Student Internship / Faculty Externship Final Report (Exhibit B)

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Allan Hancock College (AHC)

Marc Carson, AHC Faculty Externship Lead

A. Outcomes and results:

Name of Student Intern	Hours Worked	Work Experience Credits Earned	Name of the DoD company
1. Efreen Hernandez-Lerena	75	1	Space Information Laboratories (SIL). Santa Maria, CA
2. Victor Marin	75	1	Space Information Laboratories (SIL). Santa Maria, CA

Description of Internship Work:

1. Efreen's internship project at SIL was to establish a Voltera-one PCB printer on-site capability. The Voltera-one is a desktop machine (See Figure 1.) that extrudes conductive ink onto blank substrate boards (See Figure2.), allowing users to quickly develop circuit boards in-house instantly after designing them. The prior lead time to procure these test boards was two to four months depending on the design. This new capability can produce a test board in one to two days, thus significantly saving SIL time and monies. Prior to starting this project, the student completed site orientation training which included safety and electro-static discharge procedures. The student also received company and product overviews, so that he would have a better understanding how the internship project supported the company's mission. A mentor engineering lead at SIL was assigned to provide Efreen on-site guidance. Following his orientation and training, Efreen successfully developed a test board (See Figure 3.) using the Eagle CAD software.

Efreen also designed a more complex board (See Figure 4.) toward the end of his internship, which will be fabricated over his planned extended summer internship at SIL.

