

The 53 Million Dollar Game

Experiencing the Thales® A380 Simulator

by Peter Hager

More than one year after publishing my A380 model for the X-Plane® flight simulator, some burning questions were still not answered:

- **What is the difference between my A380 model for X-Plane® and the real A380 in flight characteristics and performance?**
- **Would a desk top pilot, like me, without having even a PPL, be able to fly the real 560 tons monster?**



Comments and statements by users, be it amateurs or professionals, confirmed that my model flies like they would suppose the real A380 to fly. But most of them had never flown one, and those few who had, did not talk about it. Lips of real A380 pilots seem to be more sealed than those of B2 crews. - Thanks, folks, for your compliments! But I need facts, a real comparison, to dispense with the torturing doubts.

Sunday evening, 9th January 2011, I was on my way to the Lufthansa Flight Training Center at Frankfurt am Main airport (EDDF), in order to find the answers on the two questions.

Of course I was not going to fly the real thing, just another simulator. But WHAT a sim! A complete cockpit with all the instruments, panels, switches, seats being the original equipment of the real

aircraft, no mock up, no replicas. And all mounted on six huge hydraulic struts, to let your ace feel what happens, equipped with 200 loudspeakers to let you hear what happens. And looking through original A380 windows, a spheric projection of the outstanding view system tells your eyes in a breath taking manner, where it happens.

Lufthansa had paid 38 Million EURO (~\$53 Million US\$) for this toy, though it has the worst exterior model ever: No wingflex, no shiny reflexions, not even a fuselage or wings, simply NOTHING of all those features people expect from a model which costs only 1/2000 of this price. Why? - It was not designed for gaming, not even to create the illusion of being a professional pilot. Those guys and girls taking their seat here do not need that, because that's what they already are. During their daily work, between take off and landing, there is usually not much flight experience to gain, in particular on a super long haul aircraft like the A380. That's why they come here to be tortured by being exposed to the illusion of artificial hazard, near disasters, any kind of abnormal and emergency situation, which can hardly be practiced in real flight, not for having fun. - If this monster machine would not provide an absolutely authentic flight model, it would not be certified for professional pilot training. So I should be able to find my answers here, without hiring a complete 300 Million EURO A380...

Arriving at Lufthansa Flight Training Center, my wife Maria and Engelbert, an old friend back from high school, and me, had to show our IDs or passports at the entrance. We were early, so we had to wait in the cafeteria, until the instructor arrived. Certainly I made sure to be early. When you pay the purchase price of an average XP payware model for each minute in the sim, you do not want to miss one single of those valuable 60 minutes you bought. That's why we came early.

The instructor showed up, and we went to a briefing room upstairs. From the gallery I had a first view on a long row of one full motion sim after another, B747, B767, A320, another B747, A380, etc.. I counted to twelve, and I was told that this was only one of two such rows... I brought a list with maneuvers I wanted to perform, and talked the matter over with the instructor.

ProFlight GmbH is a small company, which sells excessive simulator time to private persons, so they can have a short flight experience. A so called FunFlight (at 395 EURO/person) is held for three people at a time. After 90 minutes of theory, commencing with "What makes an aircraft fly...?", they enter the simulator, and each of them has 20 min. of piloting through a pre-defined program. When I told the ProFlight people about my intentions, they instantly knew that this was not the appropriate thing for me. So they made me a special offer for 900 EURO only (the normal price is higher), including a 45 min briefing, the simulator a full hour at my disposal, plus a short debriefing.

For sure the instructor was curious about my intentions and my background of building simulator models for XP. One of the things I wanted to experience was the DIRECT mode of the flight controls. This was rejected, because ProFlight does not allow training of ABNORMAL and EMERGENCY. All other topics on my list were accepted.

The time had come, we left the room and walked just a few steps to the A380 gate on the gallery. The sim was still in motion, but stopped soon, and a 4 meter wide metal bridge lowered hydraulically to connect the gallery with the simulators cabin entry. Then the door opened and the previous group left, with faces like you see at people leaving a roller coaster... We entered the simulator cabin and I took my place on the captain's seat, Maria on the jump seat, Engelbert on the FO's place, though he did not intend to fly or to assist as PNF (Pilot Not Flying). He knew little to nothing about it. - I felt instantly comfortable at my place. Everything was familiar, exactly like I knew it from the model I had built by myself. Only the glare shield was a lot higher than expected.

Now the view system appeared. WOW, that's simply breath taking. The panorama around you is so incredibly real! It was the first time I got an impression of how high the pilot is located above the

ground, and of how wide such a 60m (197ft) runway really is. It appears all so huge! Details and resolution are overwhelming at and near the airports. The rest consists mostly of mapped orthofotos, no artificial textures. So the visual impression is amazing, whether you are at an airport or in flight. You really don't miss 3D-buildings and 3D-trees in the landscape, since in an airliner you keep your distance to the ground. This would likely be different at low altitude flights, but this is not what the simulator was made for.

