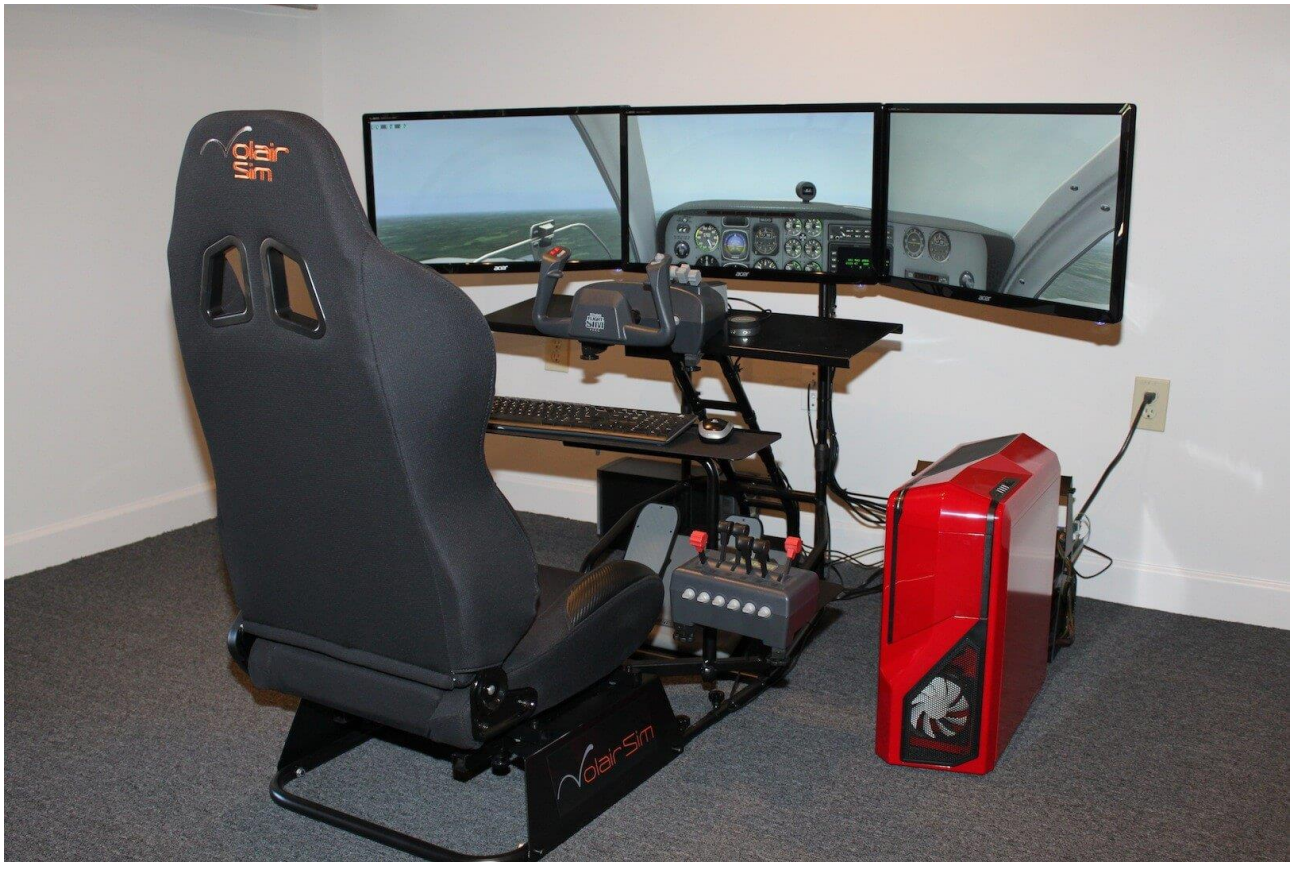
How to build a home simulator

Written by Brad, FlightSimGear
Updated over a week ago

This is an outline of the major components needed to create an effective home flight simulator.

Over the years, many have asked me what is involved with building a home simulator and what parts might be needed. As one may expect, there are not a lot of true "plug and play" systems out there, and the ones that "are" tend to be very expensive ($10,000+) and in and of themselves are not truly plug and play. Building a home simulator is not difficult, but will require some knowledge and/or ability to experiment and learn. The purpose of this guide is to outline all the components one would normally need and provide some recommendations based on my own simulator experience. So let's get going! (At the end you will find a table with parts, prices, and links).

