Future Problem Solving Program International **2008-2009 Qualifying Problem**
Middle/Senior Division **Space Junk**

Commander Bretta Brutan and her crew closely examined the debris they had just pulled from the retrieval portal. *"It's only a frozen lump of rocket fuel,"* a crew member moaned. Brutan shrugged, *"Jettison it. We already have a sample of that."* Brutan's spaceship, the *Astralorbitor*, was created for the sole purpose of collecting valuable space artifacts and her crew wasn't about to weigh down their ship with duplicates or worthless junk.

In 2007, Google's Lunar X-Prize opened the door for privately funded teams to compete in the race to conquer space. Now, in 2044, over thirty privately owned spaceships are in orbit, with more on the way. Their goal? The Z-Prize: A ten billion dollar prize for collecting the most significant historic artifacts floating in space. Z-Prize money is donated by benefactors dedicated to supplying artifacts for a recently created space station museum. The orbiting museum is the logical destination for space tourists who can optimize a trip into space by viewing space history as well.

The museum currently houses a multitude of small items, and its developers plan to use ion thruster technology to change the orbit of large historic items to bring them near the museum. But ion thrusters take months to change the orbits of large artifacts, and prize-seekers like Commander Brutan are too impatient for that. They are racing to cash in on the large items by tethering them to their spaceships and towing them to orbits near the museum. Commander Brutan boasts, "Vanguard 1 was launched in 1958 and is still in orbit, and the defunct Hubble telescope is out there, too. When we deliver these relics, just think what historians can learn - and, of course, we'll definitely win!"

The goal of winning is shared by other Z-Prize competitors who are using extreme measures to be the first to reach and deliver these prized artifacts. Mid-space collisions are an ever-present danger. Early in the competition, two prize-seeking spaceships collided, killing all on board. Recently, the *Astralorbitor*'s tether destroyed a Chinese communication satellite. But most prize-seekers share Brutan's philosophy, "The reward is worth the risk." Museum personnel are dismayed at this attitude, yet can't help but be excited about the number of historically valuable items the prize-seekers will deliver.

Brutan's crew faces competition not only from other Z-Prize seekers but also from a growing number of space salvage operators who want to capture and sell junk to the highest bidder. Space junk is not necessarily "junk" since its estimated total value is three trillion dollars! Commander Brutan worries that some of the most desirable artifacts will be captured by salvage operators before she can get to them. But she is even more concerned about the recent appearance of spaceships known as "clean sweepers." Using cutting-edge technology, the "clean sweepers" are determined to create easier access to the moon. They use costly lasers to vaporize any space junk they encounter, with no concern about its value or historical significance. They envision the profits from mining the moon to be far greater than what either the Z-Prize or salvaging would generate.

The *Astralorbitor* also faces an increase in new space objects: updated weather and communication satellites, telescopes, and a vast number of military weapons - many launched by countries new to the space environment. In addition, the prize-seekers are dodging millions of man-made pieces of junk in many different orbits. Recently, the space station museum had to be boosted into a different orbit in order to avoid a derelict rocket.

Most scientists are appalled by the profit-motivated space travelers. Many scientists warn about human exposure to space debris before it can be studied in depth. They point out that some debris can be radioactive or contain other dangerous elements. One of the Z-Prize ships recently returned to Earth with most of the crew suffering from unexplained illnesses.

While Brutan and others race to win the Z-Prize, heated debate continues. The orbiting museum developers argue the value of space junk and its historical significance. As Future Problem Solvers, you are asked to use the six-step problem solving model to address the issues dealing with the space station museum as it builds its collection of artifacts**.**

Complete Steps 1-6 in the booklet provided