



FCC Form 442, Exhibit: Question 4
Cesium Mission 1

FRN: 0029768140

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1 INTRODUCTION

As required by reporting that this authorization is to be used for fulfilling the requirements of a government contract, this exhibit provides a narrative statement describing the government project, agency, and contract number. This exhibit reports details of Cesium Mission 1 (CM1) and the major government agency stakeholder.

QUESTION 4: STATEMENT REGARDING GOVERNMENT CONTRACT:

Contracting Agency Name: Washington Headquarters Services

Contract Number: HQ08452090005

2 MISSION DEFINITION

Cesium Mission 1 (CM1) is CesiumAstro's (hereafter Cesium) first mission to launch and operate our own hardware in space. This mission consists of two spacecraft, Cesium Satellite 1 (CS1) and Cesium Satellite 2 (CS2). Each satellite is a 6U CubeSat with the Cesium Nightingale 1 active phased array payload as well as an intersatellite link (CommPack) payload. The spacecraft each have a high-accuracy attitude system with a star tracker and a state-of-the-art electric propulsion system. CM1 provides in-orbit platforms that push the boundaries of small satellite communication technologies. In addition, CM1 gives Cesium the capability to demonstrate advanced features of our technology such as dynamic waveform switching and dynamic link optimization, which are of interest to Cesium's U.S. Government Sponsors. The development of these advanced features was in part funded by the government contract. With the launch of Mission 1, Cesium will have a complete commercial phased array communication system in LEO orbit and will be significantly closer to providing next generation phased-array communication products for U.S. Government and commercial customers. A visual overview of the mission is illustrated in Figure 1.

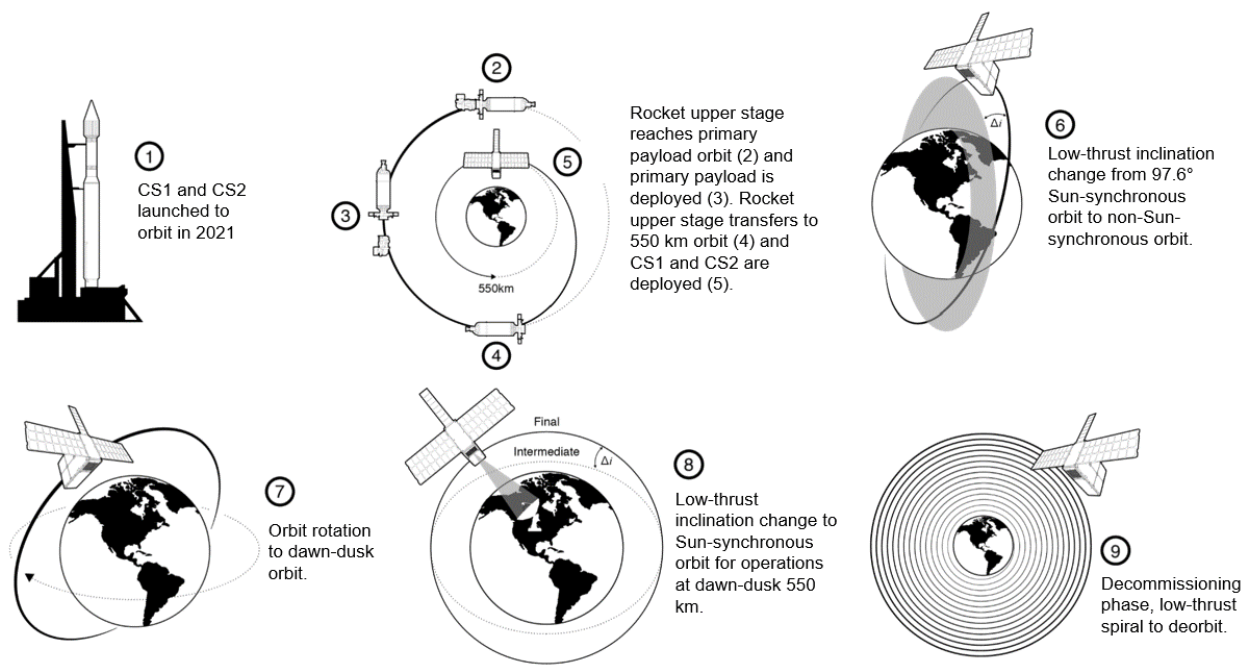


Figure 1: Visual step-by-step overview of the mission.

The CM1 ground segment includes Cesium ground stations and the GlobalStar network for persistent command and telemetry. Cesium is developing ground stations at office locations in Texas and Colorado. These ground stations can communicate with the spacecraft over both payload and telemetry links. Additionally, the ground stations are remote-operable on the Cesium network across Cesium locations.

2.1 LICENSE DURATION

To operate CM1 successfully, Cesium requests for a license period of 5 years. This period is the anticipated lifetime for the mission. The process of adjusting CS1's and CS2's orbit from deployment to the dawn-dusk SSO mission orbit will take a considerable amount of time – up to four years. Mission operations will continue to take place in-between orbital adjustment periods. Once the spacecraft has reached its desired orbital orientation, experiments can be conducted with greater efficiency and increased durations. Additionally, as a commercialized space hardware product, Cesium's Nightingale 1 is required to withstand the space environment for the lifetime of expected missions. As such, we require to maintain and utilize the payload on orbit for 5 years to characterize long terms environmental effects.

2.2 COMMUNICATION PATHS

Our communication paths are depicted in Figure 2 below.

