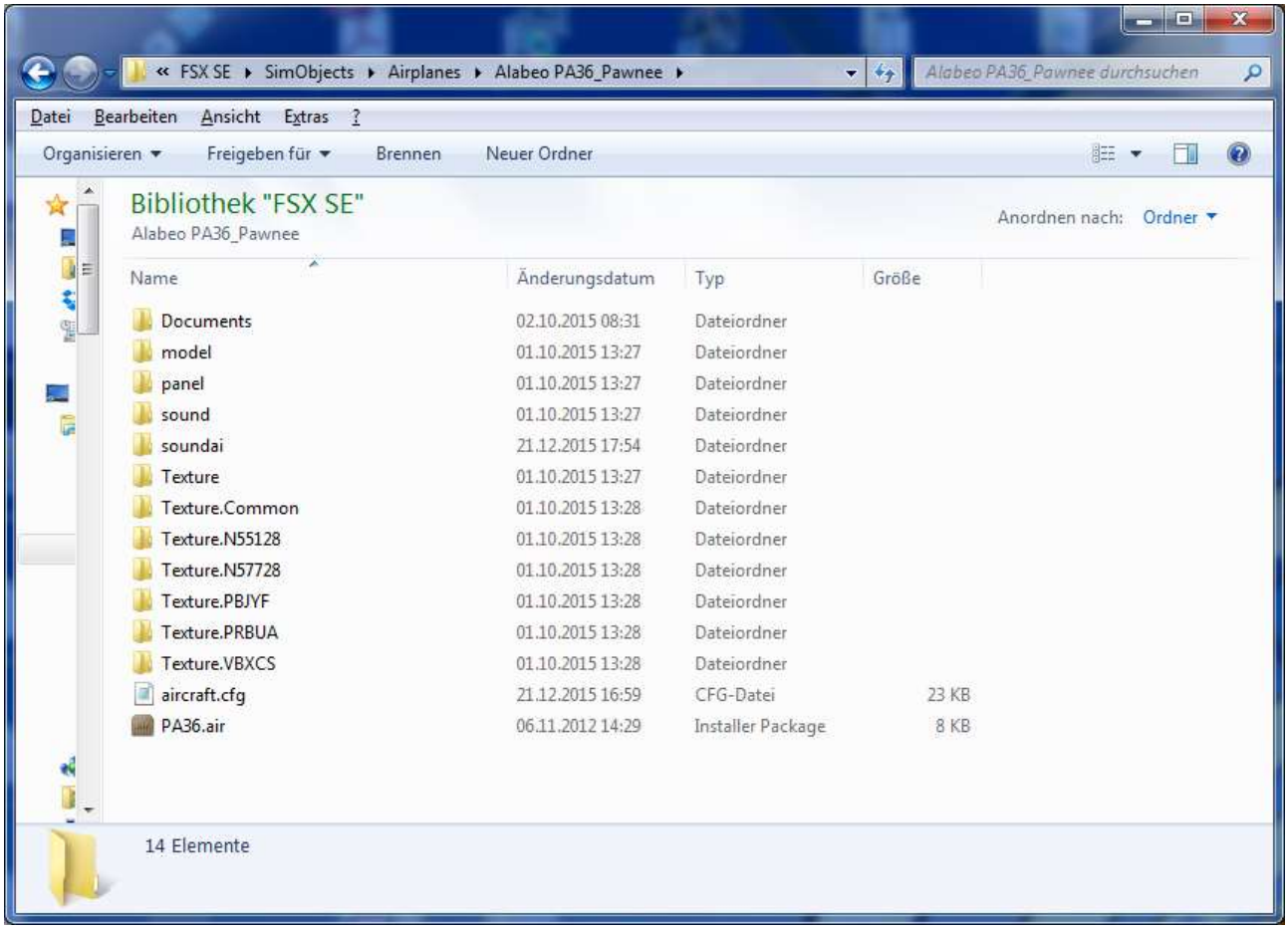
For an automatic installation of all three gauges into your current aircraft, please use the gauge installer in the Settings dialog, once you are connected to the sim.

