

V1.2 - Charles Cox (charles.cox@gmail.com)

Project Goal: To build out a combined computer + AV + input hardware + furniture “pit” that can serve as a comfortable, flexible PC flight simulator experience for combat and civil flight sims.

Version history:

1.2 - Mar 6 2019 - Added \$7 sound card under “Haptics” to drive the Buttkicker

1.1 - Jan 29 2019 - GPU switchout not viable, added new computer purchase phase

1.0 - Jan 14 2019 - First version

Principles:

Modes of Operation

- Must be able to flexibly switch between the following modes:
 - Seated VR civil flight (yoke)
 - Seated VR military flight (stick)
 - Seated multi-screen IR-track civil flight (yoke)
 - Seated multi-screen IR-track military flight (stick)
 - Seated PC gaming and productivity (mouse and keyboard)
 - Standing room-scale VR (with mounted “lighthouses”)

Accessibility and Comfort

- The seat must be comfortable for extended flight sessions, with controls in reach at all times without straining or uncomfortable bending.
- The seat must fit a 6’3” 200lb person with adequate neck and back support.
- The seat must be able to be moved out of the play space when using standing VR.

Seated Flight

- While it is not required to reach both the Yoke and Stick/Throttle combination at the same time, switching between Yoke and Stick control must not require the use of tools; it should be switchable by hand in less than 90 seconds.
- The use of Stick or Yoke must not preclude ability to reach keyboard and mouse while flying. The use of a mounted trackball is an acceptable mouse substitute.
- Must allow the use of rudder pedals without counterforce slipping or twisting (such as the slipping that occurs when trying to use rudder pedals with a rolling chair).
- Motion (moving chair) is not necessary for this version of the project.

A/V Specific

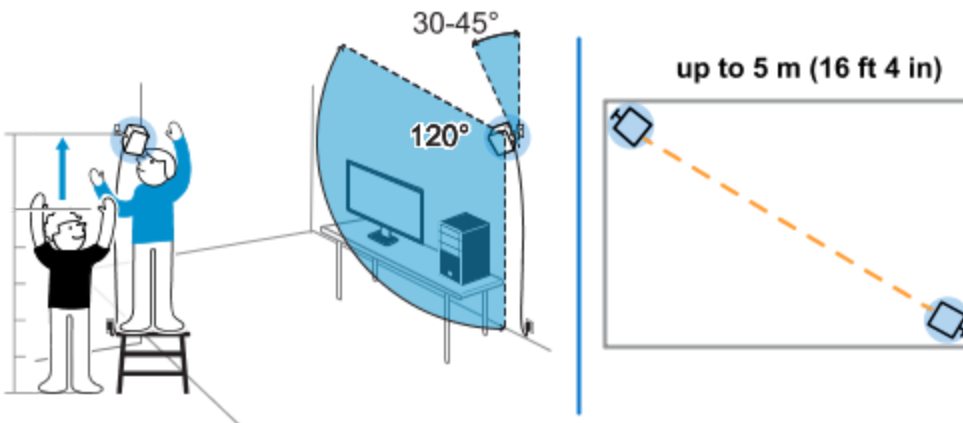
- Audio must be switchable between headphones and speakers.
- Video must be able to display 1080p output at constant 30fps on three monitors for enhanced FOV, as well as optional VR output at stereoscopic 60hz.

- Infrared tracking must be enabled, with enough throw distance between the seated wearer's IR headmount and the IR camera to allow for a proper field of view and no "dead" zones. Appropriate distance is 24-36 inches, no more than 46 inches.
- Video output will be on monitors (and optionally VR), not a projector, as projectors do not have enough brightness to be suitable for flying tasks.
- LFX should be delivered through a "buttkicker" style device, which can be turned on or off as desired.

Dimension Requirements:

VR "Lighthouses" - Room Corner to Corner

Maximum distance between lighthouses is 5m (16ft 4 in)



IR Monitor to Head Distance

Correct distance is 24-36 inches, max is 46 inches.

