Team Extended Lightning Bricks
Aaron Wang and sidekick Master Mykoloduck
Daniel Jang and sidekick Frosty
Edward Liu and sidekick <Ducky2> (absent)
IntroCS Pd 6
L1: On Wednesdays We Wear Pink
Spring 2020

01. Flight Simulator

Daniel's Original Plan

Component	Product	Significance	Price
CPU	*AMD Ryzen 7 1700 3GHz 8-Core Processor*	The CPU needs to be powerful enough to handle this game: it requires powerful components, and therefore a powerful CPU to control everything. The AMD Ryzen 7 is much cheaper than the Intel Core i7-7700K, which are the 2 recommended CPUs on the game website.	$285.49
Cooler	*Cooler Master Hyper 212 EVO 82.9 CFM Sleeve Bearing CPU Cooler*	This cooler is responsible for keeping the computer cool, since a game like this is likely to create lots of heat, due to the high amount of processes going on.	$34.99
Motherboard	*Gigabyte B450 Gaming X ATX AM4 Motherboard*	I need to have a motherboard that has compatibility with all the components listed below.	$121.00
RAM	*Team T-FORCE VULCAN Z 16 GB (2 x 8 GB) DDR4-3200 Memory*	The price point of this particular RAM is ok, and 16 GB is sufficient for this game.	$69.99
HDD	*Seagate Barracuda Compute 2 TB 3.5″*	It wouldn't hurt to get a cheap hard drive with a lot of storage. I went for a hard drive, since SSDs are still quite expensive, and I	$50.99

	7200RPM Internal Hard Drive	heard that sometimes there's a chance that they just stop working.	
PSU	*Thermaltake Smart 700 W 80+ Certified ATX Power Supply*	This PSU has a wattage of 700W, and so it has the capability to handle much power.	$67.98
Case	*Cooler Master MB600L ODD ATX Mid Tower Case*	This is self-explanatory: how can you put all computer components outside the case? This case has USB ports included, and is compatible with the build.	$49.99
OS	*Microsoft Windows 10 Pro OEM 64-bit*	Microsoft Windows 10 64-bit is the recommended software, and is the only software on the pcpartpicker website.	$139.99
Network	*Rosewill RNX-N250PCe PCIe x1 802.11b/g/n Wi-Fi Adapter*	This network adapter is fairly cheap, and it connects to Wi-fi, which is good enough for me. Although Wi-fi isn't as reliable as ethernet, it's still reliable.	$14.99
Graphics	*Asus Radeon RX 570 4 GB ROG STRIX Video Card*	It says that 4096 MB of memory needs to be used solely for graphics. This graphics card can handle that, since it holds 4 GB of it.	$129.99
Monitor	*Asus VG248QG 24.0" 1920x1080 165 Hz Monitor*	A monitor is needed to see everything. A good monitor is required for this game, since it needs good graphics.	$179.99
Keyboard	*Corsair K55 RGB Wired Gaming Keyboard*	It's a game: a gaming keyboard is self explanatory. A wired one is more reliable than wireless.	$49.88
Mouse	*Logitech G305 (Black) Wireless Optical Mouse*	I've been using a wireless mouse for a couple months now, and I love it: although it needs to have a USB plug-in, it's more convenient. It's a game, so I think this would give more mobility.	$49.99
Speaker	*Logitech Z200 0*	Good speakers are needed for this computer	$21.99

	nW 2.0 Channel Speakers	in general, but maybe not for the game, since communication might be necessary.	
Headphones	*(I would expect her to have her own headphones)*	I may be friends with Hikaru in this scenario, but not enough to buy her headphones. I trust her to have her own headphones with a microphone.	$0.00
			Total: $1241.76

Aaron's Original Plan

Component	Product	Significance	Price
CPU	*AMD Ryzen 7 3800X 3.9 GHz 8-Core Processor*	To run a flight simulator it's important to have a fast multi core CPU. This is the best option for an impressive performance and is at a nice price point when compared with the Intel equivalent of i7-9700k. Comes with its own CPU fan so a cooler is not needed unless overclocking is desired.	$338.99
Motherboard	*MSI MPG X570 GAMING PLUS ATX AM4 Motherboard*	A motherboard generally doesn't affect gaming performance but finding a sturdy and reliable one that is compatible is still essential.	$168.00

