

Have Spacesuit Will Travel

Program Summary for 2011



Lady Gaga inspired spacesuit design by ninth grade student at North County High School in Glen Burnie, Maryland.

Prepared by Don Thomas

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Have Spacesuit Will Travel

2011 Program Summary

During 2011 the Heinlein Prize Trust together with Dr. Don Thomas at Towson University presented the *Have Spacesuit Will Travel* program at three different public schools across Maryland. These schools included:

Fallston Middle School (Harford County Public Schools)
2303 Carrs Mill Road
Fallston, Maryland 21047

North County High School (Anne Arundel County Public Schools)
10 1st Avenue E.
Glen Burnie, Maryland 21061

South River High School (Anne Arundel County Public Schools)
201 Central Avenue E.
Edgewater, Maryland 21037



North County High School and South River High School participated in the **HSWT** program previously in 2009 and 2010. Both of these schools are STEM (Science, Technology, Engineering, and Mathematics) magnet schools with rigorous science and math programs and curriculum designed to attract the best students into STEM and to prepare them for college entry and technical careers in the future.

In 2011 the ***Have Spacesuit Will Travel*** program was expanded to a new school, Fallston Middle School, located in Harford County, Maryland. This area is seeing huge growth in high technology companies due to the expanded role that the U.S. Army Aberdeen Proving Ground installation is playing resulting from the recent Congressionally mandated base realignments and closures (BRAC). STEM programs are gaining increased attention and priority as the public schools are working to better prepare their students for the high technology jobs that currently exist and will continue to grow in this region of Maryland.

A total of 250 students participated in the program from these three schools in 2011, reading Robert Heinlein's book ***Have Spacesuit Will Travel*** and completing various technology development and art projects as part of the program. With the previous 204 students that participated in **HSWT** in 2009, and the 232 students in 2010, the total student participation in ***Have Spacesuit Will Travel*** for 2009-2011 has grown to 686 students.

During its inaugural year in 2009, **HSWT** was such a big hit at North County and South River High Schools that both schools were anxious for us to repeat the program for them with their incoming freshman class in 2010, once again in 2011, and are looking forward to repeating it again in 2012. To illustrate the impact that **HSWT** has had, South River High School has made it one of their signature programs that they use to promote their STEM program and recruit incoming freshmen to their STEM magnet school.



A wall-sized display of their signature STEM programs at South River High School prominently features ***Have Spacesuit Will Travel*** as one of their project based learning activities.

Preliminary Planning Meetings

Before the programs were started preliminary planning meetings were held with each of the schools to discuss the program details and plan out schedules for the school year. Even though this was the third year running these programs at North County and South River High Schools, both schools had new teachers involved in the program which necessitated the additional planning and preparation meetings. One of the sixth grade teachers at Fallston Middle School expressed interest in **HSWT** and in March 2010 I met with her and other science teachers at the school to discuss the program, present various options, and help work out a schedule with the school. It was decided to run the program as an after-school activity, as a sort of science related book club. It was decided to limit the program to about 25 students.

Fallston Middle School

On April 1, 2011 Dr. Don Thomas returned to Fallston Middle School and presented a program on spacesuit technology and what it is like to live and work in space to the entire 6th grade class of 250 students. The *Have Spacesuit Will Travel* book and program were explained to them and they were offered a chance to participate as part of an after-school Book Club program. As an added incentive and to generate interest in the program, the Sokol spacesuit was shown and explained to them followed by one of their teachers trying on the suit. This turned out to be wildly popular and a big hit with the students that day!



Fallston Middle School science teacher tries on the Sokol spacesuit at sixth grade assembly to generate interest and enthusiasm for the *Have Spacesuit Will Travel*

Interested students applied for participation in **HSWT** and their teachers selected 23 of them for the program. Books were purchased by the school and the students began reading the book and sharing their thoughts and having on-line discussions on a specially set up web-site called **Edmoto**, a secure social learning network for students and teachers. Students also began working on various spacesuit-related projects inspired from their reading. Their assignment for their projects was to design some improvements for the current generation of spacesuits.

On May 17, 2011 Dr. Thomas returned to Fallston Middle School and spent time reviewing the various student projects after which 14 of the students were allowed to try on the Sokol spacesuit. As nearly every student was interested in getting into the suit, a return visit was planned which would permit the others to enjoy this once-in-a-lifetime experience.

