ProSimA320
Professional Simulator Suite

Flight Model 1.0 User Manual

Document History

Version	Date	Author	Comments
1.0	28 December 2016	L & H	Initial release.

Support

Please read this document and the ProSimA320 user manual carefully. To discuss or find extended information please visit the ProSimA320 forum at: http://www.prosim-ar.com/forum/

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1.0   Introduction

1.1   Welcome on board

The advanced flight model and visual model you have just acquired is a common effort between ProSim Aviation Research B.V. and a veteran flight simulator designer A.K. Lapi as well as Steve Cozens. The parties have put together their knowledge and experience to create the most advanced A320 flight model available so far, extended by a new external visual model by Steve. The model will definitely change the way you fly your A320 simulator.

1.2   History and goal

This unique advanced flight model is primarily aimed at the home cockpit builder. Although it can also be used for commercial entertainment, (under different user license conditions available separately from ProSim Aviation Research B.V.) the widest user base remains a rapidly growing number of home cockpit builders.

For quite some time there has been an intensive urge to have better and better flight (dynamic) models for our simulators. When home cockpit builders spend a considerable amount of money and put countless number of hours into their simulators, the dynamic model becomes a more and more important factor in realistic flying and flight experience. Before our first such model came out to the limelight of the Microsoft® Flight Simulator™ (MSFS) based simulator platform, cockpit builders, naturally using different hardware components, had used different flight models in order to satisfy their need for realistic flight experiences. This, although seemed to satisfy many, didn't prove to be a truly good and final solution, as the characteristics of all visual and dynamic models differed greatly.

The ProSim737 Suite was the first software solution focusing on a single model and type of aircraft, offering a full solution for both home and professional cockpits.

The extremely complicated systems and internals of a plane, such as the Boeing738 and now the A320-214, also brought the need for a unified and advanced flight model, which could work in perfect accordance with the ProSimA320 Suite and its internals.

In order to work perfectly, the auto flight characteristics, as well as the Flight Management System (FMS), need a unified and common flight model to be used simultaneously and in accordance with the underlying software solution. This is why ProSim Aviation Research B.V. decided to develop a flight model as close to the real plane, the A320-214, as possible.

2.0   Flight Dynamics

No doubt, flight dynamics and the possible most realistic simulation of the airplane behavior are the essence of flight simulation.

Present day Full Flight Training Devices used in the aviation industry employ a very similar approach to flight dynamics as Microsoft® Flight Simulator™ X (hereafter: FSX) and its successors do. FSX has a fairly refined flight-character-performance engine and its pre-entered data is interpreted by the sim1.dll at runtime.

FSX (also ESP and Prepar3D®) uses the exact same 'look-up-table' system for flight dynamics as level-D simulators use. Interestingly in many ways FSX is even more sophisticated than older versions of Level-D simulators are. The slight but important difference is that level-D flight simulator dynamic models are always based on a single plane and it's thoroughly noted and measured characteristics, whereas FSX's dynamic engine was built to equally serve a Cessna, a glider, a 737, a 747 and helicopters. This versatility makes it a bit 'generic' and that's why certain limitations always pop up here and there. But generally speaking, the FSX dynamic engine (now also in Lockheed Martin's Prepar3D®) is capable of simulating dynamics on a very detailed and sophisticated level.

Quite a few level-D simulators still in use for crew training, mainly the older builds but still widely used world over, have even less dynamic parameters and capabilities compared to the FSX engine. We feel FSX or the similar Prepar3D® have nothing to be ashamed of in relation to flight dynamics.

At present if one looks around on the horizon of desktop flight simulators, the choice is minimal – to say the least. Microsoft® FSX is over ten years old now and it is not developed or updated anymore, yet there are still thousands of people out there, flying the even earlier version – FS2004 / FS9.