RAM	*G. Skill Aegis 32 GB (2 x 16 GB) DDR4-2133 Memory*	32GB of RAM seemed to be a common factor in inclusion to the latest alpha program	$117.99
HDD	*Crucial MX500 250 GB 2.5" Solid State Drive*	SSDs are faster at the expense of more money for greater storage. This one isn't too pricey and 250 should be more than enough for flight simulator 2020 and for the OS.	$49.99
PSU	*Corsair RM (2019) 750 W 80+ Gold Certified Fully Modular ATX Power Supply*	The GPU requires a minimum of 500 watts, by having additional support this ensures that the PSU is never at maximum capacity and is able to handle power usage up to 50% higher.	$124.99
Case	*NZXT H710 ATX Mid Tower Case*	A mid tower case can fit standard ATX motherboards, can fit the graphics card, and has sufficient space for the rest of the components.	$139.99
OS	*Microsoft Windows 10 Home OEM 64-bit*	Microsoft FS2020 is currently set to release on Microsoft Windows 10	$106.99
Network	*Rosewill RNG-406U USB 3.0 1000 Mbit/s Network Adapter*	The motherboard has onboard ethernet and ethernet connections are generally faster and more secure than	$19.99

		wifi.	
Graphics	*EVGA GeForce RTX 2060 6 GB KO ULTRA GAMING Video Card*	A mid to high end GPU is strongly recommended. This GPU will provide a 1080p display for the flight simulator.	$372.00
Monitor	*Asus VG248QE 24.0" 1920x1080 144 Hz Monitor*	A wide monitor for displaying FS2020 and has built in speakers.	$249.99
Headphones	*Corsair VOID PRO Surround (Black) 7.1 Channel headset*	Built-in speakers might not be enough so having nice headphones can help the player feel really immersed.	$76.99
Mouse	*SteelSeries Sensei 310 Wired Optical Mouse*	For navigating purposes and for playing FS2020. Has an orientation fit for both hands so it doesn't matter whether the user is left or right handed. Also, has configurable buttons on the mouse for key bindings should it be necessary for the game.	$49.76
Keyboard	*Redragon K552 Wired Gaming Keyboard*	The keyboard will be needed for playing the game so while a super luxurious one isn't needed, one that can do the job well at a low cost would be good.	$33.99

			Total: $1849.66

Two brains are better than one:

Component	Product	Price
CPU	*AMD Ryzen 7 3800X 3.9 GHz 8-Core Processor*	$338.99
Motherboard	*MSI MPG X570 GAMING PLUS ATX AM4 Motherboard*	$168.00
RAM	*Team T-FORCE VULCAN Z 32 GB (2 x 16 GB) DDR4-3000 Memory*	$125.99
HDD, SSD	*Western Digital Caviar Blue 1 TB 3.5" 7200RPM Internal Hard Drive*	$44.94
PSU	*Corsair RM (2019) 750 W 80+ Gold Certified Fully Modular ATX Power Supply*	$124.99
Case	*Phanteks P300 ATX Mid Tower Case*	$49.99
OS	*Microsoft Windows 10 Home OEM 64-bit*	$109.99
Network	*Rosewill RNG-406U USB 3.0 1000 Mbit/s Network Adapter*	$19.99
Graphics	*EVGA GeForce RTX 2060 6 GB KO ULTRA GAMING Video Card*	$299.99
Monitor	*Asus VG248QG 24.0" 1920x1080 165 Hz Monitor*	$179.99
Keyboard (optional)	*Redragon K552 Wired Gaming Keyboard*	$33.99

Mouse (optional)	*SteelSeries Sensei 310 Wired Optical Mouse*	$49.76
Headphones (optional)	*Corsair VOID PRO Surround (Black) 7.1 Channel headset*	$76.99
CPU Cooler	Not needed	

Our Sales Pitch

Our client Hikaru is a former pilot who also happens to be an avid gamer, at least for flight simulators that is. She currently runs Microsoft Flight Simulator 2019 on her computer but she has one crucial problem, it's way too "sloooow" (that's slow with four o's!). Now, this just won't do, so Hikaru's looking for a solution for when the highly-anticipated Microsoft FS2020 releases. Fortunately for her, we've designed a computer that'll run FS2020 seamlessly using quality and affordable components all under half the cost of her budget ($3000)! It doesn't take a pilot to figure out that our design's just "plane" awesome ;^).

