PURPOSE

This summer, I interned at the Maglab in the Machine Shop under Vaughan Williams. As an Aerospace Engineer Major, my goal was to learn the innerworkings of manufacturing. Exactly how an idea could develop from a concept to a finished product ready to be used. When scientists perform experiments at the Maglab, they require custom built parts ranging from the size of a tic-tac to the enormity of an entire room. My purpose this summer was to take their big ideas and help turn them into reality.

PROCESS

Models

Drawings

Beam monitor housing

Drawings are the most crucial cog in the system of communication in the Machine Shop. It is the bridge that transfers the model information to the machinist; without it, there is no finished product. Drawings typically include multiple 2-D views (known as orthographic projections) of a part with all the information needed to make it. Alongside with math, these computer sketches are the universal language to engineers around the world.

With 35 drawings created this summer, primarily the most vital lessons taught to me was how crucial datum referencing and tolerancing are. I’ve learned in the drawing process, it is vital to keep the machinist into mind when dimensioning the model. You have to know which face or edge the machinist will go off of, and which dimensions are the most important. If you don’t dimension effectively, the person making the part will be lost as a result of your unprofessional drawing skills.

Machining

Here I am lathing over 100 vacuum feedthroughs

Before the summer internship, I had absolutely zero experience in machining parts. Towards the end, I was working with the machines on a daily basis, turning the drawings into real life physical objects. A great deal of engineers and scientists lack the machinist point of view when designing equipment. I was lucky enough to not only design parts, but to help machine them, helping to gain the experience to model more effectively.

During this summer I lathed over a 100 brass vacuum feedthroughs for optic fiber, milled pieces of a support frame for a new 32 Tesla magnet, and used a NC machine to create fillets on a dozen steel plates. I also continuously operated vertical and horizontal band saws to cut Aluminum. On top of that, I shadowed expert machinist on a regular basis to see how to professionally sculpt metal into the desired dimensions.

Experimenting

1 mm/s until it snapped. Because of this experience, I had the rare opportunity to see an idea transform from a model, to a drawing, into a physical object that was scientifically experimented on.

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I would like to give special thanks to my mentor, Vaughan Williams. With his patience and commitment for me to learn, I would not have the experience that I have today. Along with Modeling and Drawing, he also taught me that machinists do in fact have a sense of humor. I couldn’t have asked for a better mentor.