FSX also appeared in a different commercial form by Microsoft® and was named ESP (Enhanced Simulation Platform) and later on the ESP code was licensed to Lockheed Martin, thus Prepar3D® (pronounced "prepared") and later its second version was born.

As far as flight dynamics go, all of these versions use the very same dynamic engine.

We wouldn't have even tried to achieve a realistic flight model in any other simulator other than FSX, which with its lookup tables is by far the closest to the multimillion dollar flight simulators.

Simulating the flight characteristics of a given airliner is not a simple or easy task. Quite a few FS add-on companies have claimed their flight models to be 'almost perfect' in this regard during the twenty-year history of Microsoft® Flight Simulator™ but very few could really succeed.

We took a logical approach to accomplish the closest possible flight dynamics, as far as real 737-800 and A320 planes go. We collected data from the airframe manufacturer and also used the very same data employed in level-D simulators. The result was very satisfying, although it took us a considerable time to fine-tune the flight model to FS's specialties and also to those of the ProSimA320 Suite.

We are certain that now you have the best flight model, ever done for FSX platform. We hope you will soon be of the same opinion, when you also experience the result of our   continued efforts.

The flight model is designed by A.K. Lapi, who is not just an experienced real world pilot, but who has been designing FS related add-ons since FS5. He has worked on FS related projects for several known companies, also worked on FS related titles for Microsoft®, regularly works for NASA and he has also been a long time special advisor to his local airline.

2.1   Visual Model

Flight Training Devices (FTDs) rarely have an external model or 3D representation of the aircraft itself. In their case, the most important - time & money saving - factor is the training itself, thus the trainees don't have any intentions to look at an external model. That is why those "serious" simulators do not even have any external views to look at the plane itself. Home cockpit builders, nevertheless, usually come from the entertainment part of the "simulation world", therefore they got used to having extremely nice external visual models   of airplanes.

This is why we are providing an outstanding 3D model along with the flight dynamics in   this release.

The new external visual model is done by Steve Cozens. It is a very nice 3D model of the A320.

Now the model contains all features that a state of the art 3D aircraft representation should. Specially made landing lights and other external lights were done with the utmost care to satisfy the needs of the serious flight simmer and the overall detail of the 3D part is a masterwork. There are several liveries made for the model (available from the ProSimA320 forum) and there is also a paint kit available on request, if users wish to design their own   liveries.

2.2   Sound

This version of the model comes with its own sound set, one of the most advanced sound packages available so far for the A320. The engine sounds are combined of 11 internal, plus 19 external sounds for each engine.

The sound pack is not a subsystem of ProSimA320, therefore the sound pack is a separate entity, which does not depend on the deep systems simulation of ProSimA320.

For additional sound enhancements ProSim Audio is available for the user, so almost any custom-made sounds can be defined through ProSimA320's Audio module.
Unlike it was done for our previous airplane (B738) the advanced sound package comes in a single stereo version, suitable for all purposes.

2.3   Landing and Taxi lights

These are important to everyone but there are limitations within FSX/Prepar3D® which mean some things simply cannot be done. The ProSimA320 model provides the following lighting systems:

a.   Exterior view. Light cones to simulate the light source, refined light splash on fuselage and engines, light splashes in front of the aircraft, default FS lights and   see below for visibility notes.

b.   VC View. Controllable light splashes for landing, taxi and runway turnoff plus the default FS landing and taxi lights. Default lights were included to help 2D view but also to add extra lighting away from the immediate area. Taxi light is fully animated. Lights are controlled by assigning switches through the ProSimA320 System configuration menu, runway turn off needs to be assigned to wing lights as there is no runway turnoff available in the Aces attachment toolkit for the modelling program.

