

Have Spacesuit Will Travel

Program Summary for 2010



Heinlein inspired artwork by a 9th grade student from North County High School participating in *Have Spacesuit Will Travel*.

**Prepared by Don Thomas
December 29, 2010**

Have Spacesuit Will Travel

2010 Program Summary

During 2010 the Heinlein Prize Trust together with Dr. Don Thomas at Towson University conducted the *Have Spacesuit Will Travel* program at four different public schools across Maryland. These schools included:

Perryville Middle School (Cecil County Public Schools)

850 Aiken Avenue
Perryville, Maryland 21903

North County High School (Anne Arundel County Public Schools)

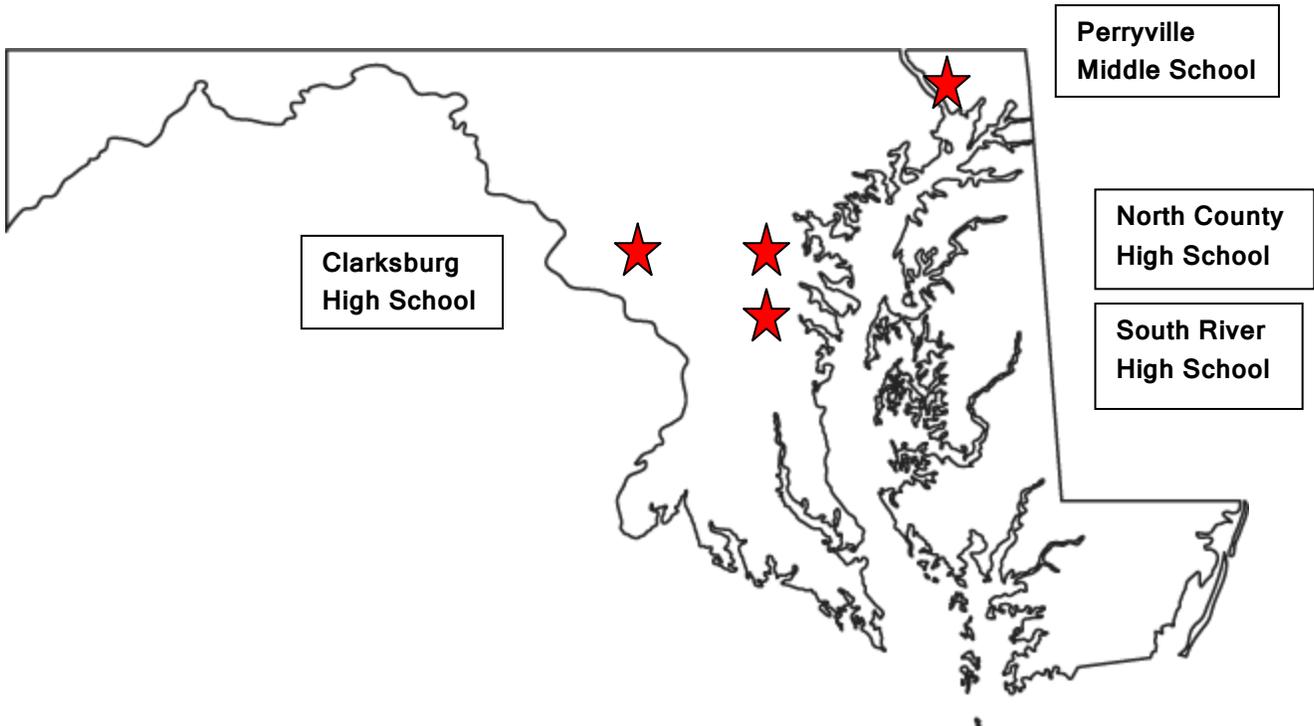
10 1st Avenue E.
Glen Burnie, Maryland 21061

South River High School (Anne Arundel County Public Schools)

201 Central Avenue E.
Edgewater, Maryland 21037

Clarksburg High School (Montgomery County Public Schools)

22500 Wims Road
Clarksburg, Maryland 20871



North County High School and South River High School participated in the **HSWT** program previously in 2009. 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 2010 the ***Have Spacesuit Will Travel*** program was expanded to include two new schools, Perrysville Middle School and Clarksburg High School. Perryville Middle School is situated in the northeast corner of Maryland in a region currently developing into a high-tech corridor with many laboratories and businesses supported the expansion of the Aberdeen Proving Ground Army installation. STEM programs are gaining increased attention and priority as the public schools are working to better prepare their students for high technology jobs that currently exist and will continue to grow in this region of Maryland.