Major Components



Let’s start by covering the major components of a simulator:

- A medium to high end gaming PC
- A high quality 1080p monitor, multiple monitors, or a nice 4k television
- Joystick or Yoke
- Rudder Pedals

Optional Add-Ons

- External Avionics/Radios
- External Switches
- Virtual Reality (VR)
- Gaming Chair/Seat

Gaming PC

The backbone of any flight simulator is the PC that runs the software. As simulators have evolved over the last few years, the amount of computing power necessary has skyrocketed. Not only do you want a fairly fast CPU, but you will want a good graphics card as well. Many choose to build their own PC's for this, but for the less technically savvy, pre-built systems are available (I will recommend one below). Plan to spend $2000+ on a good gaming system.

While this is not a full on "how to build your own PC" tutorial, in general, you will want a system with the following specifications:

- CPU - X-Plane in particular suffers from single threaded bottleneck (at this time), therefore you will want the fastest CPU you can buy such as the Intel 9700k or 10700k, both of which will get you 5Ghz speed on all threads. For Intel CPU's, always look for the 'k' models as those are meant to be overclocked.
- Memory - Most simulators will be OK with 16GB of memory, but I would recommend 32GB. It also makes sense to get memory that is fairly fast, such as 3000 to 3600 Mhz.
- GPU (Graphics Card) - Likely the most expensive part of the PC. Most systems will have at least an nVidia GTX2060 or better, with most newer systems being the RTX3080 or better. Recommendation is RTX3080. You will want to get one with multiple graphics outputs (usually a mix of HDMI, DisplayPort, Mini-DisplayPort, or USB-C) to power all the monitors we will discuss later.
- Hard Drives - With the price of SSD's (Solid State Drives) coming down, the recommendation here is to have at least one SSD for the operating system, another for your simulator, each being at least 512GB in size (you can also do both on the same drive if desired). Additionally, if you wish to add ortho-scenery to your sim, you will need another drive at least 3TB in size (can be a standard hard drive, but recommend something with higher RPM).
- Power Supply - When adding high end components above, make sure you have at least 750watt power supply, if not 1000watt
- Cooling - Make sure your system has adequate cooling, particularly the CPU. Water cooling is recommended for CPU

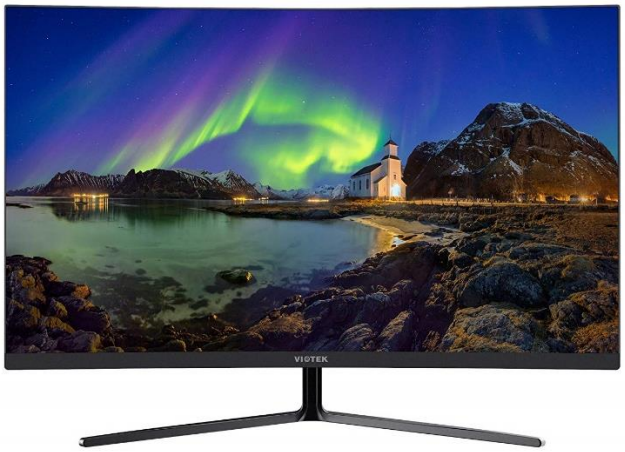
For those that would prefer to simply purchase a system, RealSimGear sells a pre-configured system which can be purchased HERE. We also partner with X-Force PC, they have a variety of other system configurations you can choose from.

Screens

Once you have your gaming machine, the next thing you will need is a screen of some sort. There are a couple of ways to approach this:

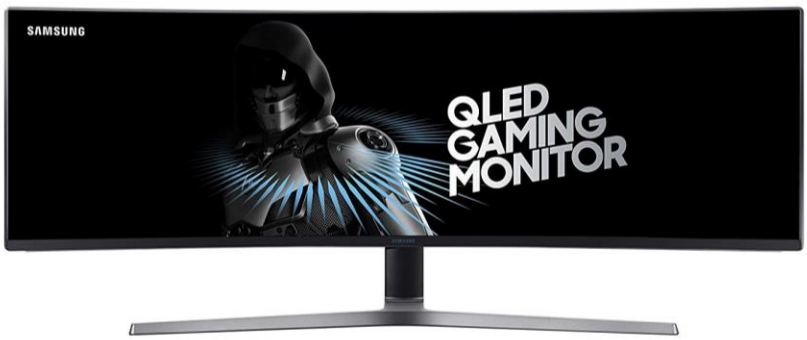
4K Televison - Many customers have started using 43" - 55" (or larger) 4K televisions. These provide a superior amount of screen space, at 4K resolution, for 1/3 the price of an ultra-wide monitor (mentioned below). You do sacrifice refresh rates as most will only do 60Hz as compared to 120 or 144Hz on the gaming monitors, but for a simulator 60 is more than adequate. THIS is one I personally use. Of note, you can also use 3x of these to get 180 degrees of vision.

