AIDAN J. FAY

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A highly-motivated, academically strong college junior with a proven aptitude for mechanical design, electronics, computer science and virtual reality. A person who values the public good and has held positions within public safety and fire organizations. As an aviation enthusiast, built an Oculus Rift based cockpit simulator from scratch, featured in major media; featured as a TEDx speaker and worked at MIT's Computer Science and Artificial Intelligence Lab at the invitation of Dr. Daniela Rus, PhD in the summers of 2016, 2017 and 2018. With a University of Washington research group, recently designed several Covid-19-related PPE products now listed in the NIH Print Exchange. Currently attending Stanford University.

EDUCATION

Stanford University, BS, Mechanical Engineering, Palo Alto, CA *Graduating Class: June 2021*

EMPLOYMENT

UW Digital Fabrication Lab (DFAB), *Mechanical Designer*
University of Washington, Seattle, WA *March 2020 - Present*
Served as the main CAD designer for several Covid-19 response projects including surgical stopgap masks, N95 masks, non-rebreather masks and face tent masks. I designed each with 3D printing, vacuum forming, 5 axis CNC routing, injection molding and silicone molding in mind and am now very comfortable with surface modeling in Solidworks. I worked with teams and members from Weill Cornell Medicine, Carnegie Mellon, the VA, Ford, Gore, HP and DWE. Many of our projects can now be found on the NIH print exchange, while others are still under development and/or awaiting certification. A paper with Weill Cornell Medicine is underway, as well.

Dust Busters Plus LLC, *Wildland Firefighter - Emergency Medical Technician (EMT)*
Contractor for Oregon Department of Forestry, Eugene, Oregon *July-August 2019*
Served as the designated EMT on a wildland fire handcrew. In this role I acted primarily as a firefighter, switching to a medical role in emergencies. This job required hard work, extremely long hours, constant teamwork, the ability to stay focused under pressure, to learn on the job and a willingness to get dirty.

MIT Computer Science & Artificial Intelligence Lab, *Independent Researcher*
Massachusetts Institute of Technology, Cambridge, MA *July-August 2018*
Continued work on the virtual reality "homunculus" system to control Baxter robot in collaboration with Daniela Rus, PhD, Jeffrey Lipton, PhD and Robert Katzhman, PhD.

Stanford University Department of Public Safety*, Special Events Patrol Officer*
Stanford University, Stanford, CA *April 2018-Present*
Provide community assistance, event security, traffic control and similar tasks in cooperation with Stanford DPS (police and fire). Part-time/casual position. This job requires an ability to follow orders, work as a team, maintain self-discipline, stay professional under stress and work unusual hours.

MIT Computer Science & Artificial Intelligence Lab, *Independent Researcher*
Massachusetts Institute of Technology, Cambridge, MA *July-August 2017*
At the invitation of Dr. Daniela Rus, PhD, continued work on the virtual reality "homunculus" system to control Baxter robot in collaboration with Daniela Rus, PhD and Jeffrey Lipton, PhD. Named on academic

paper entitled Scaling Teleoperation For Manufacturing With Human-AI Teams .

Battlespace Exploitation of Mixed Reality (BEMR) Lab, *Independent Researcher*
Space and Naval Warfare Systems Command (SPAWAR), San Diego, CA *June-July 2017*
Devised a novel system for intercepting network traffic from a decades old training system to be displayed in a new, VR capable, simulator for Landing Signal Officer trainees. Developed the architecture for the new training system. This was a job that required the ability to take directions without any technical supervision, quickly identify what skills were needed and learn them.

Aidan J. Fay Engineering, *Independent Contractor, La Jolla, CA* *Fall 2016*
Hired to build parts for and subsequently wire, paint, construct and assemble a Raspberry-Pi-based Bartop Arcade Machine system for local client. Project duration: 33 hours.

MIT Computer Science & Artificial Intelligence Lab, *Independent Researcher*
Massachusetts Institute of Technology, Cambridge, MA *Summer 2016*
Created virtual reality "homunculus" system to control Baxter robot in collaboration with Daniela Rus, PhD and Jeffrey Lipton, PhD. Academic paper entitled Baxter's Homunculus: Virtual Reality Spaces for Teleoperation in Manufacturing presented by Dr. Lipton at International Conference on Intelligent Robots and Systems and Scaling Teleoperation For Manufacturing With Human-AI Teams. First high school student hired by Dr. Daniela Rus to work at CSAIL.

