HUNCH: The birth, Phase One and were do we go from here.

The Birth:

During the summer of 2003 Stacy Hale/DV4 from JSC spent three months at MSFC working for Debbie Underwood/FD35. Debbie had Stacy work with Bob Zeek/Fd35 to improve the Lab mock-up at MSFC in building 4610. The Lab mock-up consisted of an Express Rack Trainer and pictures to represent the US Lab. GSP training for payloads consisted of reading documentation and classroom training. There was very little if any hand on training hardware.

Faced with this limitation Stacy came up with a unique solution, latter to be named HUNCH (High school students United with NASA to Create Hardware). The solution was inspired by his son's Bar-B-Q pit that he built in high school. The solution was to team with high schools that had the capability and desire to work with NASA. NASA would provide the materials and the documentation. The schools would provide the technical direction to the students and a safe working environment. (The HUNCH logo represents the students taking the raw material and molding it and conforming it into something crisp, smooth and precise for NASA to use.)

Debbie felt the idea had merit, and Greg Burns/FD35 was added to the team to start working with the MSFC/Education outreach.

The HUNCH team put together a phased approach to being able to meet the goal of being able to fabricate integratable and standalone payload training simulators. Because of the shortage of sub-rack payloads, and most sub-rack payloads are based on an ISS Single Stowage Locker, it was decided that the first phase would be the fabrication of ISS Single Stowage Lockers. To make Phase one work we needed schools that could perform metal fabrication. The second phase would be the mock-up of two – three sub-rack payloads. This would also require metal fabrication. Also in phase two would be the addition of electronics. Specifically we wanted to find a school that could perform wiring, programming and control IO devices. Phase three was the merger of the mock-up with the electronics to produce a simulator either standalone or integrated. When all of these phases were finished and there were High Schools teamed with NASA, we believe that this would be one more option that could be offered to Payload Developers for the fabrication of a training unit.

We also had other phases that represented the fabrication of other items. These items included the fabrication of ISPR training racks and the outfitting of those racks. The fabrication of soft stowage capabilities like cargo transfer bags. The fabrication of training modules, like the CAM in the SSTF.

We also believe that HUNCH could lead to the fabrication of High Schools manufacturing trailers that represent different ISS modules. The trailers would be cylindrical on the outside, but on the inside would be a full scale mockup of an ISS module. The inside would be pictures on the floor and ceiling, but the sides would be six inch deep racks that represent the racks on orbit, but were built by different schools around the USA for a NASA build a rack competition. Where the best racks were mounted into a trailer then the trailers were sent to different schools and fairs around the USA to educate the American population about what it is like onboard the ISS.

Prior to Stacy returning to JSC the HUNCH team was able to put together a Phase One project plan

that was presented to and approved by Rickey Cissom/POIF.

Phase One; The manufacturing of thirty ISS Single Stowage Lockers.

Stacy, Bob and Greg went out looking for high schools that had the capabilities and would be interested in teaming with NASA. Stacy found Clear Creek High School (CCHS) in League City Texas. Bob found Brewer High School (BHS) in Huntsville Alabama. And Greg found Huntsville Center for Technology (HCT) in Huntsville Alabama. Each school has its specialty and will contribute differently to the phase one goals. CCHS has tremendous eagerness to work with NASA and has basic metal cutting, drilling and bending capability. The shop teacher Mr. Gibbs is also has experience in organizing assembly line production. Therefore CCHS is being used to cut, drill and bend all sheet metal activities and provide the assembly of all pieces. CCHS will build the locker top, bottom and sides. BHS specialty is welding, and always performs well at state level welding competitions. Therefore BHS is being used to weld the corners of the box to increase its rigidity and to weld together items to create a locker insertion tools. HCT is an incredible find. It has drafting, painting, programming, electronics and metal fabrication machinery. Therefore HCT will be used to cut out the door and back plate. They will also paint the door.

Process: First is to prove each schools ability by building a prototype. Because there are three schools involved in the manufacturing there are dependencies that need to be worked out prior to getting in to production. CCHS built prototype #1, it turned out to be to big and would not fit on the back-plate of an old training unit. But this did prove that CCHS would be successful they just needed to make some minor modifications to a drilling template. CCHS built prototype #2, The size was good, but the box was not square. It was decided that using an assembly jig to keep the sides square would fix this problem. It was also decided that a pneumatic rivet gun should be used to maintain consistent riveting. The prototype #2 was sent to BHS. BHS was able to weld the corners of prototype #2. This will minimize sharp edges and stiffen up the locker. BHS was also able to take some metal bar stock and an Allen wrench and manufacture a locker insertion tool. With these two items demonstrated BHS is ready to go into production. Then prototype #2 was taken to HCT. HCT was working at loading the software into their computer controlled lathe, when they ran into a problem. This problem was overcome and they started working on cutting out the first door so it could be mounted onto prototype #2. The bit was not being withdrawn far enough prior to moving it over and it broke two bits. HCT is also finished with drawing the back plate, but has not yet cut out a back plate. Based on what NASA has seen from HCT there will not be a problem with them being able to manufacture both the door and the back plate. So all schools have shown that they will be able to perform their part of the fabrication.

Current status: Need to ship a door or back plate from HCT to CCHS. CCHS will use this to figure out both the locker insertion tool guides and the front door latch positions. Once this is a go both CCHS and HCT would be a go for going into production.