I wanted to warm up with a visual closed pattern at my home airport, EDDF 25R, at fair weather conditions. The instructor made the necessary entries into the FMS. This caused me to smile, because it really was the same procedure like in my model: INIT Page, flight plan EDDF > EDDE, Performance T.O page, T.O Speeds F + 1, THR RED, etc. Ah, my APPR page is not yet complete...! (*Is fixed by now.*) - "The plane is yours!" he said. I released the parking brake. Huh, the aircraft started rolling...! Before I stepped onto the pedal brakes, he said: "Let it go! Rolling take off is permitted." So I moved the throttle a bit forward to let the engines spool up a little. When I checked they were synchronized, I slowly applied TOGA. On the A380 you need not be too careful on the throttle. FADEC does a great job. The start up roll was as expected, V1, Vr. I pulled the stick and the nose went instantly up. I followed the crossbars during climb, at 18° pitch attitude. Roll control was surprisingly sensible and nervous. - The instructor retracted the landing gear, and also the flaps, after I had set the thrust levers to the CL detend, which engaged the A/THR, and the "S" bug had been passed. - I went into a 180° left turn towards waypoint CHARLY, leveling off at 5.000ft. My pulse ran high, my hands and feet felt like hot iron, and I sweated like hell. But yes, it all works the same way! Just roll is really different! Once a roll command is initiated, it keeps on rolling for a while, after the stick has been returned to neutral. This does not really feel like FBW. That's something which has to be fixed in my model (*It's also done by now*). But pitch feels absolutely the same way as in my XP model.

Well, not quite! A huge difference makes the hardware. The pedals are neglectable in this aspect, because you never need them during flight, but the control stick is no way similar to any joystick I ever touched before. It is made of heavy, solid material. And you need some serious effort to move it. In particular when you try to pull or push in the pitch axis, with increasing G-forces, you need to pull very hard. If you had such a stick at home, you needed to fix it very tight. Connected to an average computer table, you might move the table or even break it into pieces on hard maneuvers.

Holding the altitude manually is really exactly the same thing like in XP. It takes permanent attention. Sometimes I ran into high or low vertical speed, while talking to the instructor. And you have to push or pull as consistently, like in the XP model, to return to the selected altitude.

Shortly before CHARLY, we penetrated a fat, dark cloud, which shuddered us a little on our seats. I initiated a descent to 4.000ft and a left U-turn in order to intercept the ILS localizer of 25R. I couldn't get tired of admiring the view system. The landscape below and the different cloud structures looked a lot more realistic than in XP9. Let's see what XP10 brings...! - Now I wanted to know how the rudder works. So I stepped slightly on the right pedal. No reaction. I pushed it further down, NOTHING! I stumped it to the bottom, and the nose very slightly swept sideways, but not for more than 2-3 degrees. Incredible! I thought, Torsten had overdone this effect, when programming the FBW plug in, giving too little yaw control. But he did it right. Indeed, Airbus made their homework, after the tragic A300 crash over New York City in 2001, where the entire stab was ripped off due to repeated hard pedal input. And it's true, you can forget about the rudder during flight, except for crosswind landings, which reminds me of my next task.

ILS approach and landing were easy, perfectly on the spot. No, I was not relaxed. On the contrary! But surprisingly every reaction of the huge Airbus was absolutely familiar to me, in no way different from what I was used to, apart from the above mention roll sensibility.

Back on the ground, the instructor demonstrated some different weather effects, and how nicely

the windshield wipers wiped away the raindrops... Wipers? No, there were none. Did the hand of a ghost clean the windows? A pair of animated wipers apparently was not within the \$53 Million budget. Maybe I should write a feature request to Thales...? Hehe, my 45 EURO X-Plane model has them!

Next topic was a manual landing at 30kn crosswind component, a bit more in gusts. 35kn, gusts 40kn, are the highest values demonstrated, if I remember that correctly. I did not attempt to set up a new record. Tough conditions though, but within the limits. The instructor set up the plane at 3nm before the threshold. Initiation was perfectly stabilized in landing configuration and speed, already on track (not course). So all I had to do was to maintain the attitude. I disengaged A/THR for a change. Curiosity kills the cat... But manual thrust control was really easy, in spite of the turbulences and gusts I could control the speed without a problem. During flare I stepped hard into the right rudder, since the wind came from the left side. RETARD! Touch down, reverse thrust... all perfect until here. And now, I could hardly believe it, I needed to fight with the rudder like in X-Plane, in order to maintain the plane close to the runway's center line, but really all the way down to runway exit speed. The wings did never attempt to come up, the new A380 FBW ground mode takes care of that with the stick centered. But the wind pressure on this huge tail fin is tremendous and not easy to deal with. XP does an excellent job in this aspect.

