Why do get 50 fps and you get single digit fps?

In the last few weeks there has been one question that I heard most of all as I was attending the Aerosoft stand at three flightsim events. “What is the hardware this is running on?” I understand the question as I always leave the framerate indication on screen and almost never show anything below 40 fps in FSX. I was asked a few times if I could discuss this a bit more. Now I have done so and even told the few persons who did not believe me to come and see. If I could not replicate the screen-shots on this forum I would pay for lunch, if I could the person who challenged me would pay. Last weekend at the show in Paris I had duck on Saturday and a fancy omelet on Sunday. And I did not pay. So what’s the deal? Do I have any tricks, some super-duper hardware?

No. But I do know FSX rather well as it is my work. And I do know a bit about hardware and operating systems as they are my work tools. So as FSX runs for an average of 50 hours a week you learn a lot.

Let’s first talk hardware. Here is what I am running:

- Asus Motherboard, no idea what one, as cheap as I could find (€180)
- Core i7, cheapest there is (€230)
- 3 GB of memory, again as cheap as I could find it (€80)
- ATI Radeon 4650 1GB (€50)
- WD VelociRaptor disk (€140)
- Sound/network onboard (€0)

Add a case with 650 watt power supply and you get it for under €800 (in the US this would be around $750). This is written on December 10, 2009 and it will drop about 2% in price every month after that.

> *A comment on the graphics card. I prefer the 4650 for FSX as it is the fastest card I can find for it. But as it works bad on the other products we handle (Rise of Flight, City Bus Simulator etc) I also got a more expensive card (Radeon 4870) that I can insert. Shitty but that’s life.*
>
> *Want a reason why FSX gets slower with more expensive cards? I can just guess but it cannot be a coincidence that the 4650 was about the fastest card around when FSX was created. Some 3d guy explained to me that when the GPU gets more complex there is more (not less) information to be send. If there is a timing problem in FSX the time window to send data might just not be large enough.*

> *A comment on the hard disk. Yes it is expensive and very fast. I like my storage fast. It’s also pretty small with only 150 GB. But that’s enough for me as all documents and files are on a server I got running here. Makes sense to keep your collection of vintage nudies from the machine I type the manuals on right?*

So it’s a solid machine but far from anything special. It’s not over-clocked in any way. But I do am careful with what I install. No crapware or silly Adobe updaters running in the background. I run it with Vista 32 bit now, updating to Windows 7 (also 32 bits) this week. FSX is installed with Acceleration. All our own addons are installed, not a lot more. The whole installation is not tweaked in any way. All 100% standard. I know a lot of people feel that tweaks to the CFG help, but to be honest I have never seen anything impressive. I prefer to run DX10 mode but on some products it simply does not work as it has some limitations, for example the fact it will not handle high detail textures.

So we have to conclude that I don’t get my good FPS from the superior hardware. It has to be from the way I use the sim and how got my settings. So let’s talk settings. I suggest we run over them quickly so we know what’s what.

FSX settings

They are sometimes names badly, often got weird or even counter intuitive results but here they are as I understand them.