Manual installation

Each CropDuster X installation (FSX boxed or SE, Prepar3D V2, V3 & V4) have their own version of the SatLoc gauge, and you have to use the correct version and gauge name for your simulator to make it work.

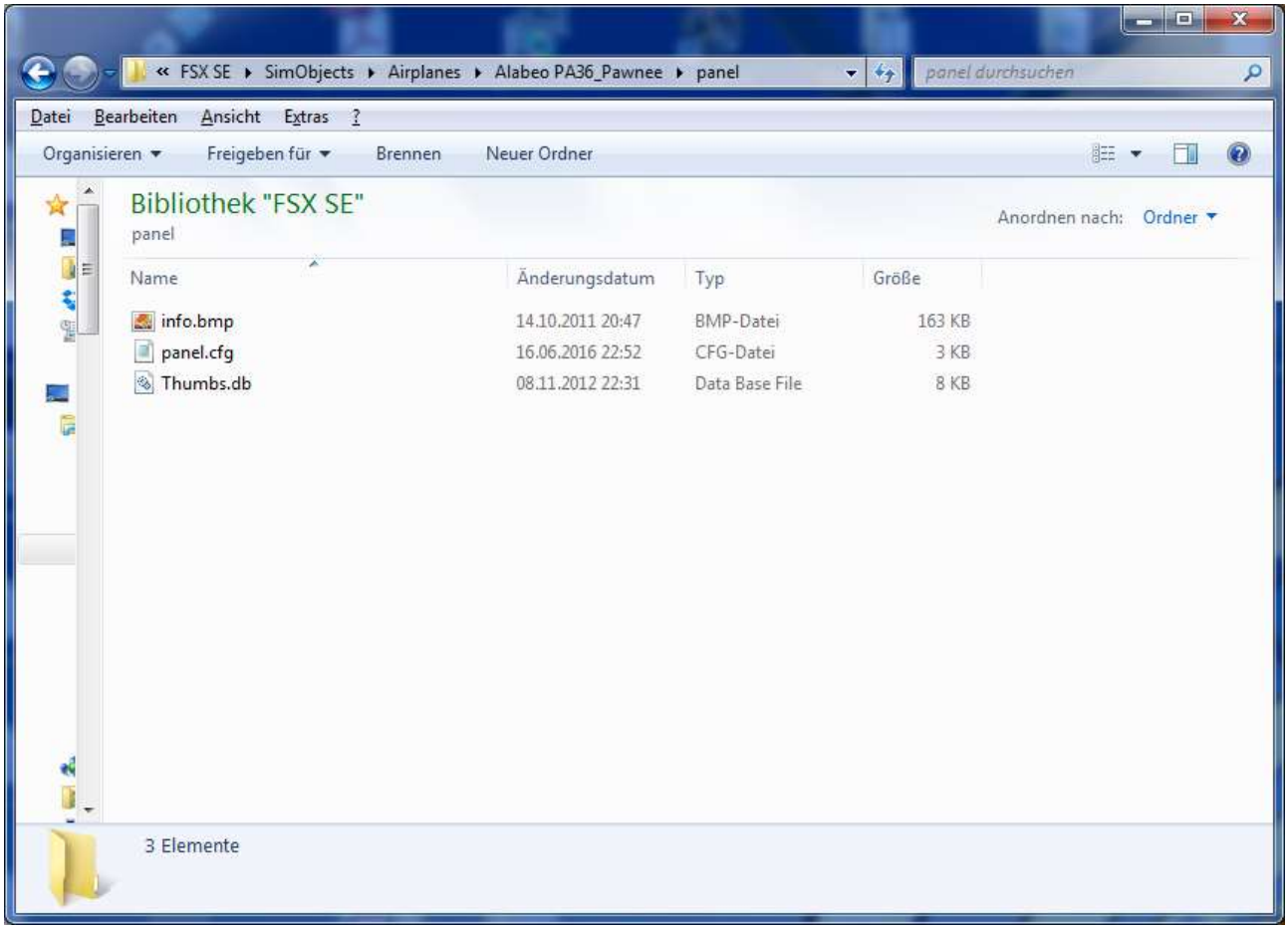
1. **Copy the necessary files to your simulator**
   - If you chose the default copy option when installing the CropDuster X, the gauge files will already been added to the appropriate folders in your simulator.
   - If you chose to copy them manually, then you will find the file in your CropDuster X installation directory in the subfolder "Gauge"