Figure 1. Voltera-one System

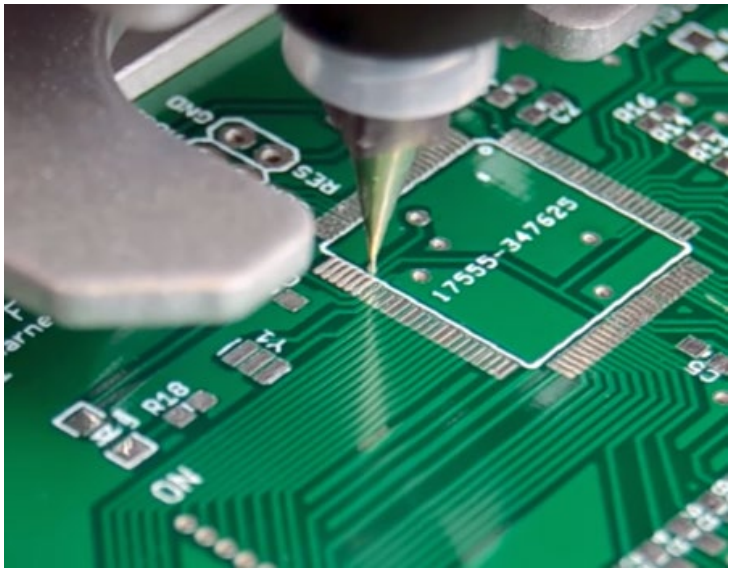

Figure 2. Printed Substrate Board

Figure 3. Project Test Board

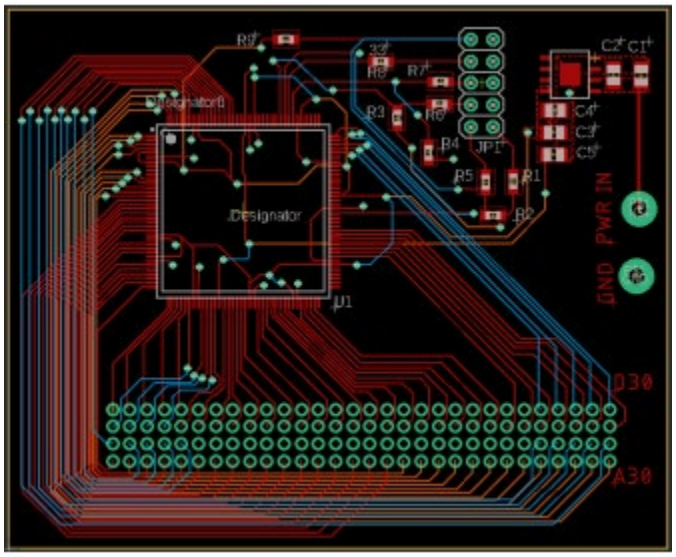

Figure 4. Complex Test Board

2. Victor's internship project at SIL was to learn the requirements of a new AVID CNC (Computer Numerical Control) mill (See Figure 5), and to design and assemble a CNC mill cooling system. This CNC will be used for manufacturing inhouse tooling/test fixtures. Prior to starting this project, the student completed site orientation training which included safety and electro-static discharge procedures. The student also received a company and product overview, so that he would have a better understanding how the internship project supported the company and mission. Victor's initial task was to research three main types of CNC cooling techniques. The cooling system needed to be appropriate to use with stainless steel, 6061 aluminum, and copper base printed circuit boards (PCBs). Cooling options included flood cooling, mist cooling and compressed air. Victor researched and recommended a mist system. This was the best solution for the parameters set in place by the Engineering Lead for the CNC work area. An Engineering Apprentice was also assigned to work with Victor to assemble the CNC mill (See Figure 6). Victor and the Engineering Apprentice designed and fabricated the CNC dust boot and mounting system (See Figure 7.) The CNC mill capability was completed, and utilization of the system is planned this summer.