On June 8, 2011 Dr. Thomas returned for their Spacesuit Project Fair and HSWT Awards Ceremony. Parents and school officials were invited to review the various spacesuit projects the students had worked on and saw first-hand some of their students trying on the Sokol spacesuit which generated great excitement once again. Afterwards **HSWT** program participation certificates were passed out along with awards (1st, 2nd and 3rd place) for the top three projects as voted by their teachers. Cake and refreshments followed.

One of the students came up with a new suit design called *Space Suit Alpha Beta*. This suit featured the following improvements:

Suit was made from a new type of fabric that could absorb sunlight and distribute the heat throughout your body.

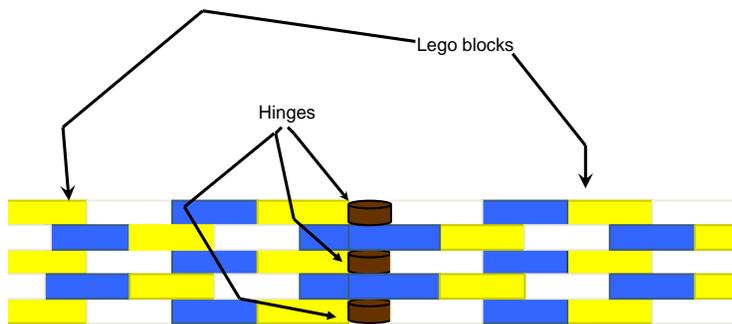
Featured a new CO₂ removal system where exhaled air passes through a small plant chamber in the suit that absorbs the CO₂.

The helmet featured lights that are more flexible to improve illumination when working in the dark.

Another student designed the suit to be made out of a spandex-type of material that would greatly improve the suit flexibility and another designed a new joint for the suit.

My Improved Space Suit Joint

(basic model not to scale)



One of the 6th grade students designed a new joint to make the spacesuit for flexible. He assembled a proto-type of the joint using Lego blocks.



Sixth grade science teacher Liz Blackwell (left) poses with one of her students who participated in the *Have Spacesuit Will Travel* program.





Sixth grade students from Fallston Middle School who participated in the *Have Spacesuit Will Travel* program in 2011.





Example of award certificate presented to students participating in *Have Spacesuit Will Travel* at Fallston Middle School.

South River High School

Have Spacesuit Will Travel was a summer reading requirement for the 125 incoming freshmen into the STEM program at South River High School which was coordinated by two new teachers this year, Sue Corby, a STEM English teacher and Rob Rice, the Earth Sciences teacher. Having already read the book over the summer, the students were more than ready for the Sokol suit to arrive at their school.

On September 19 and 20, Dr. Don Thomas brought the Sokol suit and met with four different classes of students. For each class the students were given the PowerPoint presentation on the background of spacesuits, describing their function, the various components that make up a spacesuit, and explaining the different types of spacesuits. An additional presentation on living and working in space was followed by a questions and answer session. Then 3-4 of the students in each class were given the opportunity to try on the Sokol. At this point the students began their projects associated with **HSWT**.

The project the students were assigned to work on for the **HSWT** program was called **Moon Missions** and involved the students working in groups or individually to design a lunar habitat that could sustain 6 astronauts for a 3 week stay on the moon.

On October 31 and November 3, Dr. Thomas returned to hear their oral presentations on their lunar habitat designs. There was a wide range of ideas presented, some very practical like building a geodesic dome made from titanium structure and solar cell paneling. Other design features were more futuristic with strong Heinlein and science fiction influences like one that incorporated "zombie protection" for the astronauts. Some of the many other ideas presented included:

Interior color schemes that utilized “Earth colors” - to remind the astronauts of their home planet, including wood flooring and green tiles.

Trees inside the habitat for both privacy and oxygen generation

Construction using a waterless concrete system called “sulfur concrete”

Alternative energy sources that convert algae into oil.

Five pyramid design featuring a central living area with all modules connected by tunnels.

Specially designed “bio-walls” that could filter out carbon dioxide and provide fresh oxygen for the astronauts.



At South River High School students were photographed in front of a green board with a lunar scene later added to the background (next page).



Earth Sciences teacher Rob Rice and 9th grade student in the STEM program at South River High School check out a Russian spacesuit as part of the *Have Spacesuit Will Travel* program.