Clarksburg High School is situated in the northern suburbs of Washington, D.C., and like many schools across the state of Maryland is working to expand its STEM programs.

A total of 232 students participated in the program from these four schools in 2010, 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, the total student participation in ***Have Spacesuit Will Travel*** for 2009-2010 is 436.

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. 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 year. In 2009 Towson University's Hackerman Academy of Mathematics and Science donated \$1000 towards the purchase of 250 copies of *Have Spacesuit Will Travel* which were retained by the schools and reused for the 2010 programs. Towson University also purchased 25 additional copies of the book for the inaugural program at Perrysville Middle School. It is planned that these books will be re-used with new students in 2011.

Perrysville Middle School Visit

In January 2010 twenty five copies of *Have Spacesuit Will Travel* were delivered to Perrysville Middle School and passed out to the 8th grade students selected to participate in the program. Over the next two months the students read the book and began working on their projects which involved creating an advertisement to help sell a new space-themed product influenced by their experience of reading *Have Spacesuit Will Travel*.

On May 17, 2010 Dr. Don Thomas brought the Sokol spacesuit to Perrysville Middle School which created great excitement throughout the school. We started off the program with a 15 minute presentation on spacesuits which discussed the purpose, types, and components of spacesuits. This PowerPoint presentation gives them more technical information about spacesuits and covers why they are such a critical component for astronauts in space. A second presentation followed lasting 30 minutes that then covered what it is like to live and work in space. This presentation helps put into context what it is like in space and makes it real for the students.

Following the two presentations and a question and answer session, eight of the students were selected and given an opportunity to try on the Sokol spacesuit provided by the Heinlein Prize Trust. This activity always proves to be one of the highlights of the program for the students. After reading about Kip's adventures in his own spacesuit in his own backyard on Earth, then on the moon and Pluto and beyond, the students are thrilled to experience what it is really like inside a real spacesuit that was actually flown in space!

While the student is assisted into the spacesuit, the rest of the class watches in awe with excitement definitely filling the room. Pictures are taken of each of the students in the suit which are later sent to the school. While not every student can try on the suit, it is available for them to touch and to see up close which is an important part of the program in that it makes it a very real hands-on experience for them. Two additional sets of Sokol space gloves are passed around for the other students to try on so that everyone can get the first-hand experience of what it is like to work inside a spacesuit or to work with space gloves on.

Besides the 25 students that participated that day, 7 or 8 teachers also were intrigued and stayed for the entire program. The teachers got as excited about the program as the students with many wishing they could get into the suit themselves.

The local press was notified and invited to attend. On May 18, 2010 the following story was printed in the Cecil Whig, the main newspaper in the area:

Astronaut fulfills promise, brings spacesuit to middle school

By Jacob Owens, Cecil Whig newspaper, May 18, 2010

Some of Perryville Middle School's most gifted students got to climb inside history Monday morning.

Each of the students took turns trying on a Russian Sokol KV-2 spacesuit that former astronaut Don Thomas borrowed from the Heinlein Prize Trust, a foundation set up in the name of famed science fiction writer Robert A. Heinlein.

Originally worn by cosmonaut Alexander Kaleri, the spacesuit spent more than 196 days in space and traveled some 85 million miles.

During a visit to the school last year, Thomas, who served on four missions aboard the Columbia and Discovery space shuttles between 1994 and 1997, urged students in the middle school's Challenge Program to read Heinlein's "Have Spacesuit Will Travel" and put together a presentation on the novel.

If they met his request, Thomas vowed to return with a space suit for them to try on.

Since then, the students read the novel on their own time and collaborated in groups to design improvements to a spacesuit, Principal Joe Buckley said.

They then put together displays for their inventions such as a space watch that keeps track of oxygen levels, temperature, time and other measurements, and the air tight and flexible insulation "Aerogel."

"These students really took on this project on their own time and worked to get it done," Buckley said. "They earned a bit of time with a really cool part of history."

The suit Thomas brought for the students to try on was made of a thick exterior layer of canvas and an interior layer made of a rubber-like material.

An astronaut would climb into the interior layer and roll up the rubber layer up before securing it with a rubber band to create an airtight seal, Thomas said.

"There are actually two different types of space suits, one for inside the spacecraft to protect an astronaut in case of a cabin leak and one for use outside the spacecraft on space walks," Thomas said.

The suits were made to protect astronauts from four different threats, including the vacuum of outer space, which would deplete an astronaut's oxygen, the temperature of outer space, which can fluctuate between minus 250 and 250 degrees, and radiation, both solar and cosmic.