Dart Neuroscience, *Contractor,* San Diego, CA *December 2015*
Assembled and configured, including electronic wiring/soldering, test machinery for an animal behavior research device.

USS Midway Museum, *IT Intern*, San Diego, CA *Summer 2015*
Created the software user interface for a new flight simulator room, acquired and modified the aircraft models in XPlane, helped with the installation of the new room, and aided in general IT tasks.

Vision Robotics, *Software Development Intern*, San Diego, CA *Summer 2015*
Created a more accurate quadrature encoder software readings at lower speed for Vision Robotics DC motors using C programming language.

UC San Diego, Academic Connections, *Student Apprentice* *July 2014*
Collaborated with Dr. Colin Zyskowski, PhD to build electro-mechanical guitar pedals from scratch. Built a "wah-wah" pedal and basic distortion/boost pedal.

ENGINEERING PROJECTS

Harrier AV8B SimPit *2016 - 2017, 2020*
Created a precision-scaled Harrier AV8B simulation cockpit made to work with the Oculus Rift virtual reality headset and RAZBAM DCS AV8B. Work includes SolidWorks CAD design, laser cutting, water jetting, carpentry, 3D printing, electrical wiring and software scripting. Project originally began in 2016 but was placed on hold due to the large physical size and large number of parts needed. I used the Covid-19 lock down as an opportunity to finish the project. Although I had much more limited resources (no CNC, water jet or laser capability), I was able to make creative use of carpentry tools and a 3D printer to complete the effort. Every switch dial and control is functional. To my knowledge I have built the most accurate AV8B flight simulator in existence outside of the military.

Glove Watchman *2019-present*

Designed and fabricated a commercially-viable clip device that enables Wildland Firefighters to more quickly remove, don and store gloves, although it can be used in many other fields. I have already had it field tested on a wildfire and have pursued independent study at Stanford to further develop it. This project has involved CAD, 3D printing, wire bending, sand casting, machining and finishing.

Naloxone Access Point *2018 (On Hold)*

Designed and fabricated (including electronics) a public access point device designed to dispense Naloxone (Narcan), a drug reverses the effects of opioid overdose. Responsible for nearly (95%) all of the hardware on the current generation design. Originally initiated by postdocs at MIT and Harvard, I am now the sole engineer as the original developers transferred the materials of the project to me when they abandoned it. The main challenges of the project are to: insure the drug stays at the proper temperature in any weather, remain theft and weather resistant and communicate with the 911 system. Skills involved include CAD, water jetting, laser cutting, hot wire cutting, 3D printing, Electronics design and soldering.

Automated Amplifier System *2017-present*

Designed, wired and constructed a control system to combine and regulate multiple guitar amplifiers. Work included CAD, electronic signal design, wiring and assembly. Completed, however the electronics need to be transitioned to PCB for reliability. Independent project at CCRMA, Stanford University.

Momentary/Toggle Guitar Distortion Pedal *2016*

Designed novel approach to guitar distortion pedal with dual-switched activation and momentary switching. Large emphasis on aesthetic design. Created all aspects from CAD to CAM to milling, plus wiring and test.

Cessna 172 Airplane Simpit *Summer 2015*

Designed, engineered and built a realistic, full-scale Cessna 172 simulation cockpit for use with Oculus Rift and Prepar3D. Work included software, electrical and mechanical engineering.

Force Feedback Yoke *Summer 2015*

Adapted an actual Cessna 172 airplane yoke to provide force feedback output which simulates control loading and realistic elevator trim. Work included electrical and mechanical engineering and computer programming.

World War II Airplane SimPit *Fall 2015*

Designed and built a full-scale simulation cockpit made to work with the Oculus Rift virtual reality headset and Prepar3D flight simulation software. Work included carpentry, electrical and mechanical engineering and software scripting.

Team Member, FRC Team 2485 WARLORDS *2013 - 2017*

Starting freshman year of high school, served on FIRST Robotics Team 2485. Spent two years as Software Lead and one year as President of Build. Was also the human player on the drive team for two years, competing in four regionals and two world championships. (My robotics team experience taught me how to code, how to mill and how to work incredibly closely with a team.)