There is a PSD file available (Landing Lights Prosim.psd) on the ProSimA320 forum where you can adjust the colour and intensity of the light splash, instructions on how to do this are in the file. Taxi light will automatically extinguish at 10 ft above ground level, Landing and runway lights will extinguish at 300 ft above ground level. They can be armed at any height they will just not be visible till these heights to avoid lighting up the ground at say 10000 ft as would be the normal case.

c.   2D view. Lighting in the 2D is limited to just default FSX lighting. FX lights were extensively tried but it was not possible to control the positions and effect when more than one .fx file was added, i.e. a moveable taxi light and two landing lights.

You may ask: What about Shockwave files for lighting? Shockwave lights do not add any light to the ground plane in the 2D or VC views, they simply add pretty light blooms near the light source. It was decided to include controllable light cones within the model to achieve a similar effect. So, no, Shockwave lights are not supported.

3.0 What's not included in the package

There is no Virtual Cockpit (VC) depiction included in this package, as there is no need to deal with those, especially because the cockpit builder has no need for an internal VC model since replication hardware panels are used.
There are no special gauges or system logic in the package, the system simulation is taken care by ProSimA320 System itself.

4.0 Requirements & Compatibility

The advanced flight & visual model will work with Microsoft® Flight Simulator™ version 10 (FSX or FSX-SE), updated to either SP2 or the 'Acceleration' pack. The model will not be compatible with the RTM version of FSX or FSX with only the SP1 update. This version of the flight & visual model is not compatible with Microsoft® Flight Simulator™ FS2004 (A Century of Flight).

The model is also compatible with Microsoft® ESP (no longer available to be purchased or licensed) and Lockheed Martin's Prepar3D® both versions 1.x, 2.x and 3.x
In order to make the installation our model as simple as possible, we did include the   default A320 panel and panel textures in our package, simply for reference purposes.

The flight model is thoroughly tuned to ProSimA320, and ProSimA320 was also tuned to the flight model, thus this model is fully compatible with ProSimA320 only!

The flight model is therefore to be used with ProSimA320 and under our license agreement the user is NOT allowed to combine it with any other plane or package.

It will not work in connection with any other simulation related suite. The flight & visual model package is not compatible with other A320 related add-ons. Don't try to achieve any sort of compatibility, it is a futile experiment!

5.0   Setting up the flight model

5.1   Installation

Our advanced flight & visual model comes with its own installer. The installer either finds FSX, FSX-SE or Prepar3D® version installed on the user's computer.

The installer will also search for existing installation of FSX-SE, distributed by Dovetail Games since 2014. (If you wish to install it for FSX-SE but you also have FSX installed, you must do it manually, by pointing the installer to the ROOT folder of the simulator).
The same stands for Prepar3D® version 1.4 or earlier. The model works on Prepar3D® 1.x but you should manually point the installer to the root folder of the simulator.

If one of the directly supported simulators are installed, the installer will find their paths in the registry.

Simply double click on setup.exe of the package you received and follow the instructions on the screen. By default, the installer places the ProSimA320 Flight Model plane into the 'Simobjects' folder of your Flight Simulator™ X or Prepar3D® installation. No further action is required by the user, apart from selecting our airplane in the simulator, later on.

We highly recommend saving a start-up flight with the ProSimA320 Flight Model, so your simulator will always start with your new plane.

5.2   Recommended FSX realism settings

In order to work correctly, your realism settings need to be at the maximum in FSX.

The flight model will be unusable or crippled if you try to use any other setting. Although not recommended either, you may change the other settings but never ever move the 'Flight model' sliders. They always have to be at the rightmost maximum setting.