"Suits used on space walks also need to protect astronauts from micrometeorites, which is like a BB traveling at 18,000 mph," Thomas said. "Getting hit by one can cause big damage if it tears a hole in the suit."

He also demonstrated the different life support systems the suits provided to astronaut, including providing oxygen and dispelling carbon dioxide, regulating temperature, as well as food and drink.

"If you happen to have to go to the bathroom during take-off or re-entry, you basically have an adult diaper, so plan accordingly," Thomas said.

Eighth-grader Richard Engelberth was the first to try on the spacesuit and test its mobility with a few dance moves.

"It was tough getting in and out of the suit," the 14-year-old said. "You definitely need two people to do it. It was hard to move in, too, which makes it hard to believe they can wear it for hours on end."

While Thomas said he does miss his NASA career, he added that his new occupation also is deeply rewarding because he gets to talk with young people about the importance of science.

"When I was 6 years old, I watched Alan Shepard," Thomas said, referring to the first American in space. "Ever since that moment, I knew I wanted to be an astronaut."



CECIL WHIG PHOTO BY MATT GIVEN

Former NASA astronaut Don Thomas helps Perryville Middle School eighth grader Desaree Osborne put on a space suit Monday once worn by Soviet cosmonaut Alexander Kaleril.



Above:
Students listen to a presentation about spacesuits discussing the function, components, and different types of spacesuits that are used.



Left:
An 8th grade student at Perrysville Middle School tries on the Sokol spacesuit



Student describes to the rest of her classmates what it feels like inside the spacesuit.