- Graphics
  - Device specific options
    - **Target Framerate:** *if I got a trick it is this one. Always leave it to unlimited as it will always get your far better fps. Only when you got very wild fluctuating fps does it make sense to set it to the lowest fps you see. It worked in FS2004 but in FSX it is a silly setting. She below for an example.*
    - **Filtering:** *complex issue, will leave that to others. I got it to anisotropic (but it could be better to leave that to the card driver settings)*
    - **Anti-aliasing:** *on (but it could be better to leave that to the card driver settings)*
  - Global options
    - **Global texture resolution**: *always on max, don't experiment with this one.*
    - **Preview DirectX 10**: *if the add-ons you use allow it, do try it! It often will get you far better fps (but only for Vista and Windows 7 users!)*
    - **Lens flare**: *demanding but looks superb if you fly high*
    - **Light bloom**: *very demanding and buggy on most systems, only try when you got very high fps.*
    - **Advanced animations**: *always on*
    - **Informational text**: *Continuous is the best option unless you have a very wide screen.*
- Aircraft
  - Cockpit settings
    - **Default Cockpit view**: *set to 3-D unless you still use 2-D panels*
    - **Shown cockpit ToolTips**: *some aircraft add a lot of info that way, so on*
    - **High resolution 3-d virtual cockpit**: *always leave this on*
    - **2-D panel transparency**: *0% who cares?*
  - Exterior settings
    - **Aircraft cast shadows on ground**: *nice for small aircraft as it gives you some depth perception, but buggy, so I got it always off*
    - **Aircraft cast shadows on itself**: *can look great but on a very complex aircraft (Catalina, F-16) it can cause serious drops in fps*
    - **Aircraft landing lights illuminate the ground**: *buggy as hell but leave it always on*
- Scenery
  - Terrain and Water
    - **Level of detail radius:** *don't use the small setting but the medium setting works fine most of the time.*
    - **Mesh complexity:** *depending on situation. Check the manual, if there is nothing there go for 50% setting.*
    - **Mesh resolution:** *depending on situation. Check the manual, if there is nothing there go for 50% setting.*
    - **Texture resolution:** *unless the manual tells you anything else a setting of 50 centimeter is okay.*
    - **Water effects**: *highest levels only look good on a Carib island and they eat FPS like nothing else. In fact most of the year, most of the world a low setting like Mid 1.x looks best.*
    - **Land detail textures:** *always leave this activated*

    - Scenery objects
        - **Scenery complexity:** *leave on Extremely Dense unless you are forced down.*
        - **Autogen density:** *can take serious effects on fps and often does not look so good. Unless you fly very low and very slow things get a lot faster and a lot smoother with low setting. But do read the manual as some product (like VFR Germany) do use it with very good effect. Keep in mind that even a very low setting will show more than FS2004 would do at max settings*
        - **Ground scenery shadows:** *if you got a lot of objects in view this slows things down a lot but I personally almost always have it deactivated*
        - **Special effects detail:** *always leave this on max*
- Weather
    - Visual Settings
        - **Cloud draw distance:** *If you cruise an airliner it is nice to set it to 110km but it is one of the first settings you should reduce when you get short on fps.*
        - **Thermal visualization:** *unless you fly a glider, keep it off.*
        - **Cloud detail:** *Detailed clouds look a LOT better but can take a huge toll on your fps. Leave it on but it is one of the first things you should switch off when needed.*
        - **Cloud coverage density:** *can be used to tweak the clouds but a low setting often looks silly.*
    - Simulation settings
        - **Download winds aloft**: *keep on unless you are sure you will only stay very close to the ground. Can save a remarkable amount of fps!*
        - **Disable turbulence:** *why switch it off?*
        - **Rate at which weather changes over time:** *I prefer high as it gives me a better idea on the weather.*
- Traffic
    - Aviation Traffic
        - **Airliner traffic:** *if you are not flying a big airliner or landing on a major airport consider having this very low or even off. It can take a huge toll on your framerate. Settings above 50% are almost never a good idea. If the airport has build in static aircraft you could get away with very low settings.*
        - **General aviation traffic:** *same as with airliners. But be cautious, many people set this to high settings that hurt badly.*
        - **Airport vehicles:** *not used by all add-ons but it has a light effect on performance as they are repetitive objects. Keep it on medium.*
    - Land and sea traffic
        - **Road vehicles:** *one of those settings that can make FSX look very good but also can take a heavy toll. Settings over 30% are almost always a bad idea.*
        - **Ships and ferries:** *If you are landing at Heathrow or Frankfurt, why would you have these settings at anything but 0?*
        - **Leisure boats:** *same as ships, but they do look very cool at islands like Ibiza and take a relative low toll on your fps.*