2. **Locate the folder where your aircraft files are stored**
   - This folder is by default in your simulator main directory, subfolder "\Simobjects\Airplanes"
   - The contents of this folder will look something like this:

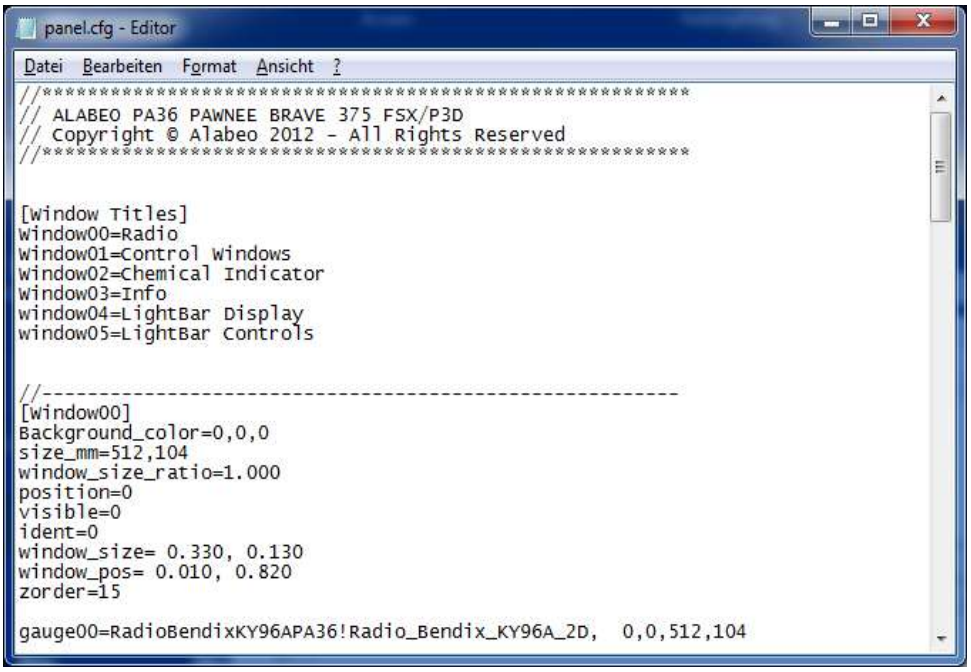