North County High School

This year the **HSWT** student projects were associated with their freshman STEM art class led by Mr. Jim Dell. After seeing the presentation on spacesuit on October 27 and 29, students read an article about future spacesuit designs and then had to come up with their own futuristic design. The students were asked to draw initial sketches and then create a final drawing of their new spacesuit using basic forms and color. In their designs the students were asked to address the following five issues:

- Mobility**
- Pressurized environment**
- Visibility**
- The ability to manipulate the environment**
- Robotic enhancements**

In their projects the students were asked to add their own creative improvements to existing spacesuit designs and to be futuristic!

On November 9 and 10, Dr. Don Thomas returned to their school where each of the students presented their spacesuit design after which Dr. Thomas was able to ask questions about them, to comment about their ideas, and to offer advice on future designs.

The designs were quite varied with some of the students focusing on the development of new exploration mobility aids while others focused on the design of spacesuits. Some of the design features the students came up with included the following:

Helmets that expel CO₂ directly as the astronaut exhales.

Suits covered with flexible solar cells to minimize weight of batteries.

ipods and earphones built into the helmet for entertainment.

Puncture resistant gloves.

Robotically enhanced appendages to assist the astronaut operating inside the suit.

Transition glass in the helmet to eliminate the need for sun visors.

Heads-up displays inside the helmet.

Of particular note was the variety of feminine designs in the spacesuits created by some of the young women in the classes (shown on page 17). Some of these designs included the following features:

Glamorized helmet and neck expanders.

Pressurized fashionable space leggings to increase mobility and flexibility.





Even for those students who do not get the opportunity to try on the spacesuit themselves, it is still a fun experience!



North Country High School 9th graders pose with fellow student wearing Alexander Kaleri's Sokol spacesuit during the *Have Spacesuit Will Travel* program on October 27, 2011.



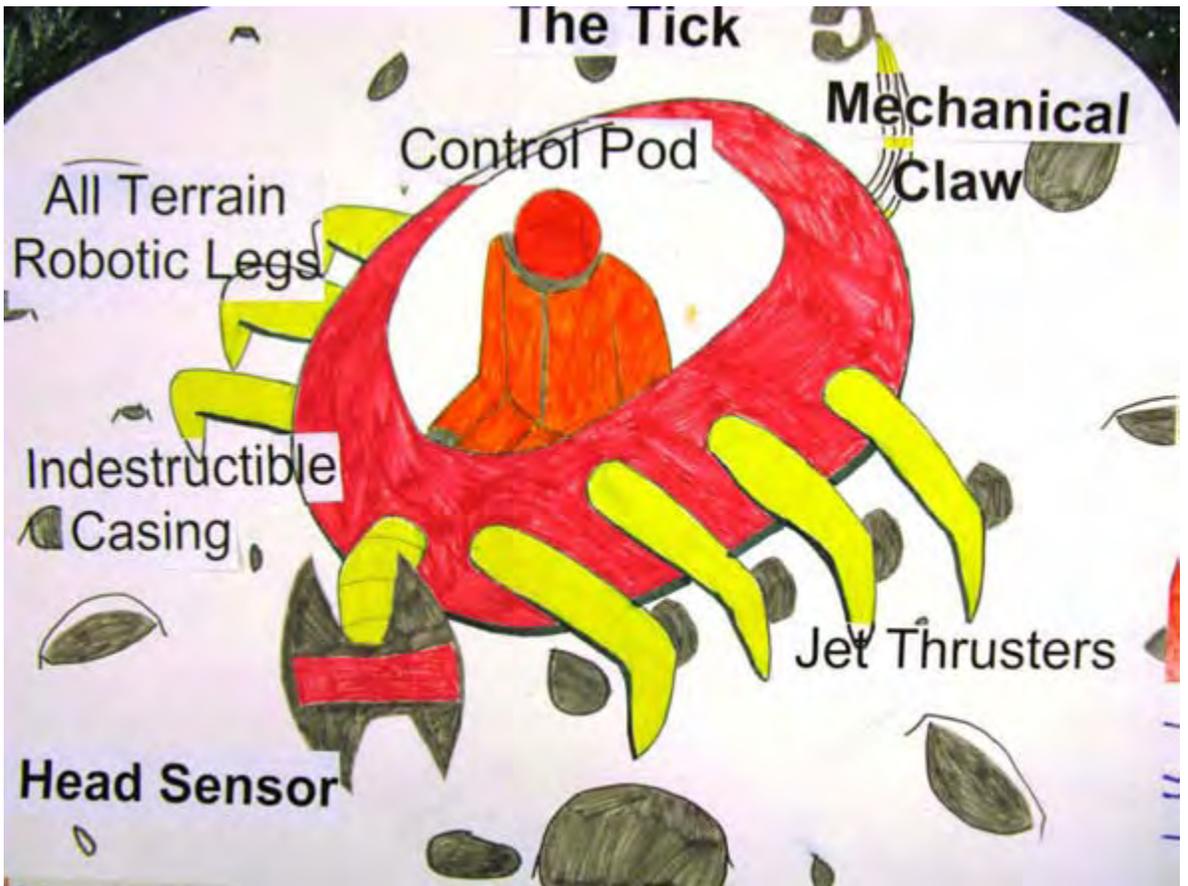
Students experience first-hand what it is like to be inside a spacesuit.