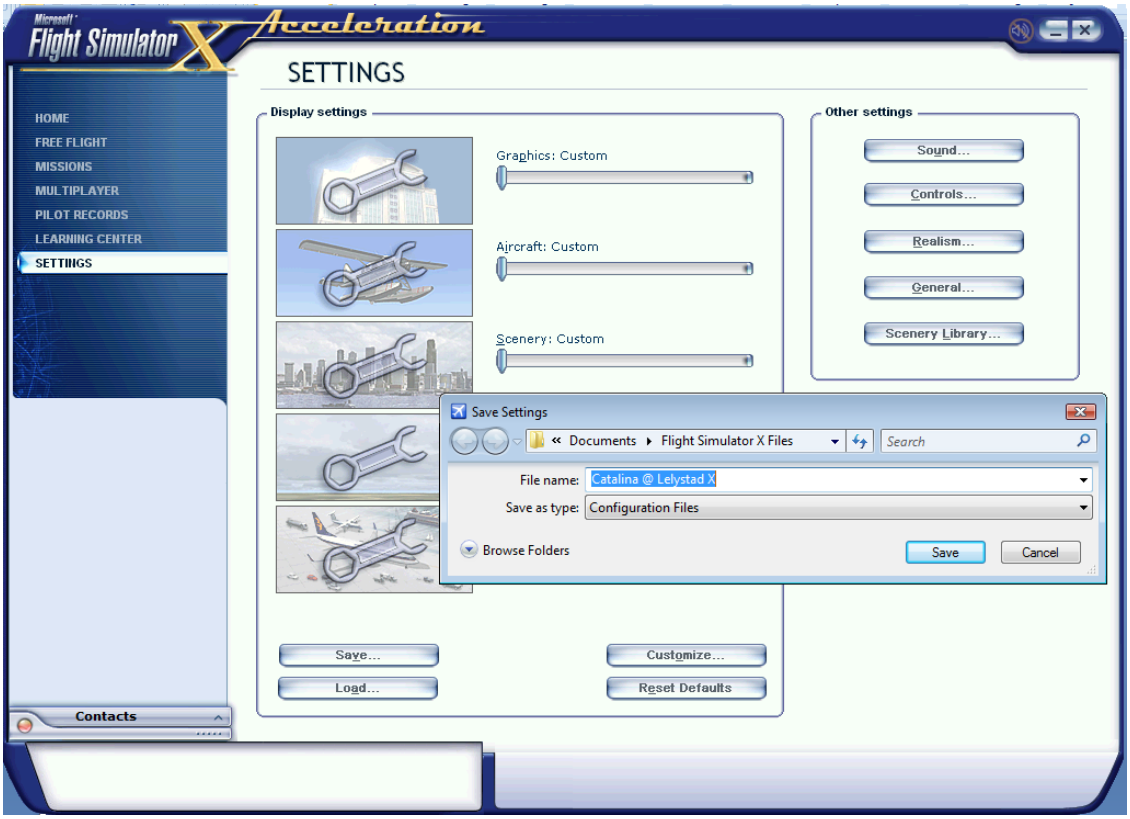
How to use the settings?

Here comes the most important bit. **You should use them to tweak the sim to what you are doing.** Sliding all sliders to the right will most likely make it always slow, sometimes buggy and most certainly not optimal.

See FSX is a jack of all trades. It needs to do gliders over the alps, helicopters on Monaco heliport and 747's on Amsterdam Schiphol. But all of these things need different settings. In the alps you want a good mesh to show the mountains but on Schiphol a high mesh setting will show you nothing and will just slow things down. So that's not a problem of FSX, it's something that simply cannot be solved. FS2004 was dead slow when it was released (ohh how fast people forget), but it was always build with 2007 hardware in mind. FSX was NOT build with future hardware in mind, it was build with an idea in mind that MS forgot to explain.

You need to tweak the sim to what you do.

When you tweaked the settings do save them there is an option for that in the Settings menu. That way you got the optimal settings for that situation. I got loads of them, FSX would be near useless for me without this option. I use it many times a day, if you do not, you are not seeing FSX as you could.



