



# STELLARXPLORERS III



## STELLARXPLORERS HISTORY

StellarXplorers (STLX) began in August 2014 with an email to the Air Force Association (AFA) from an official in the Secretary of the Air Force's Acquisition Office charged with science, technology, engineering, and mathematics (STEM) outreach. The email asked if AFA would be interested in developing a program with a space theme similar to our extremely successful CyberPatriot National Youth Cyber Education Program. AFA accepted the challenge and began with an evolutionary development of a program to offer participants as much of the space system design and operations process that can be delivered to large numbers of students within reasonably attainable resource levels.

A Space Task Force under the auspices of the AFA Aerospace Education Council was formed with the assistance of the AFA Commissioner of CyberPatriot. The first step would be a Proof of Concept demonstration in spring 2015 using computer-based models to solve a realistic satellite orbit determination problem, seen as the type of task that likely would be included in initial phases of any subsequent full-scale competition.

The Chair of the Space Task Force contacted the Educational Program Specialist for Analytical Graphics, Inc (AGI), a leader in software to model, analyze, and visualize space systems with a long history of educational outreach. AGI offered an activity that could be adapted for a one-day demonstration based on their Systems Tool Kit (STK). They provided free software and on-line education support for the effort. The Air Force Research Laboratory's STEM Outreach Office agreed to fund the Proof of Concept, and the U.S. Air Force Academy's Astronautics Department agreed to provide educational materials, mentors, and assistance. Finally, the Space Foundation agreed to support the initial competition held in conjunction with their annual Space Symposium in Colorado Springs, Colorado and host the event in their Discovery Center.

On the morning of April 15, 2015, five high school teams assembled at the Space Foundation's Discovery Center. Three teams, Falcon, Lewis-Palmer, and Vista Ridge, were from the Colorado Springs area. One team, Rangeview, was from Aurora, in the Denver area, and the fifth was from Mesa County School District from Grand Junction in the western part of the state. Teams consisted of 4-5 high school students, a teacher as the Team Director, and mentors from USAF personnel in the area. Colorado AFA volunteers coordinated all logistics for the event led by the Colorado State AFA President. AGI, the U.S. Air Force Academy, and Space Foundation all provided exceptional support instrumental to the event's success. Rangeview High School was awarded the first place trophy as the first StellarXplorers Champion.



The Rangeview High School Space Raiders of Aurora, CO, winners of the first StellarXplorers competition. (left-to-right) Bill Yucuis, AFA Space TF Chair; Gage Niles; Sie Hen Son; Herman Solis; Dave Nuttall; Maj Gen Denker, AF Space Command; and Jerry White, AFA Vice Chair for

The StellarXplorers Proof of Concept was a resounding success with enthusiastic comments from all participants and considerable interest expressed by symposium exhibitors. The goal of the next iteration of the competition, a Pilot National Deployment, was to demonstrate ability to deliver the initial phases of competition nationally in an online format.

StellarXplorers II opened registration on October 1, 2015, with students challenged to design realistic aspects of space operations, such as orbit definition, satellite design, and launch vehicle selection. For orbit and satellite design, competitors used the Analytical Graphics, Inc. (AGI) software, Systems Toolkit (STK). Additionally, competitors were provided an online space textbook, titled *Exploration of Space*. The competition consisted of three practice rounds and three online qualification rounds held January 14-16, February 18-20, and March 3-5, 2016. During Qualification Rounds Two and Three, 20% of the total score included academic quizzes drawn from the *Exploration of Space* text. Qualification Round One required teams to define two orbits providing the most satellite coverage over a designated city during a two-week period. Qualification Round Two required teams to select components for the satellites used in the first qualifying round. Finally, for Qualification Round Three, teams had to choose the best launch vehicle option to launch the two satellites from previous rounds.

The top ten cumulative scores during the qualification rounds determined the teams invited to compete at the National Finals on April 12-15, 2016. On 13 April, the competition began again in the Space Foundation's Discovery Center and included all aspects of the qualification rounds with a new scenario. Teams were assigned an ocean level assessment task. In an eight-hour competition period, teams had to select an orbit permitting data collection over eight points widely distributed over the globe and download the data to a facility in Suitland, MD. They were also required to select five critical satellite components, all with weight and performance tradeoffs, and a launch vehicle and launch location that would meet the multiple constraints of the mission. The following day, teams presented a 15-minute debriefing counting for 20% of their final scores. Teams visited the Space Symposium Exhibit Hall after the debriefing and attended a Reception/Awards Ceremony and also the Space Technology Hall of Fame Dinner that evening.

Team **Sirius Potatoes** from Palos Verdes Peninsula HS, CA, took top honors, with **Star Fleet**, also from Peninsula HS, as runner up. The **Space Raiders** from Rangeview HS, CO, took third place. All ten teams in our National Finals completed the rigorous competition with solutions meeting mission requirements and gained a new appreciation for the complexity of space. The students have taken their first steps on the road toward future leadership in America's critical space enterprise.

Planning for StellarXplorers III began on April 16, 2016. Registration for the coming year's competition opened May 1 and will continue to October 15, 2016. This year will feature a Full National Deployment of the program to demonstrate the ability to scale the competition to the larger numbers of students that is a quintessential feature of the program. The target is growth to 125-150 teams in the coming academic year, with an added semifinal round and a 'prestige' round for teams not attaining the semifinals. The finals are planned for April 5-8, 2016, again in Colorado Springs, Colorado.



StellarXplorers II Champions, Team **Sirius Potatoes** from Palos Verdes Peninsula High School, Rolling Hills Estates, CA. (left to right): Richard A. Bundy, AFA Vice Chair for Education; Team Captain Regina Kim; Eugene Lin; Saahil Parikh; Yodai Takeuchi; Sher Shah; Team Director Mrs. Elizabeth Grenier; and Major General Roger W. Teague, USAF, Director, Space Programs, Office of the Assistant Secretary for Acquisition.