“Blockland” Video Game Addons *2010 - 2013*

Created mods for a sandbox type video games which involved 3D modeling, scripting and animating.

MEDIA COVERAGE, PUBLICATIONS AND PRESENTATIONS

- **Scaling Teleoperation For Manufacturing With Human-AI Teams**, Lipton, J.I, Choi, C, Fay, A.J., Wallar, A, Rus, D, MIT, 2018
- **Baxter's Homunculus: Virtual Reality Spaces for Teleoperation in Manufacturing**, Lipton, J.I, Fay, A.J., Rus, D, International Conference on Intelligent Robots and Systems, October 2017
- **UW-DFAB Facetent (NIH Print Exchange)**, Jeffrey Lipton, Aidan Fay, James Shin, Scott Hudson, Flyn O'Brien
- **UW-DFAB Non-Rebreather Mask (NIH Print Exchange)**, Jeffrey Lipton, Aidan Fay, James Shin, Scott Hudson, Flyn O'Brien
- **SFM Revision A, B (NIH Print Exchange)**
- **The Power of Play,** Featured Speaker, TEDx Youth and Innovation Park, El Cajon, CA, April 2016
- **"Teenager Builds Cockpit in His Bedroom"**, Discovery Channel Daily Planet
- **"Garage Flight Simulator"**, Intel Presents America's Greatest Makers
- **"La Jolla Teen Builds Own Realistic Flight Simulator**", La Jolla Light
- **"Told He Couldn't Pilot, Teen Builds Full-Scale Flight Sim in His Room"**, MakeZine
- **"Teenager's Bedroom Flight Simulator Gets National Attention",** NBC San Diego
- **"Dreams Take Flight",** Parker Magazine
- **"Aidan Fay's Homebuilt Cockpit**", PC Pilot
- **"A California Teen Built His Own Cessna 172 Flight Simulator With VR"**, Popular Mechanics
- **"California Teen Constructs Full-Scale Cockpit"**, Ruptly.tv
- **"Learning To Fly, With a Full-Size Cockpit Simulator**", Slashdot
- **"Dreaming Big at Maker Faire**", U-T San Diego
- **"This 17 Year Old Built a Full-Scale Cessna Cockpit Simulator in His Bedroom**", VICE Motherboard

APPLICABLE SKILLS

- CAD - Certified Solidworks Professional (CSWP)
- CNC Milling (CNCMasters, Prototrak, Acu-Rite)
- CAM (HSMWorks, SolidCAM)
- Manual Milling
- Manual Turning
- Sand Casting
- 3D Printing (Stratasys, Form, Ender)
- Laser Cutting
- Water Jet Cutting
- Designing for Injection Molding
- Designing for Vacuum Forming
- Electronics Design (EAGLE, Fritzing, LiveSPICE, PartSim)
- Electronics Assembly
- 3D Modeling (Blender, Milkshape)
- Java
- C#
- Lua
- Unity Development
- Wireshark
- Certified Emergency Medical Technician

EXPANDED PROJECT EXPERIENCE NARRATIVE

My first introduction to truly making (beyond with toys) came in the form of video game mods. From fourth grade through eighth grade I created "add-ons" for "Blockland", a sandbox video game entirely dependent on the creativity of its community to make content. With no skills to begin with, I slowly taught myself 3D modeling, scripting and some basic UI design. Initially, my releases were low quality and harshly received by the community. Eventually, however, I improved and by middle school my add-ons became widely-used. I would log on to play Blockland and find people using my creations to play in ways they never could have before. By tinkering from my elementary school bedroom, I positively affected others across this community.

Growing up, I loved flight simulators. After years of online flying, I wanted to create a more involved and realistic experience. I started by building small switch boxes so that I could control gear and flaps without using my keyboard. Then, once I got my hands on the Developer's Edition of the Oculus Rift in 10th grade, I set out to make the experience of virtual flight fully immersive; I wanted to feel the controls physically. So, with no real plan or training, I bought some wood, went to my garage and within two months I had built my first fully functional simpit. Enclosed on all but one side, I could sit in my cockpit and control nearly everything I needed by touch.

The summer before my junior year in high school, I started considering getting my pilot's license seriously and decided to build a simulator that I could actually practice on—a full-scale replica of a Cessna 172. I wanted this simulator to be a one-to-one representation, so that when I looked for a control in VR and I could actually touch it in real life. This project gave me the opportunity to learn and use CAD. (After years of 3D modeling, it was easy to pick up and today I am a Certified Solidworks Professional.) I manufactured the necessary parts mainly using simple garage tools.