VFR scenery, highly complex aircraft

Take for example a scenery product like Lelystad X we recently released. It's a small airport in a rather special surrounding. It's located in a polder that's very empty and very flat. **The lowest settings (fully off) for mesh and autogen are actually the most realistic**. There is a lot of water around but it is all rather muddy and certainly not very blue. So a low water effect setting works best. As you fly circuits over the airport there are no major roads around so road traffic can be left off. So even with the complex Catalina and the highest weather settings I get very high fps. So high that I even have bloom and lens flare activated. T**he top image has 67.8 fps average, the bottom one 73.6 fps average.**

Mesh scenery, medium complex aircraft

Now let’s look at a very different situation. Let’s start with the image this time.

We are in the advanced Discus glider we released recently. In modeling the aircraft is so complex it could not even be compiled for FS2004 and in systems and animation it is complex and demanding. We are flying over the Swiss Alps (using Switzerland Pro) and I think you agree it looks pretty good. Certainly with an **average fps of 149.4**. Getting this high FPS is easy. We need good mesh and weather settings, and moderate autogen settings work best here. But nearly all other settings can be low because you simply don’t use it. Also note the variation (between lowest and highest fps) is rather higher, over 10%. And it is indeed choppy with some nasty stutters. So this would be better limited at 60 fps, that would smooth it out and still be very fast. FSX at its best, a complete joy to fly.

Medium airport, complex aircraft

Let's move to a large aircraft and a larger airport, the Aerosoft A321 on our latest Nice X scenery. Here things start to get more difficult. FSX is simply not very good with major airports due to some technical reasons. Yet, with giving up detailed clouds (hey it's mostly sunny at the med anyway), and medium settings of traffic, mesh and textures I get a very respectable **69.1 fps average**. But a large variation between high and low (over 40%) so a capped framerate of 40 fps would make this far better usable.

Mega airport, complex aircraft

Now make things serious complex. Mega Heathrow with a VC view from our Airbus. Things do not get much more demanding for FSX. Now the first thing I did was move to DX10 mode. Nothing in this scenery (and in most Mega airports) prevents this and on my system it gets me 30% better FPS. Traffic settings are moderate and I even use detailed clouds. Autogen is low as is mesh because you'll never notice very high settings in these conditions. With these settings I get **32.7 fps average**. Very acceptable.

Changing to the PMDG MD11, a rather demanding but seriously great aircraft, I lose a bit of fps but if that would worry me I would gladly move to simple clouds. That would move fps directly in the +30 range for sure. Right now I see **25.3 fps average**. Personally that's good enough for me.

Some loose comments

Now there is a lot more to say and no way to write a document that will ensure you get the results I see. But there are a few things that I like to share. Some make sense for all users, some might not.

The OS of choice

Simple one. Windows 7 rocks, in any aspect. FSX is a bit (but only a bit) faster than in XP or Vista. If you do not want a fresh OS use XP, with Windows 7 available there is no reason to use the horrible Vista (and yes, I still need to upgrade the machine I write this on). After you installed the new OS go to http://ninite.com/ and save a load of time getting the other important things installed (for me that's: Firefox, Pidgin, VLC, IrfanView, Essentials, Flash, Silverlight, Google Earth, CCleaner, Defraggler, Revi and 7-Zip.