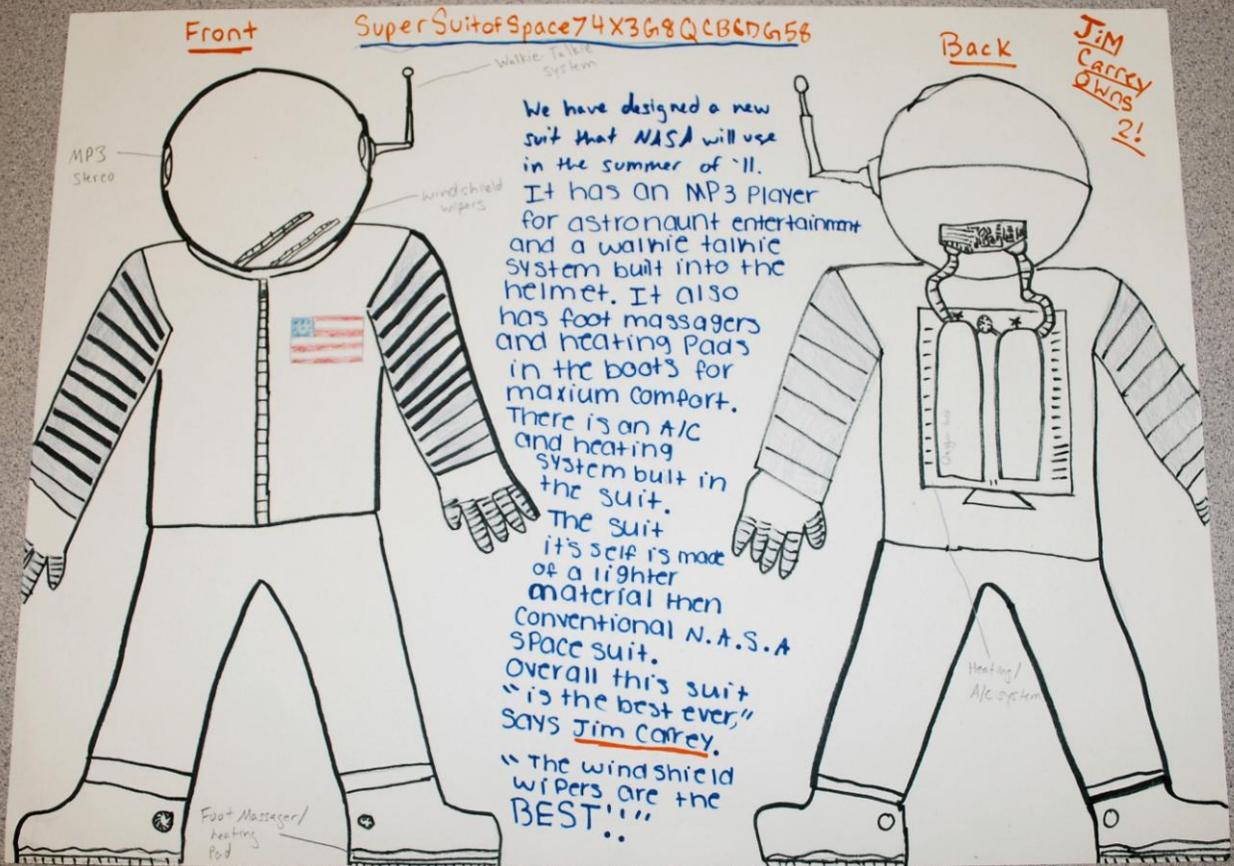


Eight students from Perrysville Middle School who tried on the Sokol spacesuit pose with astronaut Don Thomas.

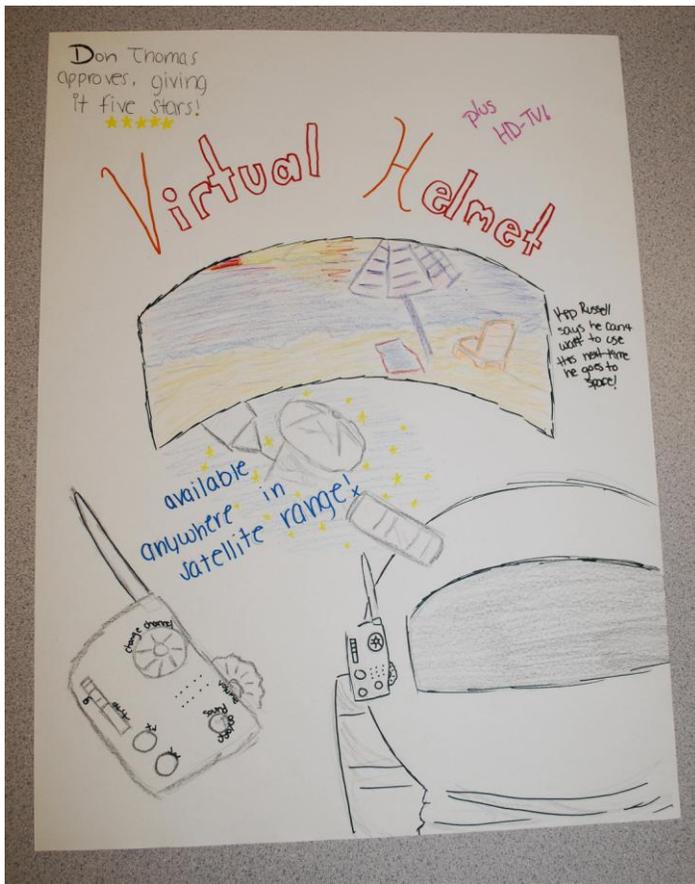
The Satellite Phone



Buy this satellite built-in phone. Many astronauts have gone into space and missed their families. But that ends now. Our phone will let you communicate with anyone on Earth. You will never have to charge this phone so you don't need to worry about low battery. Since its built-in, you can't lose it! Jump on the bandwagon—everyone needs this!



8th grade student projects at Perrysville Middle School involved developing an advertisement of some HSWT influenced space-based product.



Perryville Middle School student project:

***Virtual Helmet* features a heads-up display that would allow astronauts in the future to visualize themselves on a beach back on their home planet!**

Perryville Middle School principal Joe Buckley (right) and Cecil County Public Schools Science Supervisor Frank Cardo pose with one of the students who got to experience the Sokol spacesuit.



North County High School Visits

Have Spacesuit Will Travel was a summer reading requirement for the 77 incoming freshmen into the STEM program at North County High School which was coordinated by Joann Brack. So having already read the book, the students were more than ready for the Sokol suit to arrive at their school.

On September 7 and 8, Dr. Don Thomas brought the Sokol suit and met with three 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 was followed by a questions and answer session. Then 5-8 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.



10th grade STEM teacher Joanne Brack (left) assists one of her students into the Sokol spacesuit at North County High School.



Left:
The final glove is attached
as Don Thomas explains
the wrist joint and seals.

Below:
Physics teacher Kevin Mann (right)
along with other teachers from
North County High School pose with
one of their students.



This year the HSWT student projects were associated with their freshman physics class led by Mr. Kevin Mann. In the beginning of *Have Spacesuit Will Travel*, Kipp makes many repairs to the suit to make it operational and throughout the book explanations are given for why the spacesuit was designed in certain ways. The students were assigned to create a presentation describing various technical components of the Sokol spacesuit and/or to create some innovations to the suit. The students worked in teams of two and each team's presentation was required to cover two different components of the suit.