Our Plan
The system requirements for Microsoft Flight Simulator have yet to be released, so a lot of the system requirements one can find online are estimated. To ensure that we have approximate system requirements, we used already existing Flight Simulators such as X-Plane 11 as a foundation for estimates. Microsoft Flight Simulator 2020 is expected to be the next generation of the simulation franchises with varying plane models, a highly realistic world, and even real-time air traffic just to name a few features. It's no doubt that not just any PC will be able to run it. Thus, if a computer can't even run the older but still very demanding X-Plane 11, then it definitely won't be able to run FS2020.

Component	**Description**

CPU: *AMD Ryzen 7 3800X 3.9 GHz 8-Core Processor* – $338.99

Flight simulators put more emphasis on CPU speed than many other games. So the faster your CPU, the better overall that Flight Sim will perform. Multi-core processors are recommended because they have multiple central processing units, which allow for the ability of doing multiple processes at once and thus improving performance on most tasks. https://www.velocitymicro.com/blog/build-best-gaming-pc-flight-sim-x/ https://www.howtogeek.com/194756/cpu-basics-multiple-cpus-cores-and-hyper-threading-explained/

We chose the AMD over its intel equivalent i7-9700 as it outperforms intel at a lower price according to comparison testing. https://www.tomshardware.com/features/best-eight-core-cpu-amd_ryzen_7_3800X_vs_intel-core-i7-9700k

Using X-Plane 11 System Requirements as the basis for comparison, the minimum CPU speed is 3 GHz and the recommended is 3.5 GHz.

https://www.x-plane.com/kb/x-plane-11-system-requirements/

This CPU puts us safely above these thresholds and if you can't run flight simulators like these, it's likely you won't be able to run FS2020.

We've also opted for no CPU cooler

because overclocking (setting your CPU and memory to run at speeds higher than their official speed grade) will not be necessary and the built-in cooler should be sufficient. https://www.pcworld.com/article/198882/overclocking_for_newbies.html
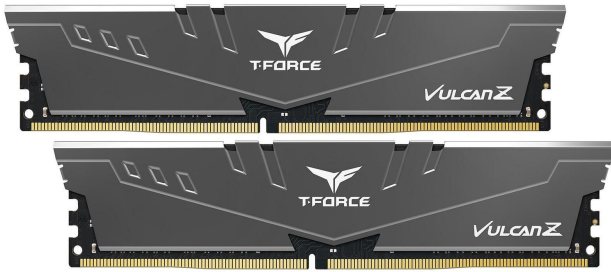
Motherboard: *MSI MPG X570 GAMING PLUS ATX AM4 Motherboard* – $168.00

Without taking into consideration overclockability, the motherboard has no effect on the performance of the pc. Instead, it's important to choose a motherboard that is able to support the CPU of choice, won't limit the RAM, and is compatible with the rest of the components.

https://www.pcpartguide.com/does-the-motherboard-affect-performance/

This motherboard is compatible with all the components of this pc, as well as supporting up to 128GB, which is definitely overkill… but for its low price, it can't be beat.

RAM (Memory): *Team T-FORCE VULCAN Z 32 GB (2 x 16 GB) DDR4-3000 Memory* – $125.99

We chose to use a dual-channel RAM as having two channels of data transfer increases the bandwidth (how much data is able to be transferred at once), which can increase the speed of the PC. https://www.keycdn.com/support/what-is-latency

From the Alpha testing, 32GB of RAM looks like a common necessity. Not to mention, it doesn't hurt to be safe. https://www.gfinityesports.com/article/3615/microsoft-flight-simulator-2020-release-date-specs-download-cost-vr-alpha-gameplay-beta-demo-and-more-for-pc-and-xbox-one

HDD: *Western Digital Caviar Blue 1 TB 3.5" 7200RPM Internal Hard Drive* – $44.94

We can't seem to find how much disk space FS2020 is estimated to require, but based on other flight simulators, we're seeing anything from 10-30GB.

We chose a hard disk drive over a solid state drive, since hard drives are still much cheaper and hold a lot more storage for less money. In terms of in-game performance, an SSD does not provide any kind of significant advantage. An SSD only affects the boot time for the game but considering that it won't affect the actual experience, we chose to value the lower price and additional storage. https://techguided.com/ssd-vs-hdd-gaming/

Graphics: *EVGA GeForce RTX 2060 6 GB KO ULTRA GAMING Video Card* – $299.99

Based on the recommended system requirements for X-Plane 11, at least 4GB of VRAM (memory used to store image data that is displayed) is needed.
https://www.x-plane.com/kb/x-plane-11-system-requirements/

In the past, many flight simulators were CPU-heavy and less dependent on the GPU. However, FS2020 is expected to require a mid to high end GPU for optimal performance. This GPU is more than capable of running X-plane 11 and should be able to run FS2020 in at least 1080p.
https://www.velocitymicro.com/blog/build-best-gaming-pc-flight-sim-x/

Case: *Phanteks P300 ATX Mid Tower Case* – $49.99

This case is at a good price point, and it fits all the other components.