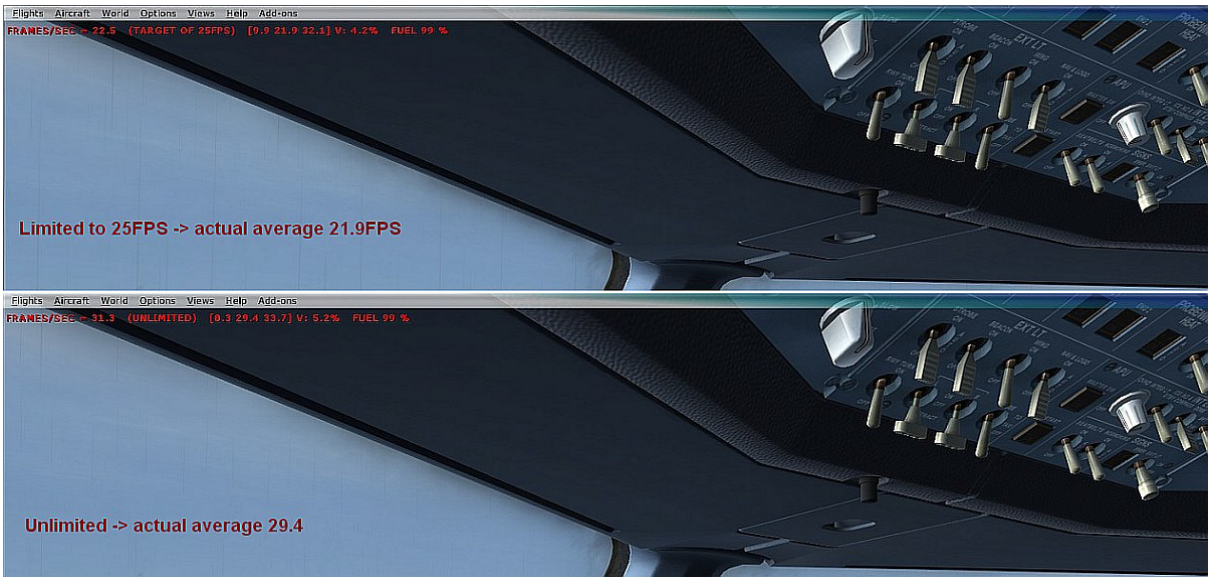
Defragging & Virus scanning

I have yet to hear a solid reason why it matters but I know it does. Defragging your disk regularly helps to get good fps. It should only have a slight impact on the loading time of files but even with zero disk activity it seems to help. If you are anal defrag before and after you installed a scenery add-on. I normally use defrag before I shut down end of the day. There are many defraggers. I have yet to see any proof payware is better than freeware. I use Defraggler. It's good, it's from the same guys that make CCleaner.

There are a few virus scanners that seriously slowdown loading of files (but they should not matter a lot when the files are loaded). Like defraggers, at this moment I seriously doubt a payware virus scanner is better than some of the freeware versions. Currently I use Microsoft Essentials. It's very easy to tell it not to check anything in the FS folder, works without ever bothering me (and that's how it should be) and seems to be good enough in catching the baddies.

Limited or Unlimited FPS

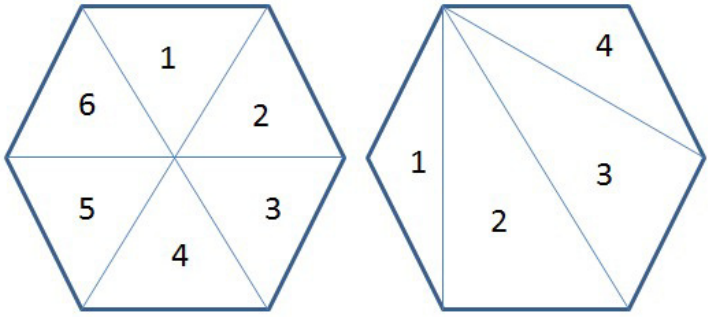
As said above, there is a nasty bug in FSX here. See the images attached. They speak for themselves. It's the best tip in this whole document. For many users this is the difference between usable and junk.



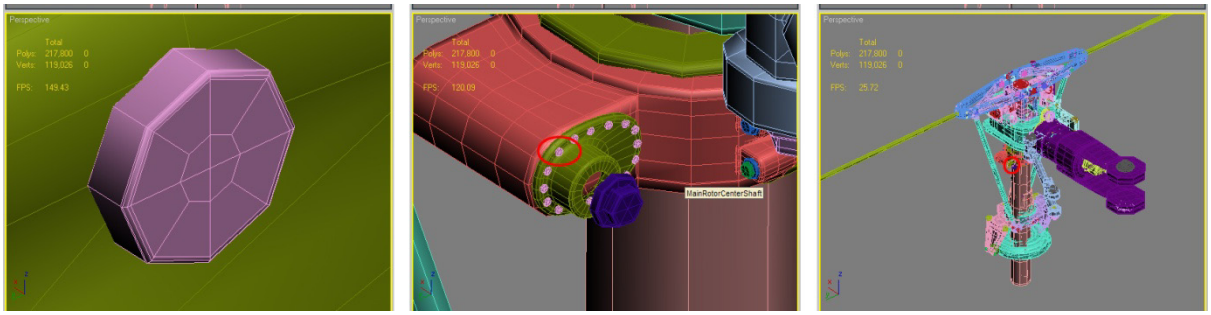
Only when you see wild fluctuations in fps consider setting a capped fps.