Figure 5. AVID CNC Mill

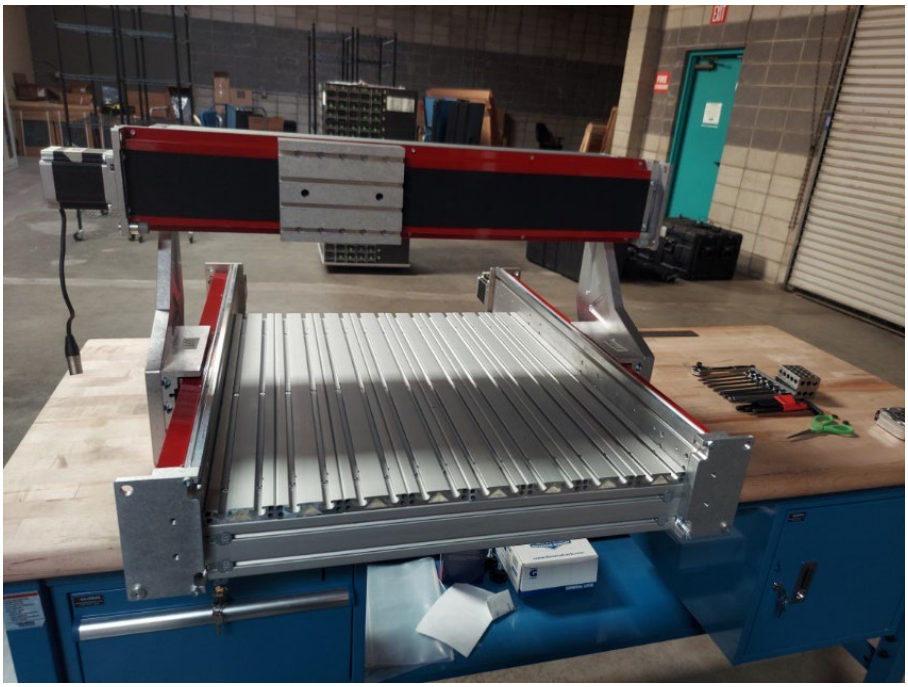

Figure 6. The AVID CNC Mill during the assembly phase

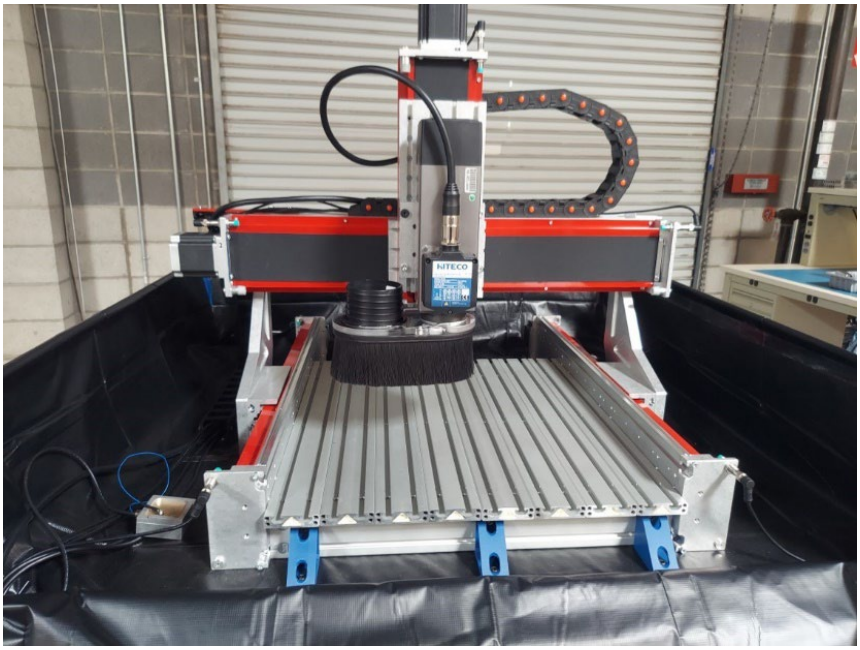

Figure7. The AVID CNC Mill dust boot and mounting system

B. Describe any benefits derived by the faculty extern/coach from working with the DoD companies and student interns.

The benefits derived by the faculty extern/coach started during the early phase of the company selection process. From a list of over twenty companies, six were evaluated using the selection criteria (See Table 1). Initial benefits during the evaluation phase included potential partnerships with local companies from Santa Barbara to San Luis Obispo. Most of these companies were not aware of CADENCE or had considered partnering with the college. Direct benefits include facilitating the two internships and industry partnership which has been established with Space Information Laboratories. Two summer follow-on internships have also resulted from this activity. The CADENCE grant process also resulted in the creation of a third internship project and strategic partnership with Zone 5 Technologies, located in San Luis Obispo, which was supported by leveraging other funding resources that resulted in similar benefits for the participating student. The industry knowledge derived from this process not only benefited the

selected two interns but will benefit generations to come through enhanced and expanded industry partnerships.

	Criteria (Score: 10= High, 5 = Medium, 1 = Low)				Score	Supporting Information (Example: Annual Revenue, # of employees, SBIR Contract Phase, etc)
Potential Project 9 Companies (Short List)	Location to AHC (SM Site)	Mfg Capabilities	Notional/ Proposed Intern Project	Desire to Partner Longterm with AHC		
MANTIS COMPOSITES INC.	5	5	10	5	25	10 people, unique 3D Printed Carbon Fiber
Space Information Laboratories, LLC	10	10	10	10	40	Growing to 50 people, Small SAT products
Stellar Exploration, Inc.	5	10	10	10	35	20 people. Fab, Assembly and Test. Nano SAT sub-systems and Propulsion
TOYON RESEARCH CORPORATION	1				1	Not Rated: In review with Toyon HR.
UMBRA LAB, INC.	1	5	5	5	16	Phase 1 SBIR only, 60 People, Assembly and Test Capabilities.FINTECH/Analytics
ZONE 5 TECHNOLOGIES, LLC	5	10	10	10	35	20 people, Excellent 3D printing and Machining Capabilities. Counter UAV solutions

Table 1. Six Selected Companies

C. List anecdotal information regarding the success of the student internship/faculty externship project.

The relationships established during the execution of the CADENCE project not only created a partnership between Space Information Laboratories and Allan Hancock College, but also positively impacted other students and businesses. The process established connections that will lead to other student internships and business partnering opportunities for the college.

D. List any extenuating circumstances that prevented you from completing objectives of the project: There were no issues that impacted the completion of this project.

E. Describe your three greatest challenges you experienced in completing the internship project:

1. Efreen's greatest project challenge was learning the Eagle CAD software needed to design electronic boards.

2. Victor had no experience with CNC mills prior to this internship project, so he had to quickly learn the basics of CNC programming, tooling, and milling, including cooling requirements.

3. It was a challenge for both interns to complete their assigned projects within the 75 hour per student maximum requirement.

F. Describe your three greatest successes from the student internship/faculty externship project:

1. Efreen successfully developed and validated the Voltera-one on-site capability at SIL, saving the company 2-4 months of procurement lead time.

2. Victor successfully assembled an AVID CNC mill capability (See Figure 8.) and developed a cooling system. This capability will allow SIL to fabricate large test fixtures on-site, saving time and monies.

3. Due to the interns' successes on the CADENCE grant, SIL invited both students (See Figure 9.) to continue as paid summer interns, supported by another College grant resource, and earn cooperative work experience credit.

Figure 8. Victor at the completed CNC Mill

Figure 9. Left to right: Efreen (Intern), Tim Anderson (SIL Eng Leader), Victor (Intern)

Additional Comments:

Overall, the internships and faculty externship were a tremendous opportunity for the selected students and Allan Hancock College. The success of this internship program was best stated by participating intern Efreen Hernandez-Lerena "The overall environment of SIL has been an

amazing opportunity for my education and my career. Primarily the innovation, research, design, testing, and high standard for quality at SIL helped me to confirm that engineering is what I want to do."