3. Edit the panel configuration file

- The file is located in the “panel” subfolder

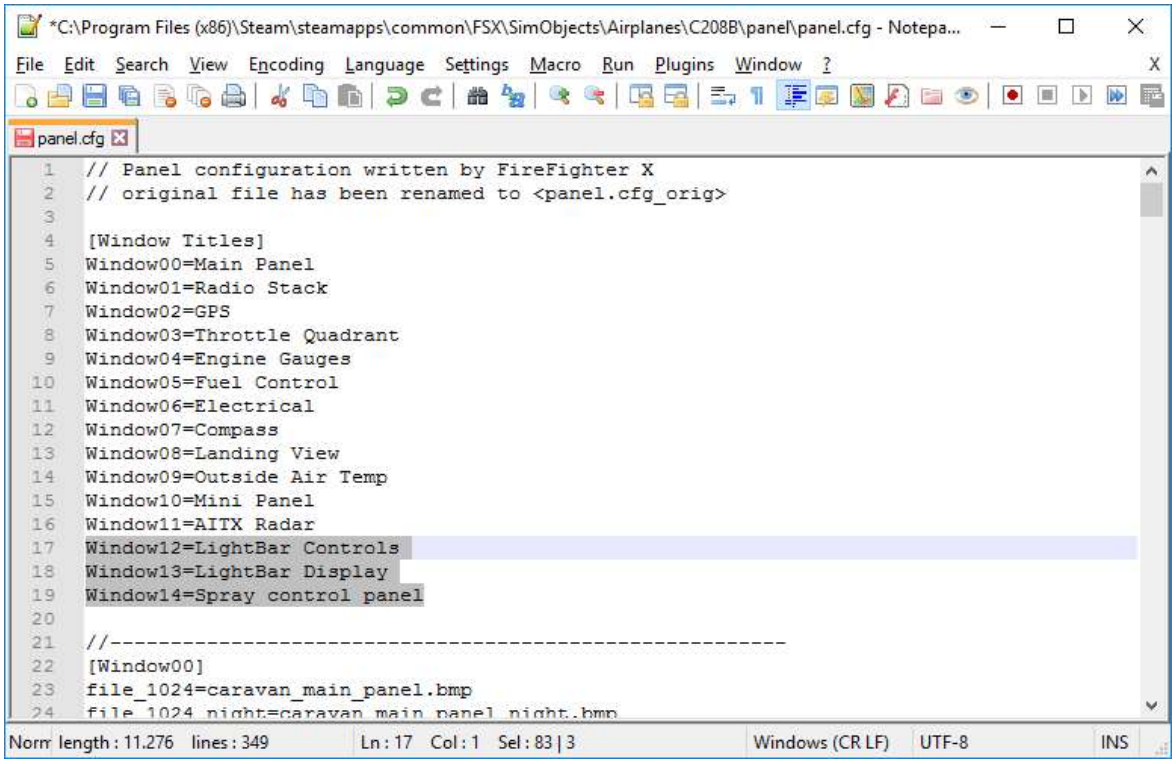


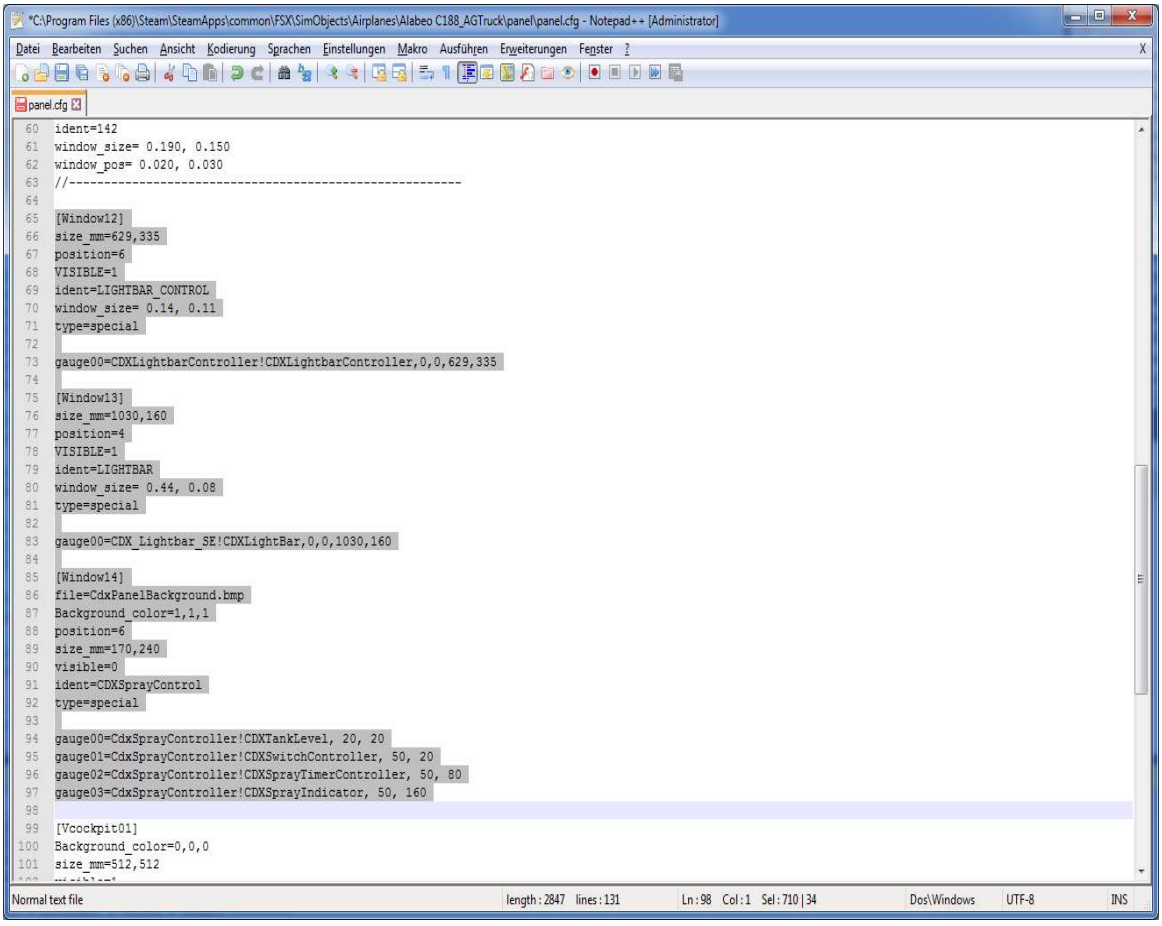
- Open the file using “notepad” or any text editor you like