Quality of add-ons

Touchy topic but it got to be discussed (without mentioning products). The level of knowledge of the modeler of the aircraft or scenery makes a lot of difference. Recently we have seen some highly trained and highly experienced modelers that worked in the gaming industry try out FSX. There they compete with the majority of developers that are not traditionally schooled but are either still doing it as a (paid) hobby or were self educated. Let me give you a very simple sample. In the image you see the same hexagon. In FSX this has to be build with triangles. The left sample shows the most 'logical' and intuitive way. But doing it as is done in the right sample reduces the amount of polygons with 1/3! Over a whole airport this makes a lot of difference. Now this is a very simple example, but when things get more complex you start to see the difference between professionals and hobby developers. And things like this mean that some developers can make the same scenery less demanding on frames per second.

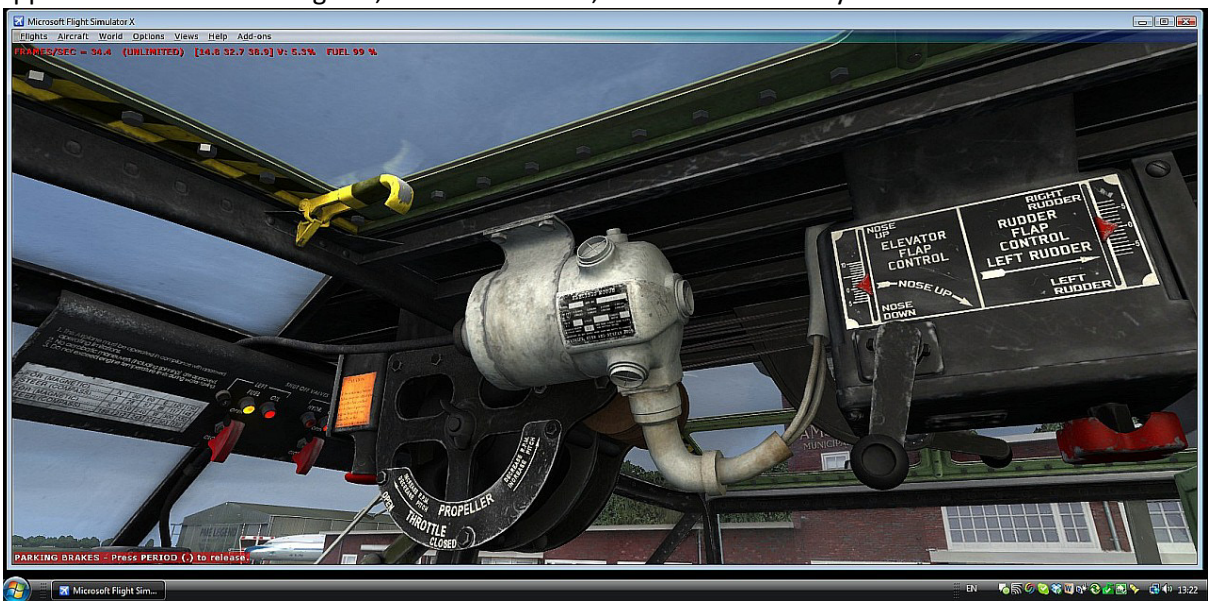


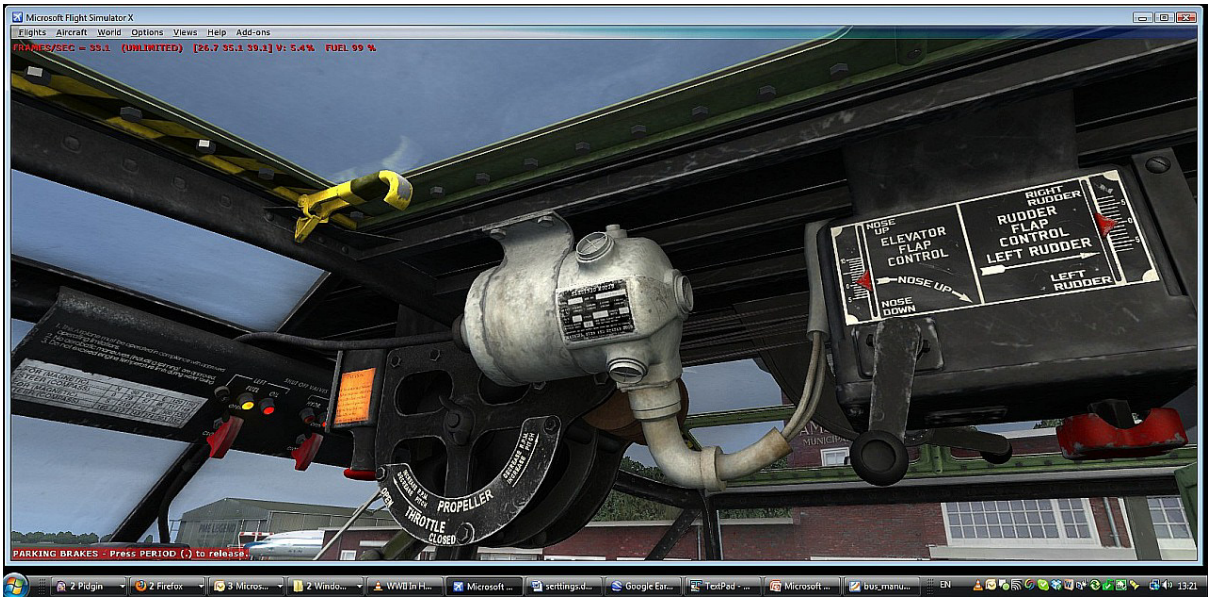
Now besides this technical aspect, there is an artistic aspect. Human eyes and brains are not like camera's. They see what they expect to see. The art of high performance modeling is to decide what to leave out (or what not to model in 3d but only in 2d textures). The Project Manager plays an important role here as well as it is in the nature of most modelers to want every greater detail. See here a fine example of how a model can be far (and in this case faaaaarrrr) too detailed to be usable for our use.



Closing applications

If you are short of memory (2 Gb or less) not a bad idea. But Window is actually pretty good at managing memory and will always try to make sure the application that needs the memory gets what it needs. So in the majority of cases it's just a waste of time. Let me give you an example. 32.7 fps average (top image) with all applications closed and 35.7 fps average (lower image) with a slew of applications open. And those are not simple apps. MS Outlook, Word and PowerPoint, I am playing a video file using VLC, two browser windows open, PDF reader, Google Earth and two explorer windows. Loads of task bar apps are running. Virus scanners, Pidgin, Skype, Google Desktop, too many to list, certainly as many are not even shown. So if you feel happy closing applications before starting FSX, feel free to do so, but I never seen any effect.





Closing arguments

Let me be totally blunt. This works for me, this works for most of the people I work with and who work for me. But even if you buy exactly the same hardware you might get different results. Might be one line in a config file, might be a driver somewhere. But I can repeat these results on a new clean machine. In fact I have done so last week. Now if it does not work for you pick the ideas that you think will help. Discuss the results here.

If you do not like FSX in the first place, got hardware that's way below what I mention (or a $600 graphics card that is great in games but lousy in FSX) do not use this topic to complain about FSX. Loads of forums for that, this is not one of them.