Single standard screen - If you simply want visuals out the front, and are happy with a FOV (Field of View) of less than 90 degrees, get a good 24" or 27" (or larger) computer monitor. You will want to make sure it supports at least 1920 x 1080 resolution and it's recommenced to have a fairly high refresh rate, 120Hz or better. One example I personally use, while not real high end, but works well is made by Viotek. You can certainly go higher end with Samsung or LG or HP or ...., but not sure you really get much more for the money.



3 Screen - If you are looking for more FOV and want to have some side views, most go with a triple screen build. Simply take the screens listed above and buy 3 of them. For this, you probably want the 27", simply to cover the appropriate amount of real estate. Be advised, getting the triple screen setup to work properly can be an exercise, but plenty of YouTube videos out there to assist. Also, with this layout, you may want to consider a 3-monitor stand such as one of THESE.

Single screen ultra-wide - A new player on the high-end monitor field is the Samsung 49" ultra-wide! At around $900, it's not cheap, but does provide unparalleled FOV out the front (albeit not much to the sides without starting to look strange).



Projectors

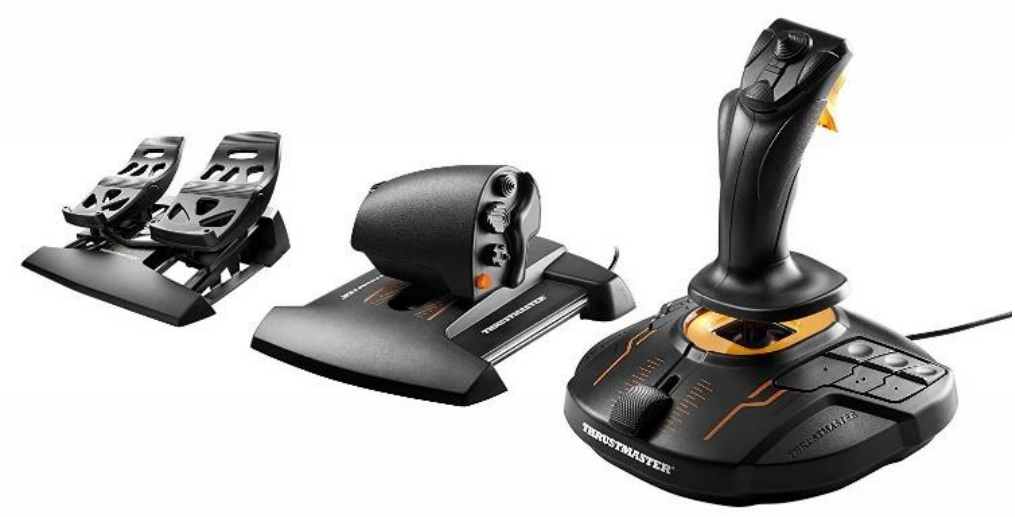
It's also possible to use one or more projectors for those really serious, I personally do not have experience here, but did want to mention it as an option

Joystick or Yoke, Throttle, and Pedals

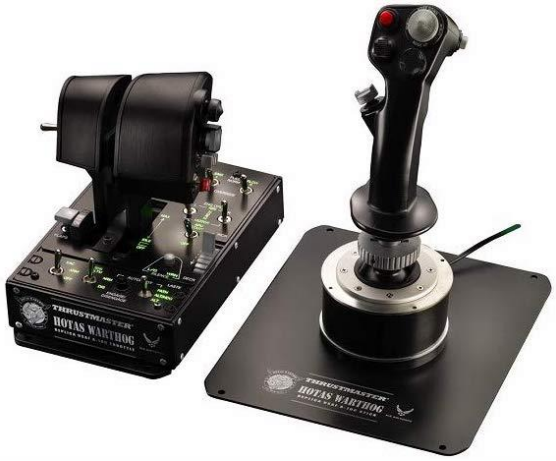
Now that you have your base system, PC and monitor, the next thing you will want, is some way to actually control your simulated aircraft! Whether you choose a Joystick or Yoke, is likely personal preference and/or desire to match a real-world aircraft.