Mid Tower cases are the standard for most PCs. Unless space is a concern and you need to go small or if you have specific needs such as multiple GPUs or custom liquid cooling, a mid-sized tower case is sufficient.
https://www.newegg.com/insider/how-to-choose-a-pc-case-in-2019/

PSU: *Corsair RM (2019) 750 W 80+ Gold Certified Fully Modular ATX Power Supply* – $124.99

A proper power supply unit is important for the pc. The GPU itself requires a minimum of 500W. Since this is 750W, it has enough wattage for the GPU's demand plus extra for other components and to ensure that the PSU is not always running at maximum capacity. A gold certified PSU is quite efficient and has the best price/performance ratio compared to other efficiency ratings. Having 80+ Certified PSUs mean more efficient conversion of AC (alternating current) to DC (direct current), which means less heat and can save on power bills in the future.
https://www.evga.com/products/product.aspx?pn=06G-P4-2068-KR
https://appuals.com/gold-vs-bronze-psu/

OS: *Microsoft Windows 10 Home OEM 64-bit* – $109.99

We chose Microsoft Windows 10 Home rather than Pro because the additional cost and extra features offered by Pro is nothing significant.

If you use your PC strictly for gaming, there is no benefit for using Pro as it is heavily focused on business and security. Home provides everything that the typical consumer will need.
https://themonitormonitor.com/windows-10-home-vs-pro-gaming/

Network: *Rosewill RNG-406U USB 3.0 1000 Mbit/s Network Adapter - $19.99*

Our motherboard comes with "onboard ethernet", which means that it has an ethernet connector on the board and can be connected to the Internet via a wire.

A wired connection is better for gaming as it offers a more reliable and secure Internet connection. By connecting directly to the router, one doesn't need to worry about packet loss and lagging as a result of latency (determines how fast data can be transferred from the client to server and back).
https://www.keycdn.com/support/what-is-latency
https://superiorgamingtech.com/wired-vs-wireless-for-gaming

Not to mention, Hikaru's going to have a desktop computer, not a laptop, so she won't be moving the computer around. As such, an ethernet connection works perfectly because she won't be moving around, so the drawback of ethernet in which the computer is wired (and thus stationary) won't be a concern.

Monitor: *Asus VG248QG 24.0"*
1920x1080 165 Hz Monitor - $179.99

A monitor that displays Full HD, has built-in speakers, and has a refresh rate of 165 times each second under $200.

1080p and 144Hz is the standard resolution and refresh rate for many games nowadays. This monitor excels at meeting these standards. Not to mention, our GPU is capable of running up to a maximum refresh rate of 240Hz so it will be able to fully utilize this monitor.
https://www.evga.com/products/product.aspx?pn=06G-P4-2068-KR

Budget: $3,000.00
Total cost: $1,462.86
Savings: $1,537.14

Although the sky's the limit for how many different builds may exist, this is our recommended build as it should not only run FS2020 but also run it at a good quality, while being affordable.

Peripherals
Hikaru requested that peripherals be included within the $3,000 budget. However, considering that Hikaru currently runs Microsoft FS2019, it's likely that Hikaru already has much of the peripherals needed for the game such as a joystick and pedals. It's also likely that Hikaru owns a mouse and keyboard too. As many of these peripherals are largely up to personal preference, we will not be including these in our system design.

However, if we must recommend one thing, it will have to be headphones. Although the monitor does come with built-in speakers, it's likely that the quality won't be the best. Thus, for a truly immersive piloting experience, we'd recommend getting quality headphones.

Though personal preference and Hikaru's own decision should be valued above all, if we had to provide a cheap, but sufficient-in-quality headphone it'd probably be:

Corsair VOID PRO Surround (Black) 7.1 Channel headset – $79.99

A nice quality, comfortable pair of headphones under $100.

Uses surround sound, which can help make for an even more immersive and realistic experience in-game.

In addition, it has a microphone, and we would expect in a flight simulator that players would use their microphone to communicate with other players, in order to keep safe distances.

Totally Accurate, Scientifically-Proven Correlation Between Hikaru's Happiness and Our PC Design

Hikaru's Happiness

Time Spent Using Our PC Design