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Term 2 Job Summary

During my co-op experience at Wright-Patt, I split time between the Detonation Engine Research Facility and the Small Engines Research Lab; my first term was mostly in DERF and my second term was mostly in SERL. Innovative Scientific Solutions Inc. has employees in both of these labs and consequently the two labs have are fairly connected; personnel spend time in both. Most of SERL's research involves the Boxer 4-cylinder Rotax gasoline engine, used on the Predator UAV. They study the effects of different fuels and loading schemes on pre-ignition and knock. The work they do is extremely hands-on; I picked up a tool every day of my second term, which I found very rewarding and exciting.

In SERL I worked on several different projects. My main project was producing a compressor and turbine map of small-scale turbochargers. These turbochargers are used on the Rotax engine to equalize the intake pressure to sea-level when the aircraft is at altitude and to increase power on take-off. Another group on base was trying to push another, smaller, more expensive turbo as a better alternative to the one that is currently being used on the Rotax. In order to prove that the current one was better suited, I was asked to produce a compressor map that describes the efficiency of the turbo at different mass flow rates. I had a fairly tight deadline to build an experimental rig that could flow compressed air through the turbo and take accurate temperature, pressure, and shaft speed readings at inlets and outlets. One of the more difficult parts of operating the rig was ensuring proper oil flow to the turbo so the journal bearings remained lubricated and cool. We went through several iterations of oil circuit design before we arrived at one that could reliably give us high flows and adequate drainage. After collecting the data, we used thermodynamic analysis to calculate isentropic efficiencies and corrected mass flows to actually plot the map. Our turbo did in fact prove to be much better suited than
the competition and our efforts were a success. Other projects that I worked on included: resolving the impulse of a ballistic pendulum and capturing video footage of a pre-chamber jet igniter.

During my second term, my mentorship unofficially shifted to Dr. Eric Anderson who I worked with on the turbo-mapping project. We worked side by side for most of my summer term. He was great to work with as he provided incredible expertise, knowledge, and patience coupled with an attitude of humility and a willingness to teach. Eric also provided invaluable advice about graduate schools, specifically University of Illinois, his alma mater. I would work with Eric again in a heartbeat. The rest of my colleagues were equally helpful with problems and offering of solutions; it’s truly a great atmosphere to work. Two of my colleagues offered incredible assistance with job and graduate school advice and even helped me with a thorough, post-Co-op overhaul of my resume. Their professional and academic connections are incredible and I can tell that they will be invaluable to my immediate future.

In conclusion, I found my second term to be extremely rewarding in that I was given much more responsibility and the opportunity to work on more hands-on research projects that were less focused around design. This job pushed me in all areas: technically, relationally, and professionally. I also felt much more motivated to work diligently and quickly during this term because the projects that I was working on were much more time sensitive; this was my only major critique of my first term. On the whole, working for ISSI at Wright-Patt has been a profoundly rewarding experience and it has inspired me to pursue research in graduate school and possibly as a career, something I had previously never considered. I was surrounded by outstanding individuals that have a real thirst for knowledge and innovation and who cared about my professional future.