Space Port Indiana™
STS-125 Hubble "Jr. Mission Expert Program"

Project: STS-125 Hubble Mission & Hoosier High School Young Astronauts

PI: Mr. Brian Tanner, Space Port Indiana™, Columbus Indiana

Program Year: 2009-2010

Project Description: STS-125 Hubble "Jr Mission Expert Program"

Project Overview

In 2009, Shuttle Mission STS-125 made the final visit to Hubble for upgrades and repairs. This mission marks the final visit to one of America's greatest achievments at space exploration. It's a mission to once more push the boundaries of how deep in space and far back in time humanity can see. It's a flight to again upgrade what already may be the most significant satellite ever launched. The STS-125 mission will return the space shuttle to the Hubble Space Telescope for one last visit before the shuttle fleet retires in 2010.

Over 11 days and five spacewalks, the shuttle Atlantis' crew made repairs and upgrades to the telescope, leaving it better than ever and ready for another five years or more of research. The shuttle Discovery launched Hubble in 1990, and released it into an orbit 304 nautical miles above the Earth. Since then it's circled Earth more than 97,000 times and provided more than 4,000 astronomers access to the stars not possible from inside Earth's atmosphere. Hubble has helped answer some of science's key questions and provided images that have awed and inspired the world.

Goals

On May 12th, 2009 STS-125 left KSC for Hubble. The 11 day mission employed seven crew members with unique disciplines to create a successful mission. Space Port Indiana™ conducted a state-wide recruiting effort to choose seven (7) 11th or 12th grade students to follow the mission from pre-launch activities to mission completion. During that time, each student picked a mission specialist to shadow. The students role is to follow the specialist and then become a "Jr. Expert" on that specialists mission

role. IMAX™ and Space Port Indiana™ then traveled to pre-determined locations state-wide to promote the team and the team members explain the mission and answer questions based on their "unique" expertise. Each student completed all outlined tasks during the STS-125 Mission project, and received a $1,000.00 scholarship to attend any Indiana college or university in fields of science, engineering or mathmatics. These Jr. Experts were able to take their message to thousands of Hoosier K-12 students and teach them the importance of the Hubble Telescope and its impact on life here on Earth. Space Port Indiana also participated in the "Indiana Space Travels" exhibit at the Indiana State Fair along with IMAX, Indiana Space Grant Consortium and the Indianapolis Challenger Center. During that time the Jr. Experts interacted with over 70,000 Hoosiers (actually counted) and taught them about the value of space exploration and that included nearly 21,000 K-12 Students.

Significance and Merit

Understanding the importance of reaching solutions to complex problems in a teaming environment is recognized by industry and government agencies. This approach gives students the chance to experience the preparation, decision process, and execution of complex tasks. The students on the team are impacted by this learning process, but at the same time, those students who hear the teams experiences can understand those processes as explained by a peer vs. a meer lecture environment. Moreover, by providing a path to financial scholarship, students can be helped to overcome, in some small way, the effects of a sluggish economy and perhaps be less likely to put off a college education. It also helps to address the brain drain by promoting an educational path utilizing an Indiana college or university. There are specific subject matter topics that are significant to space, commercial space flight and science in general. During the STS-125 project, we utilized STEM subject matter, particularly related to engineering and introduced that to the Jr Experts. Below is a logic chart depicting that pathway.

Dimension 1: Engineering Design	Declarative (Understands)	Procedural (Will be or is able to)
The following topics are the initial ideas that lead to this dimension for all Americans: • Problem-Solving National Science Standards (ITA) 9C/P. 102 and G/P. 103; Atlas of Science Literacy (Project 2061) Chapter 3; National Math Standards P. 52. • Creativity and assessment STL Chapter 5, Standard 8, P. 97, Standard 9, P. 104 • Research Abilities National Science Standards Teaching Standard C P. 37; Project 2061 P. 22; Atlas of Science Literacy P. 16-17. • Application of Engineering Design Atlas of Science Literacy P. 33-35;	**All Americans will develop an understanding of engineering design.** **All Americans will understand that:** • Engineers design and conduct experiments, as well as analyze and interpret data as it relates to product design. • Applying iteration as a part of the engineering design process. • That engineers create and evaluate alternative design solutions. • That not all problems can be solved with engineering design. • Optimal solutions depend on outcomes and perspectives. For example, engineers, funding sources, project managers, and political and others are	**All Americans will apply concepts of engineering design to solve problems.** **All Americans will:** • Apply a structured approach to solving problems including: defining a problem, brainstorming, researching and generating ideas, identifying criteria and constraints, exploring possibilities, making a model or prototype, evaluating the design using specifications, and communicating results. • Ask questions and make observations to help figure out how things work. • Learn that all products and systems are subject to failure and that many