On October 22 and 23, Dr. Don Thomas returned to their school where each of the teams presented their designs after which Dr. Thomas was able to ask questions about them, and to comment about their ideas, and offer advice on future designs.

The students presented on a wide range of concepts which included:

Rebreathers for scrubbing carbon dioxide

Improved spacesuit joints for greater mobility

Helmet cameras

Gyro sensor belt for navigation on a foreign planet

Magnetic shoes

New outer layer spacesuit material with greater strength

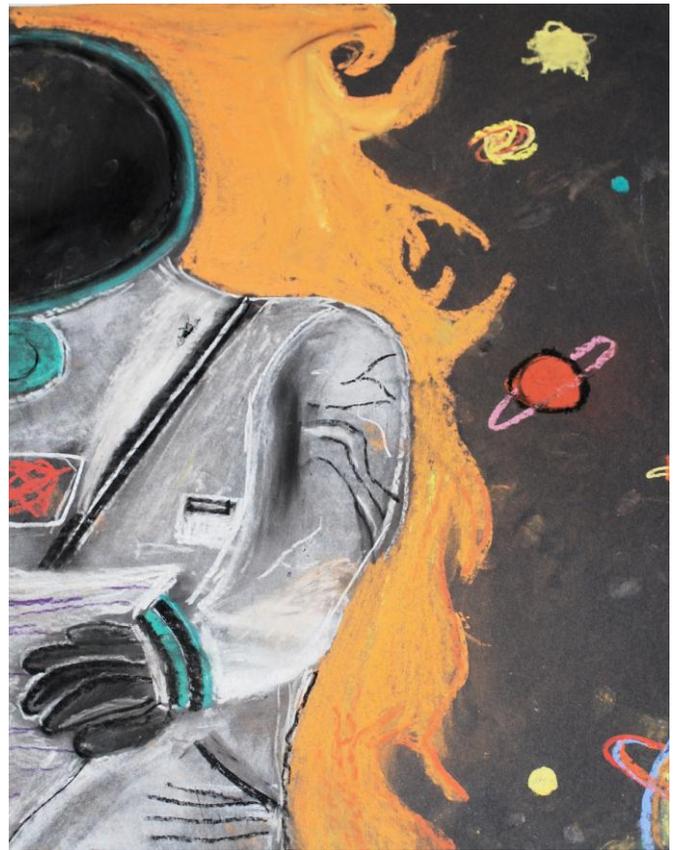
Rocket packs for planetary exploration

Through their presentations the students showed excellent understanding of spacesuit technology, design, and shortcomings in the current generation of suits.

Additionally each of the students made a chalk drawing of the Sokol suit in their STEM-based art class. This project had the students draw the Sokol spacesuit from observation with directional lighting and then add an imagined background from outer space based on ideas or influences from reading *Have Spacesuit Will Travel*. The media used for this was colored chalk on black paper.



North County High School student's Heinlein inspired artwork using colored chalk on black paper.



Heinlein inspired artwork by North County High School students participating in HSWT program.

South River High School Visits

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 Debie Lesko . 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 13 and 15, Dr. Don Thomas brought the Sokol suit and met with three different classes of students. For each class the students were given the PowerPoint presentation on the background of spacesuits, a follow-up presentation on living and working in space followed by a Q&A session. Then 5-8 of the students in each class were given the opportunity to try on the Sokol. Following these visits students began their projects associated with HSWT.

On October 6 and 7, Dr. Thomas returned to hear their presentations on future space technology developments that would serve exploration. Again there was a wide range of ideas presented, some very practical like using solar cells as a portable power source and others with a strong science fiction theme to them like the development of a StarGate for spacetravel.

Some of the ideas presented included:

An in-suit back massager to increase astronaut comfort in the suit

Spacesuits made out of lighter weight carbon fibers

A prosthetic hand for the suit for improved dexterity

Portable in-suit radar system

Rocket cannons to intercept incoming meteors

Lunar cars

Spaceball exercise court

Water bed that compresses around the body while sleeping

Spacesuit glove with special attachment tools at the fingertips



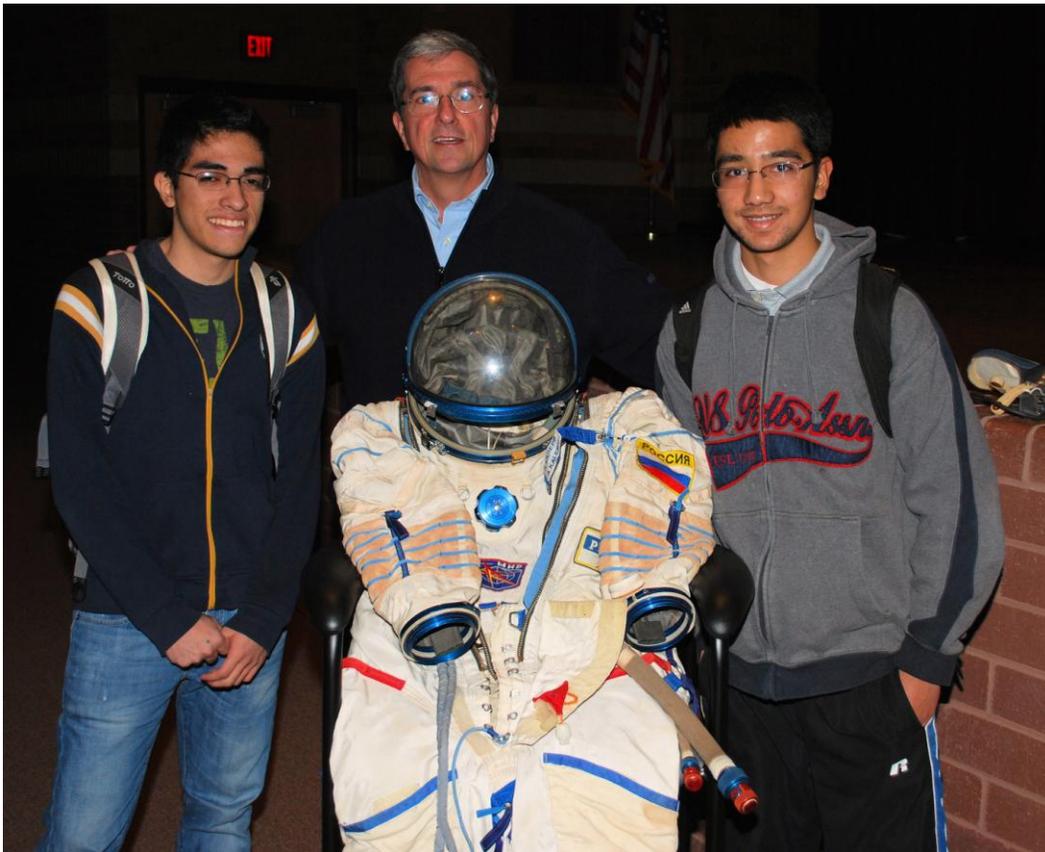


South River High School students enjoying their spacesuit experience.

Clarksburg High School Visit

This was the first year for Clarksburg High School to participate and they made participation in the **HSWT** program voluntary. Five students signed up for the program and read *Have Spacesuit Will Travel* on their own time and met after school a few times to discuss the book. On December 3, Dr. Thomas visited Clarksburg High School and spoke with 125 advanced placement (AP) physics students that included the five participants in **HSWT** about spacesuits and living in space. Afterwards a special session was held with the 5 participants to allow them to examine the Sokol spacesuit up close.

Base on comments that I received from Sarah Costlow, the Signature Program Coordinator at the school, we have generated enough interest at the school for the program to hopefully expand in 2011. I will continue working with them to explore how **HSWT** can be integrated into their planned curriculum for next year.



Honor students Joaquin Jaramillo (left) and Mohit Bisht (right) pose with the Sokol suit and Don Thomas during his visit to Clarksburg High School.



Signature Program Coordinator Sarah Costlow (left) with the information technology teacher (right) at Clarksburg High School pose with the spacesuit.

Summary of 2010 Activities

Four public schools in Maryland participated in the **Have Spacesuit Will Travel** program in 2010 that involved a total of 232 students. Together with the students from 2009, **the total students who have participated in HSWT to date is 436.**

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.

Recommendations

I recommend continuing to work with these four schools and expand the program to include other middle and high schools as we identify ones interested in participating. Clarksburg High School will need more formal development of their program, but this should not be a major hurdle given the excitement and enthusiasm that was generated by our school visit this year.

I believe we will find the most interest 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 me, 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 had nothing but high praise for the program. Both North County and South River High Schools have already approached me about continuing the program in 2011 and are planning on making **HSWT** an integral part of the reading assignment for next year's incoming freshmen students in their STEM program.

Acknowledgements

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