Comprehensive Environmental and Technical Measurements in the Stratosphere Using a Balloon-Borne Probe

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Abstract*. This project aims to conduct a stratospheric flight to extensively measure several critical environmental and technical variables in the stratosphere. This flight is crucial for advancing science and engineering, as it provides essential insights into the effects of stratospheric conditions on electronics and probe construction. The probe, which will be launched on a meteorological balloon, is designed to measure pressure, temperature, UVA and UVB radiation, the probe's orientation relative to Earth, and GPS coordinates. GPS data will be critical for locating the probe upon its return to the Earth's surface. An Arduino UNO microcontroller controls the measurement system, and the data will be recorded on an SD card using a datalogger. Given the extreme temperature conditions in the stratosphere, a chemical heating element has been incorporated into the probe's design to protect the electronic components. The probe also includes solar panels, whose output voltage is monitored to evaluate their reliability and functionality in stratospheric conditions. Additionally, an Arduino NANO is mounted on the probe's structure, exposed to stratospheric conditions, with its functionality monitored by the system. Besides these measurement tasks, the probe is equipped with three cameras to capture Earth's images from the stratosphere and views of near space. This flight will thus provide critical scientific data on stratospheric conditions and visual documentation and validation of the technical performance of the integrated systems under extreme conditions. One of the primary goals was to minimize weight and energy consumption, enhancing the probe's efficiency and prolonging its operational duration in the stratosphere. Our future vision involves developing stratospheric and orbital devices designed to enhance smart logistics, smart infrastructure, and emergency locating during natural disasters. We aim to significantly contribute to global problem-solving and innovation by leveraging advanced technology.*

Keywords. stratosphere, space, probe, acquisition of data, measurements, balloon, extreme temperature, environmental measurements

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