Edit the panel file like this:

Add the three window definitions:





Note: The gauge DLL has a different name for each simulator:
FSX boxed:
gauge00=CDX_Lightbar!CDXLightBar,0,0,1030,160

FSX SE:
gauge00=CDX_Lightbar_SE!CDXLightBar,0,0,1030,160

P3D V 2.5
gauge00=CDX_Lightbar_P3D!CDXLightBar,0,0,1030,160

P3D V3.x
gauge00=CDX_Lightbar_P3D_V3!CDXLightBar,0,0,1030,160

P3D V4.x
gauge00=CDX_Lightbar_P3D_V4!CDXLightBar,0,0,1030,160

Now save and close the panel.cfg.

You can access the gauges with the usual key controls or by using the menu:

7.4. Operations of the SatLoc lightbar

SatLoc Air Products Divsion kindly allowed the distribution of the actual user's manual for the LiteStar III product with the CropDuster X.
Except for the few functions that cannot be simulated, all operations of the LiteStar III can be conducted by using this manual. You can find the document either in your start menu or in the CropDuster X installation directory.

Special considerations in the simulator:

- The StaLoc gauges are independent from the CropDuster X application, there is no exchange of data between the gauge and the application. The lightbar will work just fine without CropDuster X running or being present in any way, so you can use it for any application that you like.
- The LiteStar instrument is connected to the avionics circuit of your aircraft. Make sure that your aircraft is powered before you switch on the device:
  - battery switch on
  - avionics master switch on
  - battery charged or generator running
- GPS functions in the sim are instantaneous, as these are derived from the virtual global position data, that is always present and accurate. As a consequence, precision data like HDOP, number of satellites seen/tracked, WAAS and e-Dif are only arbitrary numbers on the instrument, they do not have relevance for it's operation.

7.5. Key control assignments

The following simulator key controls have been assigned to operate the SatLoc gauge:

- On/Off switch: VSI_BUG_SELECT
- Swath advance: INCREASE_AUTOBRAKE_CONTROL
- Swath decrement: DECREASE_AUTOBRAKE_CONTROL
- Menu: ALTITUDE_BUG_SELECT
- Enter: HEADING_BUG_SELECT
- Manual Mark: EGT

Swath advance/decrement double as the up/down arrows on the controller. Manual Mark should be bound to a joystick button, as it cannot be operated from the controller gauge.

8. Disclaimer

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You may not distribute this package or parts of it.

Disassembling, refactoring or changes of any kind to code and models are prohibited.

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- the software will meet your requirements or expectations
- the software or the software content will be free of bugs, errors, viruses or other defects;
- any results, output, or data provided through or generated by the software will be accurate, up-to-date, complete or reliable;
- the software will be compatible with third party software;
- any errors in the software will be corrected.
- the software will not cause errors or damage to the computer system it is installed on.

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