Joystick - If you primarily fly aircraft with a side-stick (such as the Cirrus SR20/22, Airbus liners, or any other with a stick) a couple of options are:

- Lower end - The Thrustmaster is what I use. It provides all the basic inputs needed, at a low cost. It also has bundles that include a side throttle, and another that includes both the side throttle and pedals.

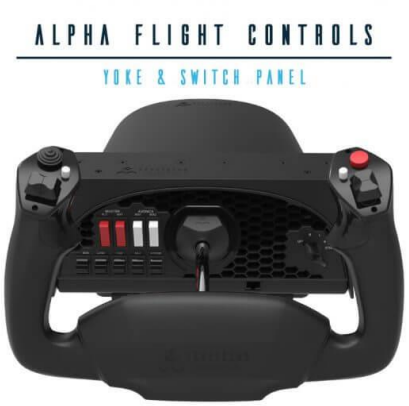


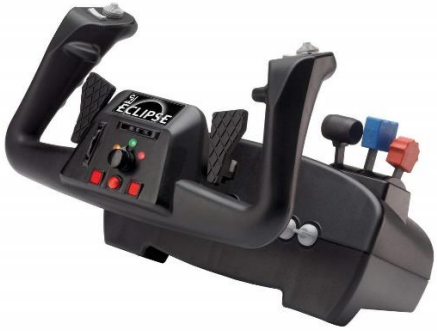
- Higher end - While I have not used it, a lot of folks swear by the HOTAS. It's solid and dependable. You would need to purchase pedals separately.

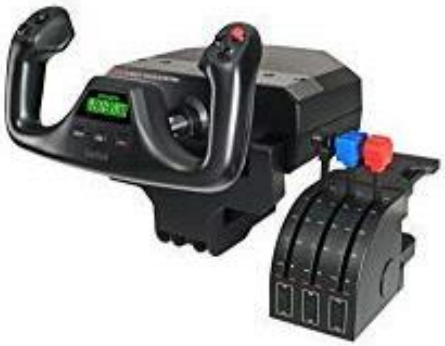


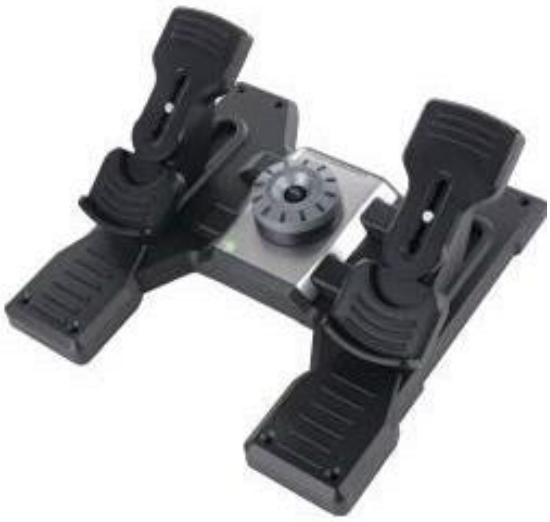
Yoke - If your primary aircraft use a standard yoke, there are a couple of options I can recommend (and make sure whichever you choose, you get the throttle quadrant that matches the type of aircraft you fly):

- Lower end - CH Products makes a decent one, Saitek (Logitech) another, and the newest player is Honeycomb. I personally have the Saitek package, Yoke, Throttle and Pedals, it has worked well for me for a number of years.

