Space Debris Map

Space debris, are all types of objects, made by different materials in different sizes, that are left behind in orbit by mankind after almost any single space mission.
Nowadays we are experiencing a very high and fast growth and progress in the space field, due to the lower prices that opened space exploration to private companies too; this means that over time, space and mostly the Earth orbit will be crowded with many more debris and junk that can become a very big threat to all spaceships and satellites orbiting our Planet, which are left with no protection against those high energy flying bullets, capable of a disaster in a matter of seconds.
This is why our team decided to address such a current topic throughout his experiment.

Mission Objective

The mission that we propose has the goal to report statistical data about quantity, location and mass of space debris around Earth, measuring and counting, throughout the whole mission any space debris that it will encounter (sense with the Infrared Sensor or hit).
To accomplish better data the mission will run the experiment until a failure occurs, this is to ensure a wide amount of data collection, that will provide a result more close to reality.

Experiment Description and Equipment

To complete our Mission Objective, shown before, the CubeSat will be controlled by a STM32 that will be the processing unit of our build, this microcontroller will also control two major sensors on the satellite that will be one or more Infrared Sensors (IR) a gyroscope and an accelerometer.
The IR sensor is able to emit infrared signal that will be reflected by a nearby object like a possible debris, the signal will then be returned to the sensor and by knowing the speed of the infrared and the time that the signal used to travel we can easily say that we detected an object; and then with the data recorded calculate the distance from the CubeSat.
We will also use additional data from the gyroscope and from the accelerometer in the event of an impact to calculate the mass and the approximate orbit of the debris.
All sensors will be connected to the STM32 with a custom designed circuit board (PCB), to ensure the presence of only essential components to our mission, without having to waste energy powering other non-essential parts (maybe present on a stock PCB).

Experimental Method and Testing

The experiment that we will be going to perform has many aspect that needs to be tested, so in order to obtain a good prototype we will be testing different parts of the CubeSat, like the type of Infrared Sensor we will be using and how many we will be able to use, given the restriction on the power usage, which is another critical factor of our build as much as the temperatures which the satellite will be subjected to.
The limitations on the power usage are what block us from operating the ir sensor all the time, so the system will be fully operational only during small windows of time in different orbit locations (2 - 5 min. per hour) while collecting data from other instrumentation without any interruptions to ensure a much wider area of coverage.

Also the operational time will depend on the type of IR sensors and how many of them will be used; at the time we are planning to use a few low power sensors for testing and then maybe upgrade to a better one.
We will also test all the components so they can operate without problems in space, for doing this we will test the IR sensors in a vacuum chamber to test how they behave without atmosphere and we will also design proper isolation for the satellite to protect the different components from being damaged by extreme cold or heat.