

## Modification Narrative

Capella Space Corp. (“Capella”) is a satellite imaging company, headquartered in San Francisco, California, that has developed technology to allow its satellites to “see” what other satellites cannot. Capella satellites are able to see through clouds and at night, permitting imaging during bad weather and/or low-light conditions, by utilizing Synthetic Aperture Radar (“SAR”) images. Optical imaging, which is the current standard for Earth imaging, is limited to cloud-free locations with ideal light conditions. These limitations mean that 75% of the Earth surface remains undetected regardless of the number of optical satellites in space.

In contrast, SAR imaging is an active imaging technique that utilizes radar antennae that emit pulses of microwave radiation at a pulse repetition frequency of 2000 pulses/second or more. The radar receiver measures the time, strength, and phase characteristics of the pulse echoes and uses this data to generate two-dimensional images.

In furtherance of this plan, Capella respectfully request that the Commission modify its existing experimental authorization, with call sign WJ2XJE, to add a single Capella SAR satellite (Capella-4) to the satellite already authorized under that license (Capella-3) (collectively, the “Capella Satellites”). Modification of the authorization to cover Capella-4 will allow Capella to test the functioning of the satellite on orbit, perform calibrations of the SAR and other radio subsystems, and perform other aspects of the satellite check-out process during the pendency of Capella’s Part 25 license application<sup>1</sup> which is anticipated to authorize commercial operations of both Capella-3 and Capella-4. Capella-4 is currently planned to be launched on the same vehicle as Capella-3 and the two satellites will possess the same radiofrequency characteristics and operate in the same orbital plane.

Like Capella-3, Capella-4 will operate with the following orbital characteristics:

<b>Orbit Type</b>	Sun Synchronous
<b>Inclination</b>	97-98 degrees
<b>LTAN</b>	9:00 PM
<b>Altitude</b>	525 km

The designed operating lifetime of both Capella-3 and Capella-4 is three years. Like Capella-3, Capella-4 will utilize the 9300-9900 MHz frequency range for SAR imaging. Downlink communication between the Capella Satellites and gateway Earth stations will occur in the 8025-8400 MHz frequency range. Uplink communication will occur in the 2035-2037 MHz frequency range, but uplink communications are provided by third-party providers and not requested for authorization under this application.

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<sup>1</sup> See *Application of Capella Space Corp. for Authority to Launch and Operate a Non-Geostationary Orbit Satellite System in the Earth Exploration Satellite Service*, File No. SAT-LOA-20200914-00108 (filed Sep. 14, 2020).

The experimental authorization for Capella-4 will allow Capella to test and validate the performance of the Capella-4 satellite. These technologies include a high-gain SAR antenna, a high-performance SAR radio, a high-power RF amplifier, a large-capacity power generation and storage subsystem, an innovative heat dissipation subsystem, and a high-performance SAR processing capability. The objective of combining these new technologies is to achieve the performance of large SAR satellites in a compact, scalable form factor.

Capella seeks to authorization use the following frequency bands:

- 1) 8025-8400 MHz for downlink;
- 2) 9300-9900 MHz for SAR imaging; and
- 3) 1626.5 - 1660.5 MHz, and 1668.0 - 1675.0 MHz for an Inmarsat Data Relay System terminal to provide world-wide TT&C communications with the spacecraft.

The proposed Capella system will also receive transmissions on the following frequencies:

- 1) 2035-2037 MHz for uplink.
- 2) 1518 MHz-1559 — GEO to LEO.

Because the Capella system will not transmit on these receive frequencies, Capella is not seeking corresponding authorization to engage in these transmissions. However, in each case, these transmissions will be permitted by authorizations held by third parties. These receive-only frequencies are listed here for informational purposes only.

Mission control for the Capella Satellites will be physically located at Capella's headquarters in San Francisco, with backup command authority at Capella's facility in Louisville, Colorado. The ground system for the Capella Satellites will be implemented utilizing Amazon Web Services - GovCloud ("AWS") to facilitate remote/decentralized management by authorized personnel. Capella has contracted with Kongsberg Satellite Services and Amazon Web Services Ground Stations for ground-based telemetry, tracking, and command and payload downlink antenna services for the Capella Satellites. Each provider works with Capella, national regulatory authorities, and international regulatory authorities to obtain all necessary licenses for station operations and transmission approval. Command packets for the Capella Satellites will be generated on Capella's local production network. Each packet will be sent into Capella's AWS instance for encryption. A plaintext version of the packet will be stored in a database in the AWS instance. The packet then travels from the AWS production instance to a remote ground station from which it is subsequently radiated to the Capella Satellites. The Capella Satellites then receives the packet and forwards it on to the main flight computer, which will then decrypt and authenticate the packet before forwarding it on to the relevant processing module. The schedule for downlink and SAR imaging is generated on the ground and commanded to the satellite.

Telemetry, payload, and beacon packet generation will occur on the main flight computers of the Capella Satellites. Each packet will be encrypted, forwarded on to the downlink radio, and radiated to a ground station. The packet will then be forwarded on to Capella's production AWS instance which will decrypt the packet, allowing the packet to travel on to the local machine running the command/telemetry application on Capella's production network. A plaintext

version of the packet will be stored in a database in Capella's AWS instance. Data will be accessed through an Application Programming Interface used by customers and Capella's online servers.