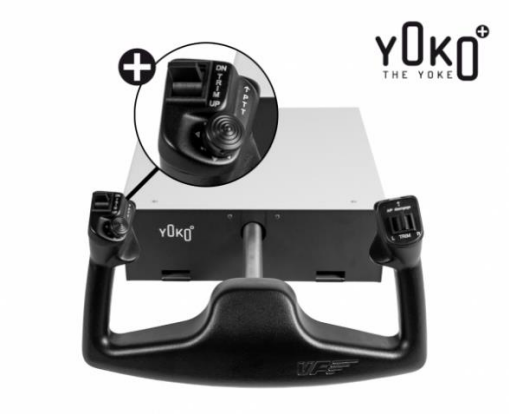




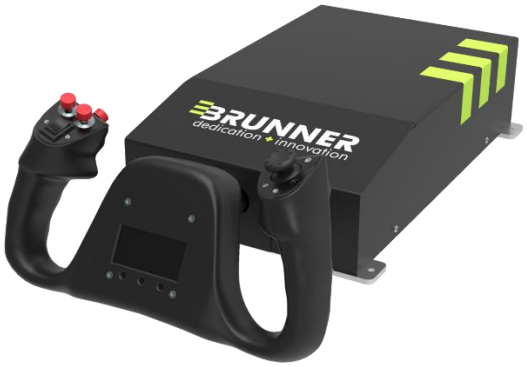




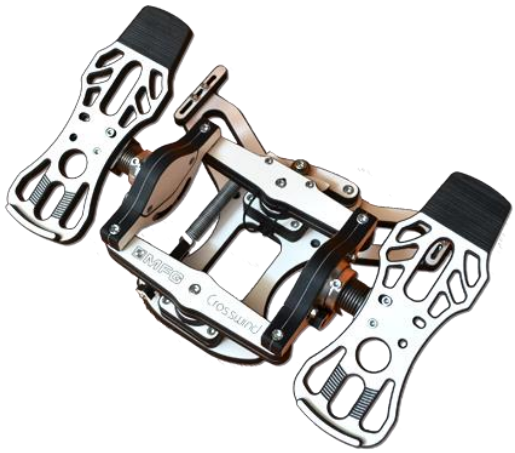
- Higher end - While I have used the Saitek for a while, I am moving to a higher end yoke. The go-to recommendation is the Yoko Plus (their newest),



- Ultra high end - If you have money to burn, and want the best quality possible, check out the Precision Flight or Brunner yokes. Each will set you back almost $2000 (and that's without a throttle or pedals).



Pedals - While not strictly necessary, having pedals increases the immersion as that is how one typically steers the aircraft on the ground, controls the rudder on takeoff/landing/in-flight, and provides for differential and progressive braking. If you choose the Saitek or CH Products above, I recommend simply getting their pedals. If you are getting the Yoko, PFC, or Brunner, (or just want to upgrade from standard Saitek), then the MFC Crosswinds are the way to go.



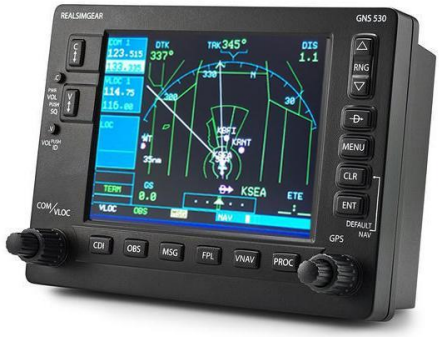
Simulator Software

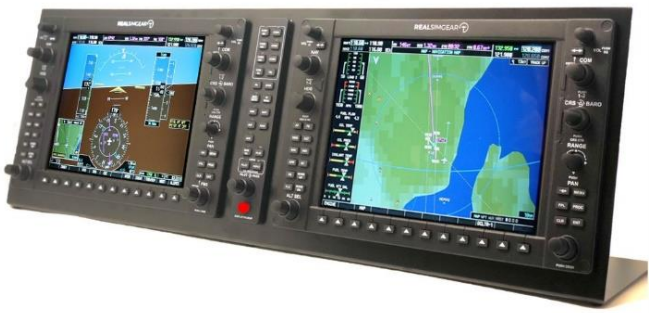
The next obvious piece you will need is to choose a simulator platform to use. There are two predominant packages out there, Prepar3d (P3D) and X-Plane that are used for general aviation and airliner simulation. There is a 3rd, and newer software, DCS, that is more focused on military aircraft. There are certainly pro's and con's to each software, which could be debated at length, I will leave it to you as user to research and choose one that you feel best meets your needs (disclaimer I have both P3D and X-Plane, and prefer X-Plane).

Once you have made it here, you will have a fully functional simulator system that can be used to simulate all sorts of aircraft, scenarios, weather, etc. Now comes the fun part, Add-ons! One does not need Add-ons, but they can greatly enhance your flight simulator experience.