Beyond an accurate cockpit layout, I implemented force feedback in order to properly replicate the important information the pressure on the yoke gives a pilot. To do this, I ripped out the electronics from an old, low power force feedback joystick and modified them to work with more powerful speed controllers, motors and new potentiometers. I built the mechanical structure behind the yoke and used an actual Cessna yoke that I bought from eBay for the user (me) to interact with. Ultimately, I wrote the software systems necessary to allow all the switches and controls on the physical cockpit to control their virtual counterparts. As you can imagine, creating this project taught me things I still use today.

After gaining far more CAD experience and freshly trained on CNC mills and laser cutters, I set off to create an extremely accurate AV8B Harrier cockpit that could be fully manufactured out of acrylic and aluminum plates. I succeeded in designing the entire cockpit and building and testing the left hand console. Ultimately, I had to halt work on this project due to the large amount of manufacturing time and cost necessary to complete it.

In hiatus of the AV8B project and during the summer of my senior year in high school, I turned my attention to creating the Momentary/Toggle pedal inspired by my experience as a guitarist. I wanted to create an effects pedal that could be used as a momentary switch for rhythmic use or could be toggled like a conventional guitar pedal. Creating this allowed me to delve deeper into both electronics and CNC milling. I quickly became comfortable with basic (and some not-so-basic) analog electronics and the main body of the pedal required 11 CNC jobs to manufacture. I placed an extremely high focus on design and build quality with decorative plastic inlays. Ultimately I built two and gave one to the band Halestorm. To my knowledge, there is absolutely no similar product in existence to this pedal.

My adventure developing the pedal inspired me to dive far deeper into electronics. The result? The Auto

Amp, which I began in high school and completed my freshman year of college. I set out to create a way to combine multiple guitar amplifiers in an automated system that allows the user to select and switch between preset amplifier settings. The result would allow guitarists to combine the sounds of multiple guitar heads and effects loops. Ultimately I designed and built a fully functional model. However, the methods I used to construct the device (veroboard and 200+ crimp connections) proved to be highly susceptible to mechanical failure and to be too unreliable to use live. Ultimately I will need to redesign it using PCBs.

During my third summer at MIT and prior to my sophomore year at Stanford, one of my CSAIL colleagues introduced me to a project of his—a novel device designed to aid in the opioid epidemic by building the equivalent of an AED box for Narcan, an opioid overdose reversal drug. He asked me to design the hardware for a version that could be tested on the streets of Boston. This project presented not only mechanical, manufacturing and structural challenges, but security and weatherproofing challenges, as well. Before I left Boston, I had designed the full assembly and manufactured nearly all parts. Back at Stanford, he hired me to design and test the electronics which is how I learned PCB design with EAGLE. While I succeeded in designing the electronics, the project was ultimately cancelled for reasons outside my control. I now have, with his permission, the remaining parts. But, without a realistic way to test or implement it, I am not currently focused on it.

Now a college junior, my most recent project and currently ongoing is the “Glove Watchman”. The impetus for this device came from ME103, a class where you design and manufacture a metal product. I wanted to solve a problem I had identified during my recent summer working as a wildland firefighter, chiefly the need for gloves to be taken on and off frequently without any means of securing them quickly.
While development is still underway, I have succeeded in making over seven plastic prototypes and five cast and machined prototypes. I have been gathering feedback from local structural firefighters and from fellow wildland firefighters I met this past summer to improve the product. I plan to further improve and test the product in industry.

Once Covid-19 hit I found myself thrust back at home. I used that time to finally complete the AV8B cockpit. Using the parts I had fabricated years earlier, basic carpentry tools and a 3D printer, I set out to finish the project. By the end of spring, I had successfully fulfilled the dream of a totally immersive cockpit I had yearned for as a high schooler. Beyond my previous simulators, this one spares no details and is built to last.

I have been designing and making for much of my life. The projects I have embarked upon vary widely in scale, purpose, and techniques; the list of those I’ve discussed above is far from exclusive. I don’t just like to make things; I like to make things that solve a problem and make a difference in realms I care about. Each problem I encounter presents the opportunity not only to solve it but to develop a new skill along the way.