We recommend using the maximum settings as shown below:
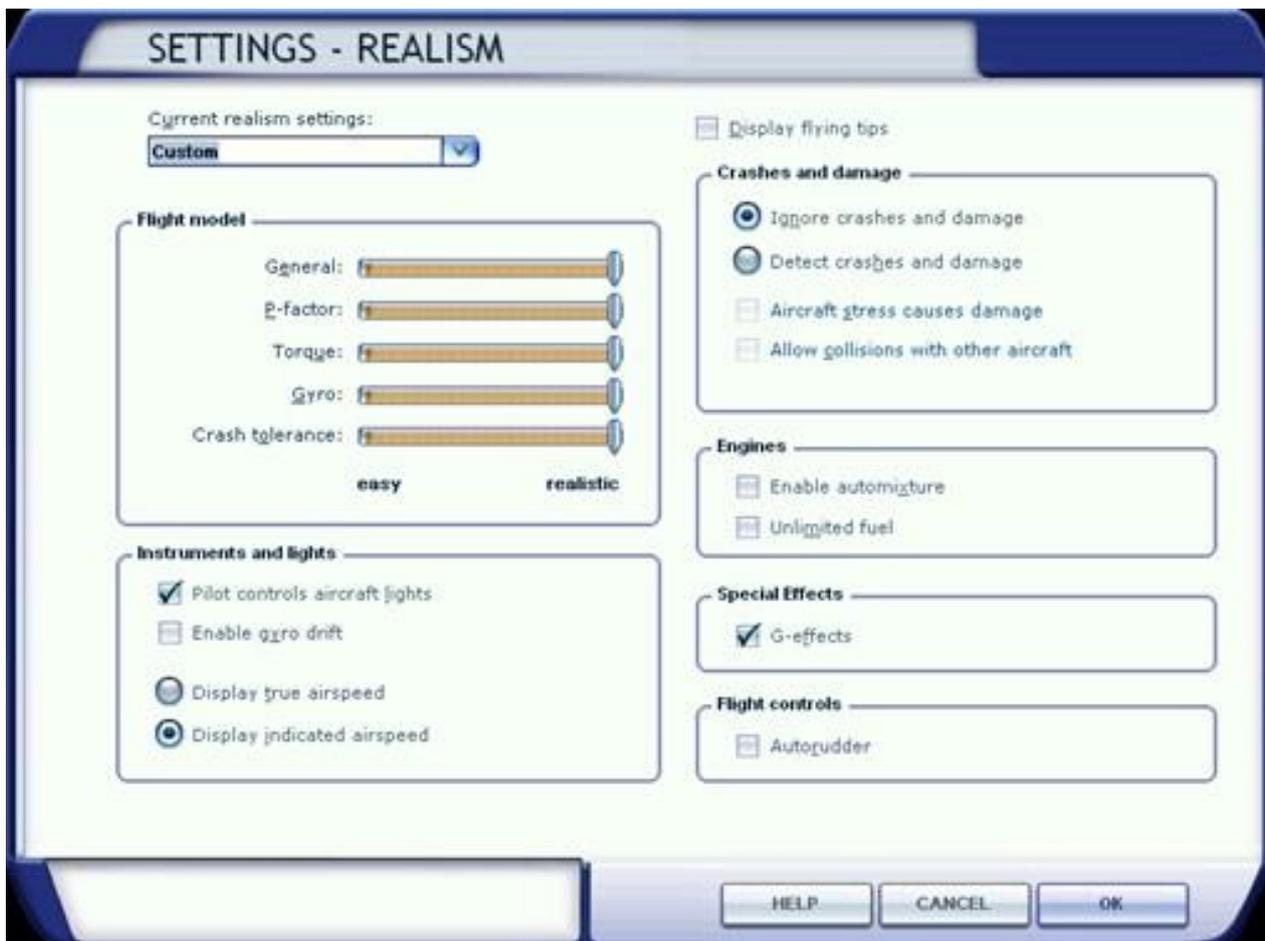
5.3   Sensitivity of controls

To achieve the needed realism, apart from our advanced flight model, the most important factor is the settings of your hardware components, mainly the side-stick and the rudder but   also the throttle levers to some degree.
If your controls are not calibrated almost perfectly or sensitivity curves are far from the desired values, your plane and our flight model will not work as should.