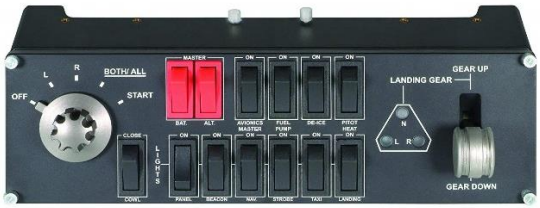
Hardware Add-Ons

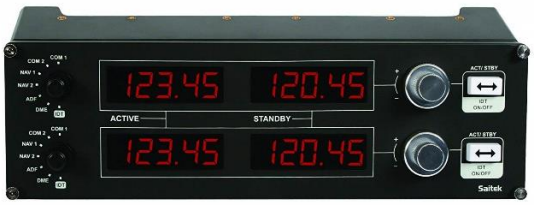
If you generally fly aircraft that have a G1000 suite, we have a replica G1000 hardware product. If you fly aircraft that have steam gauges but with a GNS430, GNS530, GTN650, or GTN750, we have those hardware interfaces as well. If you want something that closely resembles a Cirrus Perspective, TBM900, or Epic E1000, we have a full G1000/GCU/GFC/GMA package. Finally, if you want a TBM900 add-on, there is a nice switch panel by M9 Aviation that pairs well with the G1000 package above. We also have a complete TBM900 package that bundles these items together.



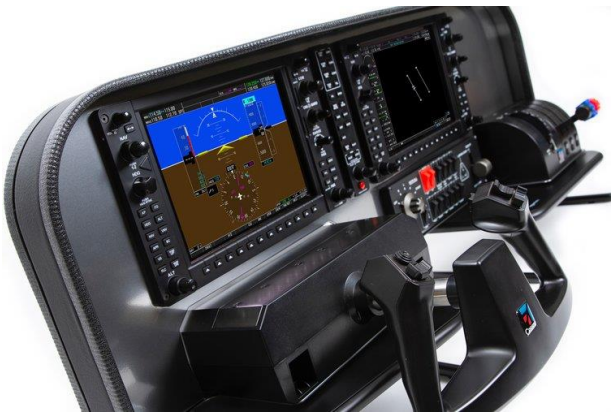


There are also other products out there as well such as Saitek switch panels and radio panels that can complete your physical cockpit.





If you want to mount everything into an actual panel replica, you can get a tabletop avionics panel from Stay Level Avionix, Flight Velocity or VolairSim.



Software Add-Ons

This part of the topic is vast and much too much to cover in this article. But safe to say, you will likely start investing in software add-ons to your simulator, whether it be new aircraft or scenery, or perhaps functional add-ons like real world traffic, simulated ATC services, the sky is really the limit. For X-Plane, x-plane.org is the go-to site!

Virtual Reality

Most of the preceding sections assume you are building a simulator where you have all the controls at your fingertips. While the introduction of the RealSimGear hardware makes it feel like you are in a real airplane, putting on an Oculus Rift S puts you INSIDE the airplane! The immersion is unbelievable, however the level of realism for pressing buttons and turning knobs is still somewhat clumsy. Using VR does require a higher end PC, but the specs I outlined at the top, should be sufficient (stay with the RTX 2080 or better).

Example Parts List

Item	Low End Build	Medium Build	High End Build	Where to Buy
PC	$1,395	$1,995	$2,795	https://xforcepc.com/english/flight-simulation/flight-simulation-computers/platinum-html.html https://xforcepc.com/english/flight-simulation/flight-simulation-computers/rtx.html https://xforcepc.com/english/gaming-pcs/rtx-pro.html
Monitor	$189	$657	$998	https://www.amazon.com/gp/product/B078P2XN9M https://www.amazon.com/Samsung-LC49HG90DMNXZA-Curved-49-Inch-Monitor/dp/B072C7TNC5
Joystick	$60	$172	$456	https://www.amazon.com/Thrustmaster-T16000M-FCS-Flight-Pack/dp/B01N2PE8CZ https://www.amazon.com/ThrustMaster-2960720-Thrustmaster-Hotas-Warthog/dp/B00371R8P4
Yoke	$330	$1,118	$1,350	https://www.amazon.com/Logitech-Saitek-Flight-Yoke-System/dp/B07KNL7PNX https://www.virtual-fly.com/shop/controls/flight-sim-yoke-yoko-the-yoke-plus https://www.brunner-innovation.swiss/product/cls-e-ng-yoke/
Pedals	NA	$290	$290	https://mfg.simundza.com/products
Simulator Software	$60	$60	$60	https://www.x-plane.com/desktop/buy-it/ https://www.prepar3d.com/prepar3d-store/
RealSimGear	$749	$1,999	$2,899	
Instrument Panel	$439	$439	$579	https://staylevelavionix.com/shop
Total	$3,222	$6,730	$9,427	

Videos of Example Simulator Setups

Please contact us if you have any questions regarding how you can build your ideal simulator.