Engineering: An Introduction for High School, Chapter 3, P. 83-112 • Reasoning Atlas of Science Literacy P. 16-17, P. 127	potential influences on outcomes or solutions. • Understand that engineering is the application of many fields of study to the problem solving process. "Atlas p 17 9-12 SFAA 3A/H4"	products and systems can be fixed. • Troubleshoot as a way of finding out why something does not work so that it can be fixed. • Analyze and break down complex systems into their component parts and explain the relationship and interdependency of the part and the system.

Dimension 2: Connecting Engineering to Science, Technology, and Mathematics	**Declarative (Understands)**	**Procedural (Will be or is able to)**
The following topics are the initial ideas that lead to this dimension: • Technological Literacy • How things work	**All Americans will develop an understanding of the essential concepts of and how to apply science, technology, and mathematics as they pertain to engineering.** **All Americans will develop the:** • Understanding of selected concepts from established science, technology, and mathematics standards. Through multiple experiences, students will: a. Understand properties of materials and how conditions affect those properties. "Atlas p29 9-12 SFAA p21" b. Understand mathematical concepts, such as, numeration, algebraic equations, and probability and estimation. "Atlas p21 6-8 2C/2" • Understanding that engineering solutions rely upon the knowledge of science, technology, and mathematics and prior results to define and provide understanding of engineering problems. "Engineering: An Introduction for High School p124" • Understand how scientific and mathematical models are used to communicate and test design ideas and processes. "Atlas p29 9-12 SAFF p21" • Understand mathematical concepts are essential to modeling. "Atlas p29 2C/2" • Understand how knowledge acquired in one context can be applied to another. "Atlas p5 6-8 1A/M2"	**All Americans will be able to apply concepts of science, technology, and mathematics to engineering processes and problems.** **All Americans will:** • Apply their knowledge of science, technology, engineering and mathematics to define, analyze, and solve problems. • Apply contemporary engineering tools in the application of science, mathematics and technology to define, analyze, model and prototype solutions to problems. • Analyze a device and explain the principals of math and science used in the design.

Dimension 3: Nature of Engineering	Declarative (Understand)	Procedural (Will be or is able to)
The following topcs are the initial ideas that lead to this dimension: • Engineering Careers • Engineering Practice Links: Atlas of Science and Literacy (3A): The Nature of Technology – Technology and Science, pp. 55-78	**All Americans will understand the characteristics and broad scope of engineering practice.** **All Americans will know that:** • Engineering is the application of knowledge of the human made world, of physical and natural science, and of mathematics for the benefit of human kind. • An engineer is a person who is trained in and uses mathematical, scientific and technological knowledge to solve practical problems. • Engineering, society, and the natural world are in relationships that influence each other over time. • Engineering has continually improved the quality of life, added business value, and significantly influenced the global economy.	**All Americans will be creative and innovative in their thought process and actions.** **All Americans will be able to:** • Use a logical process for inquiry, solving practical problems, critical thinking, and innovation. • Explain what engineers do. • Explain how engineers solve problems. • Explain the need for diversity in engineering solutions.

IMAX/ SPACE PORT INDIANA STS-125 MISSION CANDIDATE EVALUATION

Applicant Evaluation

APPLICANT INFORMATION
Candidate
Date
Grade
Interview

SELECTION RECOMMENDATION (SCALE OF 1-100 PLEASE RANK)

CANDIDATE EVALUATION	Poor	Fair	Satisfactory	Good	Excellent
Understands Requirements	☐	☐	☐	☐	☐
Related School Activities	☐	☐	☐	☐	☐
Science/Technical Aptitude	☐	☐	☐	☐	☐
Demonstrated Initiative	☐	☐	☐	☐	☐
Communication Skills	☐	☐	☐	☐	☐
Attitude	☐	☐	☐	☐	☐
Appearance/Neatness	☐	☐	☐	☐	☐

STRENGTHS
WEAKNESSES (IDENTIFY WEAKNESSES THAT COULD BE OVERCOME IN SHORT PERIOD IF ANY)
ADDITIONAL COMMENTS

Requirements for STS-125 Mission Program

Requirements:

- Student Must be enrolled in an Indiana school (or home schooled and at the equivalent level of education/grade and age) and be a junior or senior grade level in either the 2009 or 2010 school year.
- Student must be in good academic standing in school where currently registered.
- Students GPA should be 3.0 on a 4.0 scale or higher and not on academic probation when selected and throughout program.
- Student must be a minimum of 16 years of age by end of program
- Student must be a U.S. citizen, not convicted of a felony.
- Student must attend an Indiana university or college that is an affiliate of INSGC.
- Student must meet ALL requirements of program including travel and personal appearance schedules.
- Student must be neat in appearance and have any uniforms supplied by the program clean, ready and available for public appearances; shall act in a responsible, professional and courteous manner during the program; and positively represent the program during official functions and in his/her personal activities throughout its duration.
- Should the student act in any manner, harmful to the program or in a manner that would reflect poorly on his/her teammates or colleagues, that student will be removed from the program and forfeit any and all awards, scholarships, or benefits of any kind provided during or anticipated to be provided at the conclusion of the program.
- Any decisions made by the Program Manager or Principle Investigator relative to the team or team members will be final.
- Scholarship awards will be held in escrow by the Indiana Space Grant Consortium until such time as the student is accepted and enrolled in an Indiana university or college that is a member of the Indiana Space Grant Consortium. Once the student has enrolled and contacts INSGC, the proceeds of the scholarship will be sent through the college or university financial aid office to be forwarded to the student. The INSGC requires that the money go to the student and that only the student decides on the use of the money (it is specifically not to be attached by the school to pay tuition or fees).
- Student must complete any coursework in which the scholarship was applied and receive a grade of C (2.0) or higher.

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Students selected by IMAX Theater and Space Port Indiana to track May 11 NASA mission

IMAX® Theater in the Indiana State Museum prepares for 2010 opening of "Hubble 3D"

INDIANAPOLIS – Seven Hoosier high school students have been selected to earn scholarship funding by serving as "Junior Mission Experts" for the historical NASA mission STS-125, launching next Monday, May 11. IMAX Theater in the Indiana State Museum and Space Port Indiana have partnered to bring this unique opportunity to

students who will track and report on space shuttle Atlantis' STS-125 mission to the Hubble Space Station to repair the Hubble Space Telescope. Aboard the mission will be IMAX 3D cameras to document footage for "Hubble 3D," opening in spring 2010.

The following students have been selected to participate and receive a $1,000 scholarship:

- Alex Hearn, Park Tudor School (Indianapolis, Ind.)
- Sarah St. Clair, Avon High School (Avon, Ind.)
- Andrea Arffa, Danville Community High School (Danville, Ind.)
- Mathew Altepeter, Jefferson High School (Lafayette, Ind.)
- Alan Pena, Highland High School (Highland, Ind.)
- Anna Keibler, The Indiana Academy for Science, Mathematics and Humanities (Muncie, Ind.)
- Jerad Kendall, Columbus East High School (Columbus, Ind.)

"Students will each be assigned an astronaut to follow throughout the 11-day mission, and they'll also be responsible for subsequent research," said Dave Brown, theater director at the IMAX Theater in the Indiana State Museum. "The students will have the chance to present their findings to the public during Space Port Indiana's summer space camps and at the Space Travels Exhibit at the 2009 Indiana State Fair. They'll also help us launch 'Hubble 3D' next year."

While students are tracking the mission from Earth, astronauts aboard the shuttle will operate IMAX cameras and film the five intricate and difficult spacewalks required to service Hubble. The shuttle's commander and pilot will double as filmmakers and perform, with two teams of spacewalking astronauts, some of the most challenging work ever undertaken in space as they replace and refurbish many of the telescope's delicate precision instruments. "Hubble 3D" will combine the footage taken during the repair mission with breathtaking, up-close images captured by the Hubble telescope.

Scholarship funding for the Junior Mission Experts program is provided by the NASA-funded Indiana Space Grant Consortium.

To learn more about the Junior Mission Experts initiative and "Hubble 3D," visit www.ImaxIndy.com.