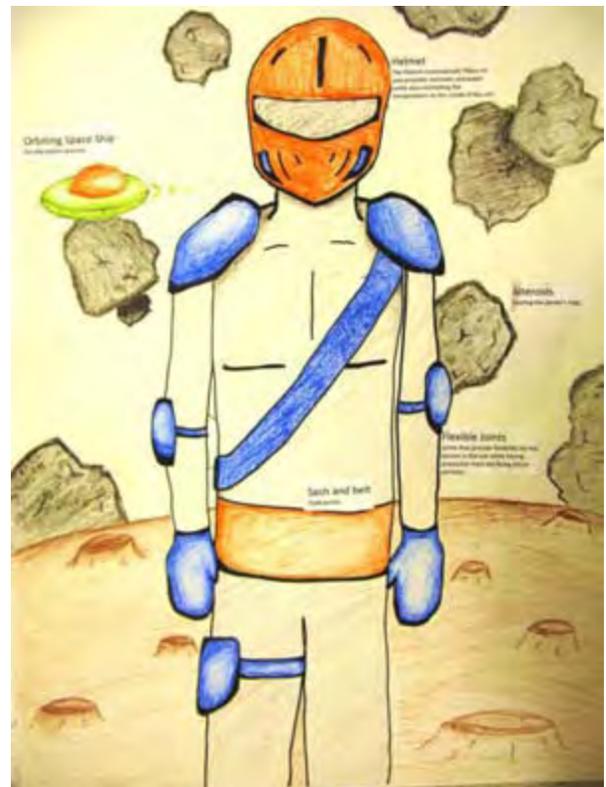
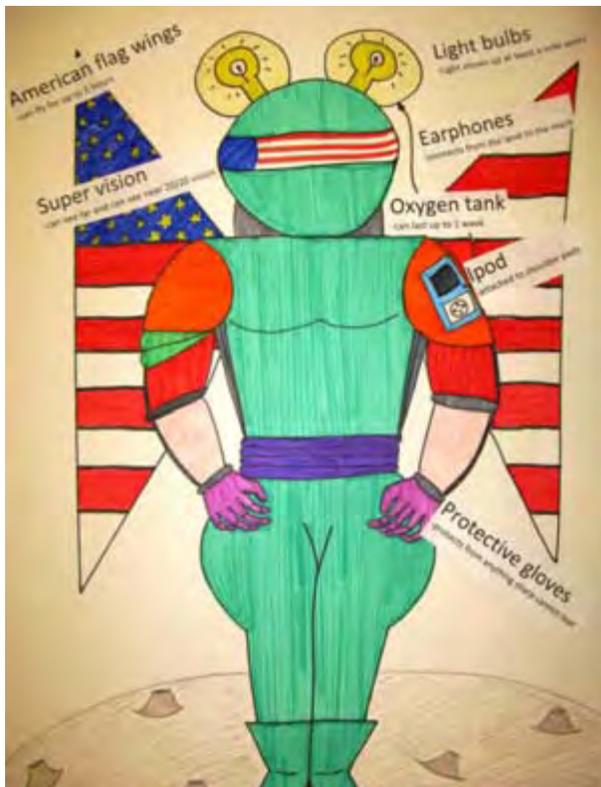
Student poses with NASA astronaut Dr. Don Thomas after successfully getting into the Sokol spacesuit.



Have Spacesuit Will Travel. The smile says it all !



Some of the student projects focused on designing advanced transportation systems to give the astronauts more mobility on foreign planets.



Some of the student projects focused on futuristic advanced spacesuit designs with improved mobility, visibility, and comfort over the current generation of spacesuits.



Some of the young women choose to design spacesuits that would be more appealing to female astronauts as illustrated in these project designs.