Therefore, it is vital to calibrate your hardware as thoroughly as possible. There should be no 'spikes' or unwanted movements of the controls, they need to be steady in a given position without any oscillations. 'Dead zones' need to be calibrated as well.

Please note that we cannot fine tune our dynamic model according to your hardware or   the tens of thousands of side-sticks and pedals out there, thus you need to calibrate your hardware according to the needs of the model. This is the only path to achieve realism.

Please do not calibrate your side-sticks a certain way, just because you are used to a comfortable setting. That particular setting may be comfortable to you but might also be a serious obstacle when you try to 'hand fly' the plane. Unfortunately, we are simply unable to give you any exact instructions We would have to present as many instructions as the number of different side-sticks out there. It would be impossible, so let us agree on a different approach to the problem. We see no other solution to this. So here it is:
When your plane behaves just as it should – in comparison to the real one – it means your settings are good or they are getting better.

Do not let your 'feelings' interfere with realism and do not judge the flight model just because your decade old settings on the side-stick suggest you so. They are different! They have served you well for quite some time, but it doesn't mean they are perfect.
Our model has been tested on different hardware by quite a few real captains of the A320. They have the real and daily experience of the 'feel' of the side-stick and the pedals, so in fact this is what you need to achieve with your own calibration.

When you get acceptable results, it means you are getting closer to the right calibration.   Do a couple of single engine landings. If you are able to keep the plane on the centerline with rudder and applying only one reverser, it means your settings are good. If you are unable to do it, it is not due to the shortcomings of the flight model, but something is unfortunately wrong with your hardware settings. Calibrate, re-calibrate, change the sensitivities and curves, until you are able to stay on centerline. Then you've probably achieved what was needed.

If you are using Peter Dowson's great FSUIPC utility, always try to assign your controls via the Axes tab and use the 'Direct' calibration method. That ensures the best result. Later on, calibrate the controls in FSUIPC and try to find the best 'slope' for your specific hardware. There are many throttle quadrants on the market by now. Some of them are even motorized, some are not. They all will work with our advanced flight model. It can be a problem though, that some other THQ's software or hardware sends information to the simulator in such a method that may be slower than required. In this case, the flight model will suffer, because throttle response is not what the real plane or our flight model was designed for.

The very same problem may also arise with other side-sticks and rudder pedals, so the only guarantee we can provide is that the advanced flight model works as it should with properly configured side-sticks and pedals. Proper calibration

of hardware is very important. We highly recommend calibrating your control axes via FSUIPC's 'Direct calibration' facility, which is independent from axes in the flight simulator's own system.

5.4   Single Engine operations

In order to practice single engine operations (SE) the rudder pedals need to be carefully calibrated but even more importantly the user has to be sure the pedals are able to provide their maximum values at their maximum deflection. Although Flight Simulator comes with its own inbuilt Yaw Damper but it doesn't work as it should. The Yaw Damper in the simulator simply abridges full rudder deflection. Therefore
– especially if SE operations are practiced – the default Yaw Damper needs to be disabled in relation to the flight model.
To achieve this, please make sure that the line 'yaw_damper_gain = ' is set to '0.0' in the aircraft.cfg file. This is always needed to be set to 0.0 if a SE operation is practiced, especially if an engine is out at V2. We advise you to always keep this setting.

5.5   Adding Liveries

Liveries can be downloaded from the ProSimA320 forum, so everyone should be happy.
If you need a third-party livery converting let Larrylynx know via the forum.

To add a livery is quite simple... and I don't apologize for the hand holding method.
1.   download the file
2.   make a texture directory
3.   adjust the aircraft.cfg file

Each download should contain, 3 fuselage files, 1 tail file, 1 texture cfg file and 1 thumbnail file (there may be a wings file but this is very very rare).