Now I went for another take off, still at the same wind conditions. I did hardly notice that. During takeoff run, at 350 tons GW only, the plane accelerates so fast that there is soon sufficient aerodynamic pressure on the rudder for easy control. I climbed to ~15.000ft to have sufficient altitude for some extreme maneuvers. I took the aircraft to about 45° bank, which is beyond the 33° soft limit of the FBW envelope. No difference was noticeable, the plane remained in a coordinated turn. When I released the stick, the attitude returned to 33°. I gave a full right roll command until the maximum of 67° was reached. Impossible to take it beyond. Like my A380 model, it slipped a bit over the wing, taking the nose downward. So I returned to leveled wings and pulled the nose up, to avoid overspeed and to regain the lost altitude. Next I forced the plane nose down into the -15° pitch hard limit and then pulled up at 1.7 G. The stick's high resistance prevented me from pulling more. I do not doubt that 2.5 G are possible, but you need to violate the stick for that. At +30 pitch attitude it did not accept more. No surprise so far, since this is the upper hard limit. I let the aircraft run into alpha floor protection. As expected, a slight forward push on the control stick took it out of this mode. I disconnected the A/THR, which certainly was locked on TOGA, moved the thrust lever, to get out of TRUST LOCKED, reset the throttle to the CL detent, and pushed the ATHR button.

After having returned to level flight, I realized that all of these maneuvers complied exactly with what my A380 model does, thanks to precise modeling of its geometry and the incredible plug in by Torsten Liesk, QPAC, and last not least, thanks to the algorithms of X-Plane. I cannot think of how one should achieve this degree of realism in any of those Microsoft games. Procedure and system simulation, yes. But such a flight model..? No way!

I had another issue on my list: Two engines out on the same side, during manual control, with A/THR on. The instructor quickly switched the engine 1 and 2 master levers to OFF, while I was cruising manually at ~300kn KIAS. So I pushed the thrust levers to the MCT detent to enable A/THR to use Continuous Maximum Thrust, if needed, and was ready to apply rudder and stick corrections. No reaction! The FBW trimmed the rudder so quickly, that the plane maintained attitude and course as if nothing had happened, though the right engines had to work harder to maintain speed. This is something the real A380 does somewhat better than my model. In my A380, FBW also totally compensates the asymmetric forces, so the pilot need not act in any way. But it takes a moment, until this is regulated, while the aircraft rolls and yaws a bit, though not very much.

The instructor asked me what to do next, and I hesitated with my answer, because I instinctively did not dare take my hands off the control stick and thought of landing the plane first, just like you

would stop your car before doing anything else which takes your full attention. Why? We were visibly some Thousand feet above the ground! How could I dare stop flying? So it was like a shock, when he turned off the view system, which brutally destroyed the illusion and reset us into a room down on earth. I decided for another two landings, since there was some valuable time left.

Meanwhile I had become a bit relaxed and more confident, so much, that the first of those final landings became a hard one. I tried to flare a little less than before, which definitely was not a good idea. The main landing gear hit the ground at -750 fpm. That's about 14km/h, not enough to cause damage to the plane, but a pilot's reputation is more sensible. The final landing was smooth again, just with the right accent to trigger the ground spoilers. I turned off the runway to taxi a long distance to the gate the instructor advised me, and learned that this part was really different from what I knew from XP. Even modest input on the tiller causes the plane to violate the front tires, responding the turn command with nothing but a horrible rumbling noise and ugly vibrations. You have to be real sloooow for a 90° turn, not more than 8kn. And all tiller movements have to be done with greatest care, very short and slowly. After a while I got used to that. But it's easy destroy a pair of tires when you're not. The tiller is auto centering, by the way, a detail which I had not been aware of.

I applied the parking brake and needed help from the instructor, to get up from my seat. My legs where week, my pulse still running high. The degree of illusion is so perfect! I really felt like having flown the A380, not a simulator.

Conclusions

The impression of switching from a desk top flight simulator, running XP on one monitor, to this incredible Thales system, is overwhelming. Attempting any comparison seems ridiculous. But after returning home and making the counter test with XP, I managed to filter out the factor of the real hardware, and compared just how the aircraft of both sims respond on stick, rudder and throttle commands, the result is stunning: It is the same, within tiny tolerances. So now I am really curious to see X-Plane® operate a high quality homecockpit, mounted onto a full motion platform with spheric projection... I am sure it has a great potential.

So the answer to my question, "What is the difference in flight characteristics and performance between my A380 model for X-Plane® and the real A380?", now that Torsten has tuned roll characteristics and the rotation law a bit, is: "CLOSE TO NONE".

And the answer to my question, "Would a desk top pilot like me, without having even a PPL, be able to fly the real 560 tons monster?", is: "YES, WITHOUT A PROBLEM." This has been proofed by the graphs of my approaches, as well as by the comment of the instructor. "Your landings really were not that bad!"

Remains the question, if this flight experience was worth the price of 900 EURO (~1,230 US\$) for one single hour? You could rent a small real aircraft more much less. - Well, for a private amusement, it depends on wether you can afford it or not. I probably would not have done it for this sole purpose, and would have missed something unforgettable, which I am glad to have as a memory. But as an investment for my virtual aircraft business, the benefits are really worth the expense. Now I am sure that my customers have the most realistic A380 model available for less than 38 Million EURO. That's worth a lot!

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For info about my A380 model: <http://petersaircraft.com>

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