Production: CCHS would start the production by manufacturing 30 boxes that have top, bottom, sides, door latch ears and locker insertion tool guides. These boxes will then be shipped to BHS. BHS will then weld the corners. The boxes are then shipped to HCT. HCT will then mount the back plate. The back plate will have the MILSON fasteners already attached. HCT will also manufacture the hinge/door assembly to the box. The door will be painted and have the close out panels installed. HCT will also provide a rear breather close out. The boxes will then be shipped back to CCHS. CCHS will then install the door assemble and latches and perform a quality inspection to make sure there are no sharp edges or burs. All sharp edges and burs will be filled smooth. The boxes will now be ISS Single Stowage lockers, that support rear breathing ventelation.

CCHS HUNCH Team; teacher Bill Gibbs, students: Clint Morton, Hana Rehakova, James

Holley, James Wilkie, Jarrad Williams, Johnathan Smith, Jordan Arnett, Lupe Reyna, Nolan Leahey, Ryan Chehovis, Stephen Lowman, Alec Halsch, Ashley Beall, Ashley Temperton, Christopher Nelson, Jacob Klopp, Jose Rios, Stevi Day, George Bulliner, JD Isaacks, Jonathon Keeth, Justin Trifilo, Michael Jones, Matthew Nichols, Mike Rich, Nelson Hoofard, Shannon Batte, Timothy Bourn, Albert Tran, Alex Ravandi, Bernie Garcia, Daniel Brizendine, Kyle Little, Lynn L. Hogan, Nick Lamkin, Shelby Bever, Andrew Pojar, Chuck Whitworth, Cody Wilson, James Narvaez, Joshua Ryan Clark, Phillip Vargas, Robert Engler, Thuan Nguyen, Travis Bolgiano.

Clear Creek High School & NASA

Wildcats

CCHS students in action cutting metal with a a 36 inch metal foot shear. A jig was used to set the depth of each cut. Two students were used to actuate the foot shear. The other students were used to hold the metal in place.

CCHS students in action bending metal, with a 48 inch metal break. A jig was used to make sure the proper angle. A second jig was used to set the length. One student was used to operate the metal break. Two other students were used to remove and insert the sheets of metal and lock the metal break into place.

CCHS students in action filling down sharp edges on metal panels that will go on the top, bottom or sides. Every piece of metal that is used to manufacture a stowage locker was filled down prior to assembly.

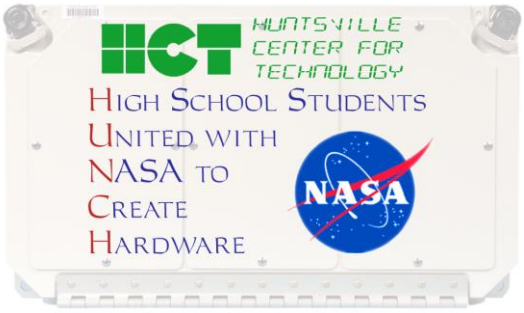
CCHS students in action drilling holes with a drill press. Every hole that was drilled used a jig. The jig was designed to hold the sheet metal in place. The same hole was drilled in each piece of metal before re-positioning the drill press to drill the next hole. This was done to maintain quality. So each piece would be the same as the one prior.

CCHS students in action assembling an ISS Single Stowage Locker, being done prior to the development of an assemble jig. A jig is critical to keep the box square.

CCHS students presenting their part of the project during a three way video conference with BHS and HCT. So that all the students from the different schools could share in the lessons learned from the other schools a video conference was used to allow the students to share what they were doing to make the project a success and what lessons they have learned in the process.

BHS HUNCH Team; teacher Greg Dudley, students: Bennett Chris, Childers Dane, Golden Jody, Jarrett Brandon, Betterton John, Williams Bruce, Sharp Chris.

HCT HUNCH Team; teachers Mike Evans and Tim White, students: Lance Galloway, A.J. Santos Joe Valentine**,** David Jackson, Zach Flournoy, John Fox, Adonna Minor, Nick Cothren Stephen Wank, Sara Robinson, Terevio Williams, Latricia Readus, Trevor Hinkson, Greg Turman ,Stephen Hamilton, Harvey Stewart, Micah, Nuchols, White Betty Chapman Nicholas, Steward Byron, Scott, Steven



HCT instructor and students taking 2-dimensional drawings and developing 3-d sure CAD drawings.

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HCT drawing students converting CAD drawings to an IGIS file to program the milling machine.

HCT 3-axis milling machine (Fadal) used to cut locker doors from ½ aluminum plate

HCT Students setting up milling machine with tooling and clamp blocks.

HCT Instructor and students programming coordinates and tooling for carousel operations.

HCT students fit-check door size to locker with NASA assistance.

HCT Instructor and student discussing hinge options with NASA assistance

Where does HUNCH go from here?

With out a doubt it is time to start Phase Two. Because we did Phase One with three schools and we were really expecting to use only one school there are more options available then previously expected. Multiple Phases could be started next year vs. only going to Phase Two. Work needs to be done this year to get HCT ready for Phase Two. The NASA HUNCH team needs to evaluate a single board computer with built in IO. HCT is the perfect school to be able to build sub-rack payload simulators. BHS is also the right school to manufacture a CAM crew station for the SSTF. This will take some work on performing weld inspections, because these welds will support the weight of ISPRs and crew members. BHS would also be great at building an ISS US LAB module. CCHS could start manufacturing four and six post ISPR for training. With the added importance on human experiments, we could have CCHS build HRF mock-ups.

The important point to remember is that we have only scratched the surface. This project allows NASA to share with the community, and inspire the next generation of explorers as only NASA can. It will be a tremendous victory if one day an old member of the NASA HUNCH team is working at their desk and they get a call on the phone. It is a call from a new hire. They just called to say hi, and to see if you wanted to have lunch at the cafeteria. Because six years ago they were junior in high school, working on the HUNCH project. They have now graduated collage with a degree in engineering. And now they are working at NASA.