Make a texture directory, the file structure for the ProSimA320 Flight Model is as follows:
SimObjects
     Airplanes
          ProSimA320
          model (visual and VC models)
          panel (default FSX Panel)
          sound (sound files)
          texture (default ProSim texture)
          texture.common (textures common to all liveries)
          Topcat (Topcat file for ProSimA320)
          docs (documentation for ProSimA320)
to add a new livery include a new texure folder like this:

texture.XXX (where XXX is the 3 or 2 letter designation, the dot is very important so don't leave it out, see end user guide for a current list though any designation will do, and place downloaded files in this directory).
CFG file modifications: Open the aircraft.cfg file with notepad or similar. Yes the ProSimA320 file not any other one. Right at the top you will see entries similar to the following:

```
[fltsim.1]
title= title= Prosim Airbus A320
sim=Prosim_A320
model= panel= sound= texture=KLM
atc_heavy=0
atc_flight_number=101 atc_airline=Prosim
atc_model=A320
atc_parking_types=GATE,RAMP ui_manufacturer="Prosim_Airbus_A320" ui_type="A320"
ui_variation="KLM"
ui_typerole="CommercialAirliner" ui_createdby="Prosim"
atc_id=PS-320
visual_damage=0
```

To add a livery, (KLM in this example), you need to copy the whole block and paste a new one after the last block you have listed, then change the following lines, which have not been modified in the top example

```
[fltsim.1]
title=Prosim A320 KLM texture=KLM
ui_manufacturer="Prosim_A320 KLM" ui_variation="KLM"
```

to

```
[fltsim.2]        (the next available number, 2 in this case,  remember the dot)
title=Prosim A320 KLM      (Name to appear in FSX  menu)
texture=KLM     (same  as  the  XXX  letters  you  used  in  the texture. folder)
ui_manufacturer="Prosim_ A320 KLM"
ui_variation="KLM"
```

ProSimA320 suggested livery codes to keep things simple, if you make a livery using the A320 paintkit suggest a XXX lettering code. The A320 is ok for the ProSimA320 Flight Model, just save the files with the correct naming structure; see a download livery for examples.

6.0   Miscellaneous

6.1   Realism

The flight model has been thoroughly tested by airline pilots and instructors.

The behavior of the plane is as close as to the real A320 as possible, thus all parameters are in the range of 1-5% of the real plane, which is a truly admirable ratio, especially if you consider that two real airplanes of the same maker may also show this much difference, without any rationally known reason.

The flight model is capable of simulating whatever the real plane does, or is needed for   any training scenario, including the mentioned Single Engine (SE) performance and stalls. All parameters are according to specifications and what level-D simulators are capable to simulate.

You will get realistic takeoff and landing performance, realistic climbs and descends, SE performance and stalls, however there is an important tool we cannot provide: the real documentation of the plane to compare our numbers to. This is something you need to get hold of yourself.

Needless to say, that the A320 flight model represents the flight dynamics of a 'Fly by Wire' airplane. That is why the model had to be designed very closely with the corresponding ProSimA320 software suit, as it is the combination of both software that helped achieving the needed 'Fly by Wire' characteristics. This is the main reason behind the fact, that our model will NOT be compatible with any other Airbus plane simulation but our own ProSimA320 Suit.

6.2   Topcat compatibility

There is a popular add-on named Topcat, used by many serious cockpit flyers to be found at http://www.topcatsim.com

This utility – an advanced weight, takeoff and landing performance calculation tool – uses   a specific file for each widely used add-on plane.

We have made such a file for you to be used in Topcat. In case you have the utility and wish to use it with the ProSimA320 flight model, please copy the "A320-214 Prosim.txt" file from your \Simobjects\Airplanes\ProsimA320\Topcat folder to Topcat's own "Configurations" folder. When starting Topcat simply select "ProSimA320" for the Aircraft/Configuration menu.

6.3   Credits

Thanks to:

F/O   Thomas Freund
F/O   Peter Orosz
Captain Oliver Nagy
Captain Adam Foldes

For their invaluable help and support.

Happy flying!

The ProSimA320 Team