Summary of 2011 Activities

Three public schools in Maryland participated in the **Have Spacesuit Will Travel** program in 2011 involving a total of 250 students. Together with the students that participated from 2009 and 2010, **686 students have participated in HSWT to date.**

The excitement that the **Have Spacesuit Will Travel** program generates with the students is difficult to put into words but hopefully some of that excitement has been captured in the pictures presented in this report. Just one indication of their enthusiasm was the numerous pictures of themselves and their classmates in the Sokol suit that were posted on their FaceBook pages the very next day! The students really appreciate what a unique opportunity it is for them to get inside a Sokol spacesuit that has actually flown in space!

Besides being a lot of fun, the **HSWT** experience exposes the students to new technologies that are used in both spacesuits and spacecrafts, and provides them with an opportunity to look into the future and envision the space travel that may be possible within their lifetimes. The program also lets the students develop more of their creative talents with both their oral presentations and the drawings of the Sokol spacesuit that they do in their art classes. The presentations in front of their classmates, teacher, and an outside visitor are valuable skills that they will surely use in the future in whatever career field they enter.

Teacher Comments and Evaluation

In order to improve the **HSWT** program, debriefings were conducted with the participating teachers at the conclusion of the program. Overall the teachers were very positive about the **HSWT** program. There was a suggestion to provide a handout with fun facts about spacesuits and/or a worksheet that the students could use to fill in information during the spacesuit presentation to help increase what the students retain. Another teacher suggested we add a few mathematical equations and thought a job-shadow program at the NASA Goddard Spaceflight Center would be a valuable experience and help tie in the real world of science and engineering. Some of the other comments they shared during debriefing are as follows:

“The spacesuit is a must. The students love to put it on and they love seeing their pictures on the walls with them “on the moon.”

“I thought the HSWT program was very effective. When we start the year we are working with a variety of students and we are trying to get “buy in”. The spacesuit and the astronaut experience are truly stimulating for these incoming 9th graders. The real life experiences and stories help create a picture that these students can relate to.”

Recommendations

One of the biggest challenges for the **Have Spacesuit Will Travel** program is teacher continuity. For most of the schools that have participated, dedicated teachers are the key to having the program succeed and this support is vital for program continuity from year to year. When teachers leave the school, are re-assigned, or get promoted, the new incoming teacher must be interested in the project to keep it going which is not always the case. We have been exceedingly fortunate in that the Anne Arundel County Public School System has committed to

HSWT and even when new teachers are brought into their STEM program, **HSWT** has continued with their full support.

Fallston Middle School was an enthusiastic participant in the program in 2011 but will most likely not participate in 2012 as the teacher running the program has recently gone out on maternity leave. She is committed to returning to teaching next year so I fully expect the program to resume there in 2013. Unfortunately no other teacher has yet stepped forward to lead the program in 2012.

I believe we will find the most interest in **HSWT** at STEM magnet schools and possibly private schools that are looking for enrichment activities and programs. I strongly recommend that the schools be within easy reach of either Leroy Chiao or Don Thomas, as an astronaut visit and assistance with the suit is critical to the success of the program. We should also continue to work with the local press to expand our coverage of the program.

Future Plans

Overall the teachers and students have had nothing but high praise for the **HSWT** program. Both North County and South River High Schools have already indicated that they would like to continue the program in 2012 and are planning once again on making **HSWT** an integral part of the reading assignment for next year's incoming freshmen students in their STEM program.

An exciting new opportunity for 2012 is the involvement of a public library in the program. The Enoch Pratt Free Library (Southeast Anchor branch) located in the City of Baltimore will be participating in the program partnering with a neighboring school, the St. Casimir Catholic School. The library will be purchasing copies of Heinlein's book and providing them at no cost to the students. On January 23, 2012 a planning meeting was held where the schedule for the program was established. On March 27, 2012 the students will meet with Dr. Thomas to hear his presentation on spacesuit technology which will be followed by 3-4 students trying on the spacesuit. On May 1, 2012 Dr. Thomas will return to review the student projects with a few additional students trying on the spacesuit. The press, school officials, and area politicians and business leaders will be invited to review the projects as well.

Acknowledgements

I would like to thank **The Heinlein Prize Trust** for making the Sokol spacesuit available and Art Dula, Buckner Hightower, and Leroy Chiao for their leadership and active involvement in the **HSWT** program. *Have Spacesuit Will Travel* helps provide a unique and invaluable learning experience for these students, who represent our country's next generation of explorers.