Yoke Mounting Width, Height, Depth

[Charles to measure the components]

Choices and Questions:

Control Mounting - Desk vs Seat-Front, Seat-Side, Seat-Crotch Options

Where should the controls be?

- Ideal stick mounting is not the same as ideal yoke mounting.
 - Stick ideally should have the stick between the legs and throttle to the left side.
 - Yoke ideally should have the entire unit mounted as a "shelf" in front of the player.
 - Likely that these cannot all be installed at the same time.
- Desk mounting means easier switch-in and -out of Yoke and Stick, but Stick would have to be forward and not between the legs, and throttle would be forward next to the stick,

not off to the side. Also limits lean-back as the player would have to strain to reach the controls that are all the way forward on the desk.

- It's possible that the compromise is a forward "shelf" mount that can be installed on the seat, with either yoke or stick mounted on the shelf and interchangeable.

Desk-Mount vs. Seat-Mount Monitors

Where should the monitors be?

- Seat-mount monitors guarantee perfect eye placement and can unlock both lean-back and future motion scenarios, but preclude use as a "desktop" computer with desk-mount keyboard and mouse.
- Desk-mount monitors have the best dual-use as sim pit and standard keyboard and mouse gaming/productivity "desktop", but limits the amount of lean-back the seat will have as excessive lean back of the seat would require neck strain or eye strain to "look down" at the monitors.

Hardware Purchasing

Furniture Components:

Seat + Joystick Mounts

Shelf Mount for Yoke

Desk (not needed if all in one solution)

Possible all-in-one solution: [Volair Sim Universal Chassis](#) : ~\$900 -- No Desk required.

MAX 32" monitors if using three, MAX 50" monitor if using one

Requires 5 feet by 5 feet clearance. Might be a problem for the cave. Might be able to turn 90deg and just use one monitor for now.



Computer Components:

Cannot just replace GPU on my R6, it's a Power Supply nightmare.
Rather, just buy an NVIDIA RTX-enabled new machine, and the R6 becomes secondary machine. Assume \$2000 spend.

<https://www.bestbuy.com/site/clp-computers-tablets/geforce-rtx/pcmcat1534362502737.c?id=pcmcat153436250273>

HDMI switcher (I think this is necessary because all video outs will be taken by monitors?) \$40

Monitors:

3x 1080p Monitor -- can my current graphics card output to 3 monitors? \$300 per = \$900 total

VR Equipment:

Vive Pro HMD-Only Upgrade - \$800

Vive Pro Wireless Add-On - \$300 (requires PCIe slot)

IR Equipment:

2x TrackClip Pro for TrackIR5 (Replacement + 1 for Alicia) - \$70

1x TrackIR5 (For Alicia) - \$150

Haptics Equipment:

Buttkicker Gamer 2 - \$200

Mounts to volair (<https://volairsim.blog/2013/11/12/volair-sim-1-2-and-updates/>)

External USB sound adapter (used to deliver dedicated bass to Buttkicker through [SimShaker](#), see [this installation guide](#)) - \$7 -

https://www.amazon.com/gp/product/B00IRVQ0F8/ref=ppx_yo_dt_b_asin_title_o00_s00?ie=UTF8&psc=1

Brunner Force Feedback yokes, sticks, rudders \$2000/ea

<https://www.brunner-innovation.swiss/shop/>

Varjo VR-2 Pro \$6000 <https://varjo.com/products/vr-2-pro/> (is there anything to explore here with realtime [chromakeying](#)?)

COMFORT Equipment:

Cup holder?

Sheepskin seat covers like real airplanes ([Why?](#)) - \$500

VIDEO Equipment:

Circular greenscreen background - \$50

Better lighting for my face - ??

Purchase Scenarios

Each phase yields a completely usable product without needing later phases. **Total: \$5400**

Seat Basics Only	+ 3 Monitors	+ New Machine	+ Pro Wireless VR
Seat, Buttkicker,	3 Monitors + HDMI	RTX-enabled	Vive Pro HMD, Vive

TrackClip	switcher	“R8”-like machine	Wireless, HDMI Split
\$1327	\$940	\$2000	\$1140
Ordered 2/15/19	Purchased 3/2/19		