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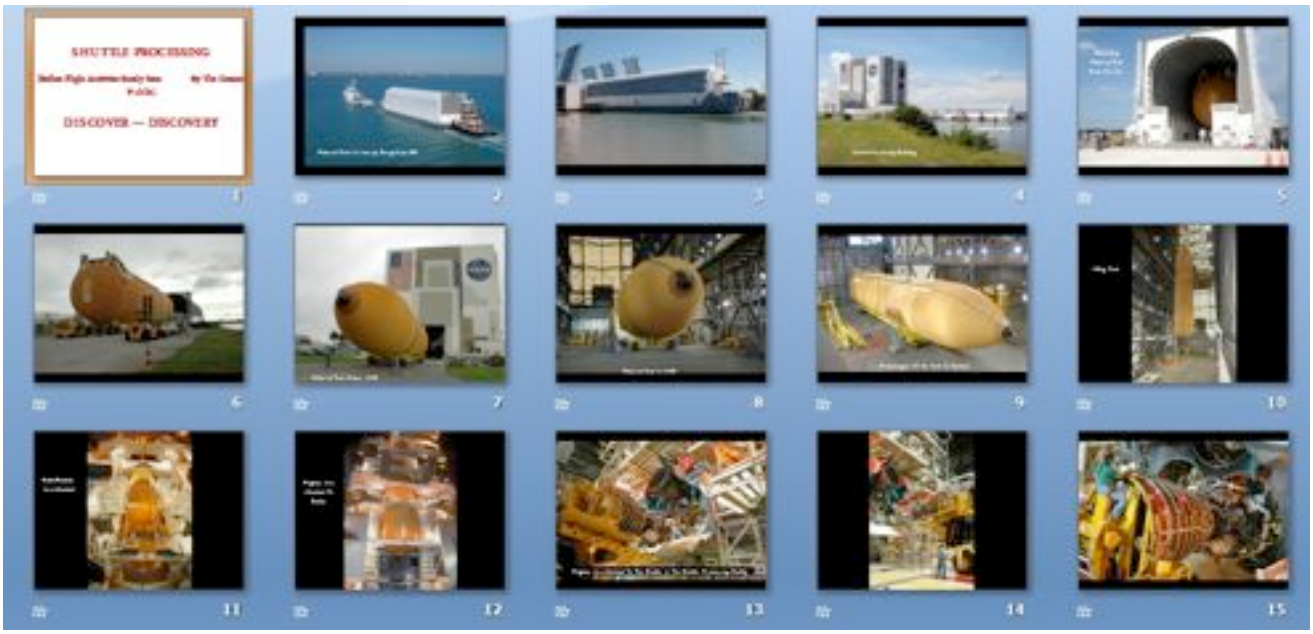
About IMAX Theater in the Indiana State Museum
IMAX® Theater in the Indiana State Museum offers entertaining and educational 2D and 3D films on a screen six stories tall and 84 feet wide, the largest movie screen in the state. Part of the White River State Park in downtown Indianapolis, IMAX Theater delivers the ultimate cinema experience to moviegoers with 12,000 watts of digital surround sound. Using state-of-the-art technology, the IMAX Theater experience gives viewers a unique, larger-than-life way to go to the movies.

About Space Port Indiana, Inc.

Space Port Indiana™, Inc. – Columbus, Indiana - provides educational, commercial and military customers with a facility to test and integrate advanced technologies. The converted former airport in Columbus, Indiana engineers balloon launches and rocket launches with commercial payloads and conducts other testing. Space Port Indiana is an affiliate member of the NASA funded Indiana Space Grant Consortium and hosts educational space camps for youth during summer months through the Indiana Space & Science Foundation, Inc., its not for profit organization.

A number of NASA, Space Port Indiana and IMAX resources were used in order to support the students' research during the project. This image shows the NASA STS-125 sim program that was available at www.nasa.gov. This program shows several EVAs and the actualu voices of mission specialists during the activities. This helped the Jr Experts understand the complexity of the activity in weightlessness. Space Port Indiana also conducted high altitude balloon launches with the students so that they could understand harsh environments and how to prepare for equipment and personnel exposure to space. Jr. Experts took there information on the road and gave lectures to teachers at Raytheon Net Centric Systems in Ft Wayne Indiana during a teacher workshop for NE Indiana, The Indiana State Fair, The Indiana State Museum, and Indianaplolis Challenger Center to name a few. They also gave presentations to Astronaut Mark Brown in August 2009. The final piece is the release of Hubble 3D which was a fantastic filming aboard the Shuttle during STS-125. NASA and IMAX developed new high speed right eye/left eye cameras to capture the amazing images aboard the shuttle and the Hubble repair. On March 17th 2010, Hubble 3D will release at te IMAX Theatre at the Indiana State Museum to a crowd of 300 Teachers and NASA VIPs. This pre-release event will allow the Jr. Experts one last chance to display their knowledge of the mission and inspire teachers to get students more involved with these activities.

Students used powerpoint presentations as well as the STS-125 simulator at events in order to demonstrate their knowledge the following is a sample powerpoint they used to describe shuttle launch preparation for STS 125.


SHUTTLE PROCESSING
DISCOVER — DISCOVERY