ANALYZING AN INCREASE IN MICROMETEORITES LOCATED IN LOW EARTH ORBIT IN COMPARISON TO EXPLORER 1. Gabriel Byers. Klein High School, Spring, TX.

Introduction: The Klein Astronomy Research Team (KART) has been attending the Lunar and Planetary Science Conference since 2004, and recently an increased amount of CubeSat proposals have been catching our attention. This was extremely interesting to the team because our research is traditionally number based using JMARS and data from the USGS. Our inclination to eventually put together our own CubeSat made us look back to one of the earliest space missions and the first satellite from the United States. Explorer 1 went into an orbit that was nearly untouched by man. Since its launch in 1958 thousands more have followed. While it had extremely important instruments that helped discover the Van Allen Radiation Belts, the most interesting tools on Explorer 1 to us were the micrometeorite microphone and the erosion gauge that were meant to take count of the many, natural, micrometeorites. The effect of space weathering by micrometeorites on all of the satellites in orbit should increase the overall number of micrometeorites in orbit.

Proposal: Using a collection method similar to the one used by Explorer 1 we expect to provide evidence exemplifying the quantity of Earth sourced micrometeorites in low earth orbit. Spacecraft are routinely colliding with space debris around 1 micron and larger, this has created a large amount of fragmentation debris (which is an estimated 42% of all micrometeorites). This debris can consist of old satellite fragments, such as dead batteries and unused fuel cells, and deterioration products which includes paint chips and aluminum oxide particles which can be left over from rocket fuel exhaust. Low Earth Orbit (LEO) space debris also consists of around 17% rocket bodies, 22% non-functioning spacecraft, and roughly 19% mission related debris, which can include tools dropped by astronauts. Using Explorer 1 as a control, the measurement made from our potential CubeSat would inform us how much of the small orbital debris, mainly micrometeorites is human caused. Having this exact number could help us bring awareness to how much of this "space pollution" is due to our space programs. This could lead to a realization that the dangers posed to astronauts are not as naturally occurring as we would like to believe. This awareness could lead to furthering safety technologies, possibly including removing unnecessary paints from satellites and making sure that they are more secure overall, from astronauts tools to inactive satellite parts.

Method: Like Explorer 1, our CubeSat would include an acoustic detector that would help us count the amount of objects that came in contact with it. A small, wide angle camera would be exciting due to the fact that it's not every day a high school astronomy team is privileged with the opportunity to launch a satellite. Since our proposal is based around one instrument another assortment of tools would be interesting, this may include a Geiger counter, an altimeter so we could know the exact altitude, and a temperature sensor. Basic radio communication would be necessary to get all of the data back to us.

References: [1] S.V. Marchenko (2018) Monitoring the Earth's Radiation Budget. [2] Steve Garber (2007) Explorer-I and Jupiter-C. [3] NASA Content Administrator (2008) Explorer 1 Fast Facts. [4] https://www.windows2universe.org/earth/Magnetosphere/radiation_belts_discovery.html. [5] https://nssdc.gsfc.nasa.gov/nmc/experiment/display.action?id=1958-001A-02.