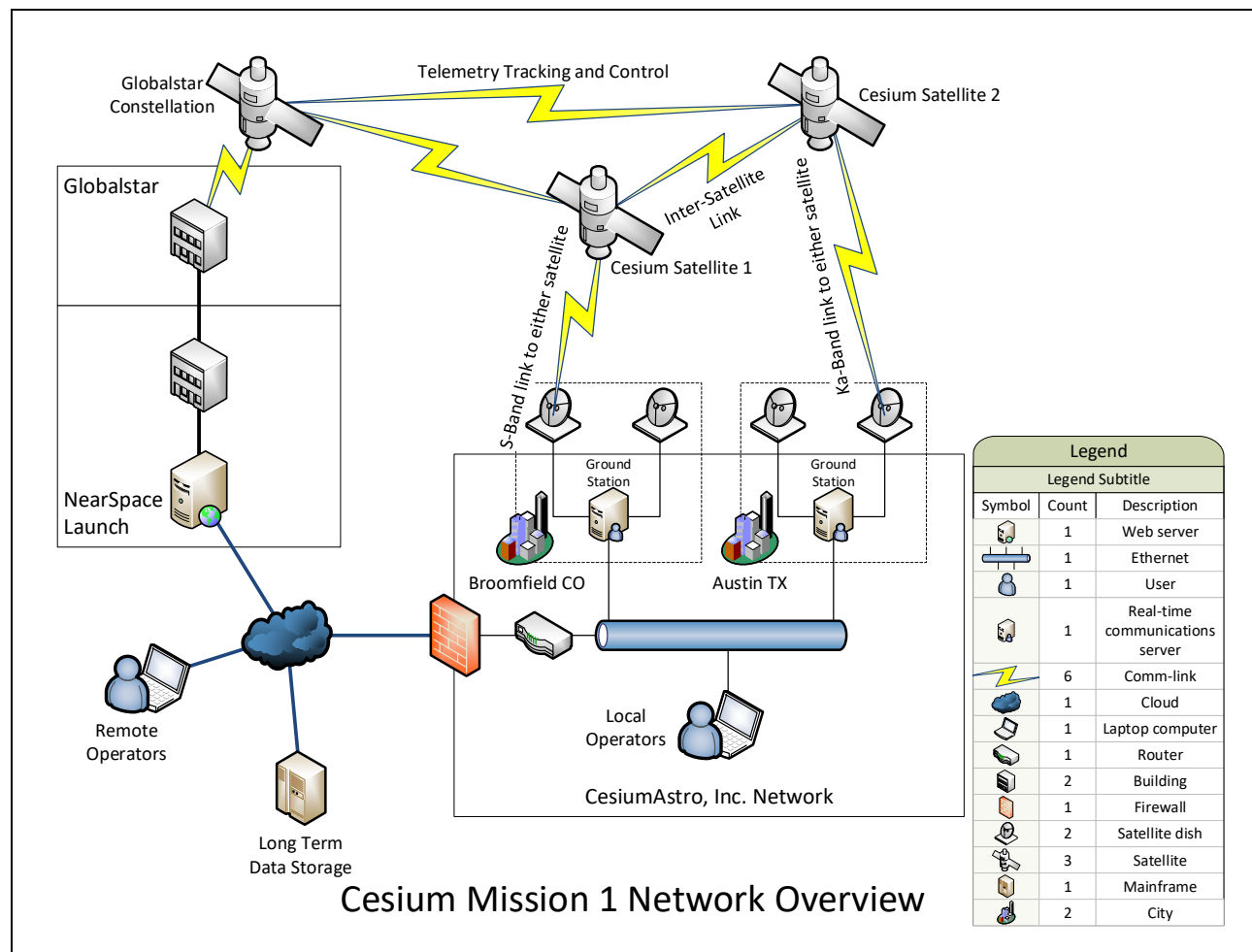


Figure 2: Cesium Mission 1 Network

The Nightingale 1 frequencies within the range of 27.0 – 27.4 GHz uplink and downlink will be used for satellite and payload TT&C as well as data transfer for Earth-to-space and space-to-Earth with Cesium ground stations. These frequencies will be used by our active phased array payload for experiments. Nightingale 1 has 100 MHz of instantaneous bandwidth but can operate from 24.0 – 29.5 GHz. One objective of this experiment is to demonstrate the tunability over a 200 – 400 MHz subset of this range.

The SRS-3 frequencies 2211 MHz and 2215 MHz downlink and 2061.2 MHz uplink will be used for satellite and payload TT&C as well as data transfer for Earth-to-space and space-to-Earth with Cesium ground stations.

The EyeStar-S3 simplex frequency 1616.25 MHz transmit will be used for satellite telemetry beacon to the GlobalStar constellation.

The EyeStar-D2 duplex frequencies 1615.65 MHz and 1616.88 MHz transmit and 2483.765 – 2499.775 MHz receive will be used for satellite and payload TT&C as well as small data transfer through the GlobalStar constellation.

The CommPack frequency 2441 MHz transmit and receive will be used for space-to-space data transfer and TT&C between the two spacecraft in the mission (Cesium Satellite 1 and Cesium Satellite 2). This transmitter is experimental, and on-orbit tests will be used to prove in-situ performance as well as provide our customer base with increased confidence in the product. The CommPack system has two antennas, each on opposite sides of the spacecraft. When transmitting, both antennas are active simultaneously.

We have conducted a few license searches using the IBFS and ULS databases and found there are a few licensees in our requested bands. While it appears that there the chance for interference is low, we are open to coordination regarding any band overlaps.