

Data Protection Plan

1. INTRODUCTION

1.1 Objective

This document describes the plans for the operation of a 1U CubeSat as regards all parts of the Data system (operations, command and control and archiving).

1.2 Scope

We have no plans to protect data and information during the entire cycle of tasking, operations, processing, archiving and dissemination. The images produced by the camera on board the flight system for EdgeCube have no commercial or scientific value. All data produced by EdgeCube are in the public domain at the time of creation.

The camera is a COTS device that produces jpg compressed images of extremely low quality. Typical compressed images are 120 x 190 pixels with a total size of ~4000 bytes. The only technical purpose of these images is to improve the aspect of the spacecraft that is crudely determined by magnetometer measurements (~3 degrees). Using the low quality camera will improve the pointing to ~1 degree. Each camera pixel is ~0.4 degrees in size.

We will only download these jpg compressed images at a rate of 1 per day initially and perhaps 1 per week as the mission proceeds. We have extremely limited telemetry bandwidth and can only rarely spot check the pointing accuracy.

We have limited on board processing capacity and will telemeter each image in a sequence of ~40 byte packets in jpg format. There is no in-flight processing capability to decode or modify these images.

We have a single ground station located on the roof of the Sonoma State University student center. There is a single Ubuntu computer system that controls the pointing and tracking of an 18-element Yagi antenna (~20 degree beam). We have a RFM23BP transceiver for receiving telemetry data from a companion transceiver in the EdgeCube's flight system. We command EdgeCube via transmission from the ground RFM23BP using a private encoding methodology that ensures only authorized control.

1.3 Data Protection Strategy

1.3.1 Summary

EdgeCube is a public domain project. Therefore we have no plans to protect the data.

1.3.2 Data Protection Diagram

NA. All EdgeCube data are placed in public domain. There is no requirement for data protection.

2. SPACE SEGMENT

2.1 Space Segment Description

2.1.1 Orbital Information

EdgeCube will be placed into a circular orbit at 500 km with an inclination of 51 degrees. Initially EdgeCube will be sent to the International Space Station (~Oct 2019). Subsequently (Dec 2019) the orbit will be boosted to 500 km (~Dec 2019).

2.1.2 On-Board Propulsion

None.

2.1.3 Sensor(s)

EdgeCube is a 1U CubeSat that will be launched into low Earth, circular, Sun synchronous orbit, at a radius of approximately 500 km and inclination 51 degrees. The mission includes a COTS camera that produces jpg compressed images of extremely low quality. Typical compressed images are 120 x 190 pixels with a total size of ~4000 bytes. The only technical purpose of these images is to improve the aspect of the spacecraft that is crudely determined by magnetometer measurements (~3 degrees). Using the low quality camera will improve the pointing to ~1 degree. Each camera pixel is ~0.4 degrees in size.

We will only download these jpg compressed images at a rate of 1 per day initially and perhaps 1 per week as the mission proceeds. We have extremely limited telemetry bandwidth and can only rarely spot check the pointing accuracy.

We have an isolated snap shot low quality camera (no scanning mode or mosaic mode). There are no mechanical mechanisms of any type. The images will be somewhat blurred due the fact that EdgeCube is spinning (typical spin period 5-10 seconds).

There is no top-level platform control. We only control the time of exposure of the isolated snap shots.

2.2 Communications

2.2.1 Communications Links

Identify all communications links between elements of the space segment and ground segment including:

Link ID	EdgeCube Flight
Direction	We use an RFM23BP for both uplink and downlink.
Frequency	437.465 MHz - coordinated with International Amateur Radio Union (IARU)

Data	Downlinked data includes a COTs low quality camera, S/C power system status, magnetometer, and gyro.
Encryption	All EdgeCube data are unsecured and placed into public domain as the telemetry reaches the ground without delay.

2.2.3 Link Characteristics [Class 3 Systems Only]

NA. We are a Class 1 System.

3. GROUND SEGMENT

We have a single ground station located on the roof of the Sonoma State University student center. There is a single Ubuntu computer system that controls the pointing and tracking of an 18-element Yagi antenna (~20 degree beam). We have a RFM22B transceiver for receiving telemetry data from a companion transceiver in the EdgeCube's flight system. We command EdgeCube via transmission from the ground RFM22B using a private encoding methodology that ensures only authorized control.

3.1 Ground Segment Locations

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Identify all ground segment facilities that handle protected data:

Facility ID	SSU CubeSat Ground Station		
Location	1801 East Cotati Avenue, Rohnert Park, California 94928, USA. Our ground system is located on the roof of the student center building on the campus of Sonoma State University.		
Coordinates	Latitude	38 d	20 m 23 s
	Longitude	-122 d	40 m 4 s
	Elevation	10 meters	
Function	Performs all uplink and downlink communications with EdgeCube. This is a public project and does not include encrypted data. The command formats are not public.		
Ownership	The ground facilities are owned by Sonoma State University (public)		
Contact	Garrett Jernigan, 707-332-7926 or Lynn Cominsky 707-664-2655		

4. SECURITY PLAN

4.1 Physical Security

Access to the ground system on the roof of the student is controlled by locks and gates. Once inside the locked area the equipment is also locked inside environmentally controlled cabinets. All rooms on campus that are involved in operations have individual key cards for all staff and students involved in the EdgeCube project. We have a web cam that observes the ground equipment.

4.2.1 General Security Measures [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

4.2.2 Cryptographic Hardware [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

4.2.3 Remote Sensing Data [Class 3 Systems Only]

NA. We are a Class 1 System.

4.2.4 Personnel [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

4.3 Network Security

4.3.1 Command and Control [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

4.3.2 Distribution [Class 3 Systems Only]

NA. We are a Class 1 System.

4.3.3 Storage [Class 3 Systems Only]

NA. We are a Class 1 System.

4.4 Cryptographic Security

4.4.1 Encryption [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

4.4.2 Key Management [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

4.5 Preventative Measures and Immediate Actions

4.5.1 Preventative Security Measures [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

4.5.2 Immediate Actions

NA. All EdgeCube data are released to a public web site as telemetered without delay. Therefore there is no need to react to a data breach.

5. RESTRICTED OPERATIONS

5.0.1 Geographic Exclusion Areas [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

5.0.2 Night Time Imaging [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

5.0.3 Non-Earth Imaging [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.

5.0.4 State of Israel [Class 2 and Class 3 Systems Only]

NA. We are a Class 1 System.