National Oceanic and Atmospheric Administration
License to Operate a Private Remote Sensing Space System

The National Oceanic and Atmospheric Administration (NOAA), an agency of the U.S. Department of Commerce, hereby grants this Tier 1 license authorizing Stanford Student Space Initiative to operate Sapling Constellation, a private remote-sensing space system comprised of 1 satellite with the following capabilities and described completely in Part D of this license:

Panchromatic (PAN) (400-700 nm) at 140 m Ground Sample Distance (GSD)

Please submit any communications, including all communications required by the regulations at 15 CFR Part 960 and this license to:

Commercial Remote Sensing Regulatory Affairs (CRSRA)
1335 East-West Highway SSMC-1/G-101
Silver Spring, MD 20910
Email: crsra@noaa.gov
Phone: 301-427-2560

Part A: Determination and License Grant

The Assistant Administrator (AA) of the National Environmental Satellite, Data, and Information Service within the National Oceanic and Atmospheric Administration, an agency of the U.S. Department of Commerce, acting pursuant to authority delegated by the Secretary of Commerce (the Secretary), determines that Stanford Student Space Initiative, as described in Part C of this license, will comply with the requirements of the Land Remote Sensing Policy Act of 1992, as amended, codified at 51 U.S.C. 60101 et seq., (hereinafter "Act"), the regulations promulgated thereunder, 15 CFR Part 960 ("the regulations"); and the conditions in this license.

Accordingly, the AA hereby grants Stanford Student Space Initiative (hereinafter "Licensee"), as described in Part C of this license, this license to operate Sapling Constellation (hereinafter "the System"), as described in Part D of this license, subject to the terms and conditions of this license. This license is valid until its term ends in accordance with the regulations. The Licensee must request and receive approval for a license modification before taking any action that would contradict a material fact listed in Part C or D of this license.

The AA makes this determination, and grants this license, under the authority delegated to him by the Secretary of Commerce through the Under Secretary of Commerce for Oceans and Atmosphere and Administrator of NOAA. The Secretary's authority is found in the Act and the regulations. This license does not authorize the System's use of spectrum for radio communications or the conduct of any non-remote sensing operations that are proposed to be undertaken by the Licensee. This license is not alienable and creates no property right in the Licensee.

IN WITNESS THEREOF, I hereby grant this License:

VOLZ.STEPHEN.MICHAEL.1504223694 Digitally signed by VOLZ.STEPHEN.MICHAEL.1504223694 Date: 2022.01.26 12:42:01 -05'00'

Stephen M. Volz Ph. D. Date
Assistant Administrator for
Satellite and Information Services

Part B: Tier 1 License Conditions

The Licensee must, at all times:

1. Comply with the Act, the Regulations, this license, applicable domestic legal obligations, and the international obligations of the United States.

2. Operate the system in such manner as to preserve the national security of the United States and to observe international obligations and policies, as articulated in conditions included in this license.

3. Upon request, offer to the government of any country (including the United States) unenhanced data collected by the system concerning the territory under the jurisdiction of such government without delay and on reasonable terms and conditions, unless doing so would be prohibited by law or license conditions.

4. Upon termination of operations under the license, make disposition of any satellites in space in a manner satisfactory to the President.

5. Notify the Secretary in writing of each of the following events, no later than seven days after the event:

i. The launch and deployment of each system component, to include confirmation that the component matches the orbital parameters and data collection characteristics of the system, as described in Part D of the license;
ii. Each disposal of an on-orbit component of the system;
iii. The detection of an anomaly; and
iv. The licensee's financial insolvency or dissolution;

6. Request and receive approval for a license modification before taking any action that would change a material fact in the license.

7. Certify that all material facts in the license remain accurate pursuant to the procedures in § 960.14 no later than October 15th of each year.

8. Cooperate with compliance, monitoring, and enforcement authorities described in the Act and this part, and permit the Secretary to access, at all reasonable times and with no shorter notice than 48 hours, any component of the system for the purpose of ensuring compliance with the Act, this part, and the license.

9. Refrain from disseminating unenhanced data, or processed data or products derived from the licensee's system, of the State of Israel at a resolution finer than the resolution most recently specified by the Secretary in the Federal Register as being available from commercial sources.

i. The most recent resolution specified by the Secretary is 0.4 m GSD, please see FR Doc.2020-15770, publish date: July 21, 2020.

Part C: Description of Licensee

Every term below constitutes a material fact. You must request and receive approval of a license modification before taking any action that would contradict a material fact.

1. General Licensee Information:

a. Name of Licensee:
Associated Students of Stanford University in care of the Stanford Student Space Initiative

b. Location and address of Licensee:
491 South Service Road
Stanford, CA 94305

c. Licensee contact information:
space.initiative@stanford.edu
HEPL Receiving
c/o Stanford SSI M300
452 Lomita Mall, Room 109

d. Contact information for a specific individual to serve as the point of contact with Commerce:
Simone D'Amico, Associate Professor of Aeronautics and Astronautics, Stanford University
Aero Astro - SLAB
496 Lomita Mall #006
Stanford, CA 94305
damicos@stanford.edu
650-272-9968

e. Place of incorporation and, if incorporated outside the United States, confirmation that the Licensee acknowledged as part of the application that the Licensee will operate its system within the United States and is therefore subject to the Secretary's jurisdiction under 15 CFR Part 960:
California, USA

2. Identity of any subsidiaries and affiliates playing a role in the operation of the System, including a brief description of that role:
N/A

Part D: Description of System

Name of System: Sapling Constellation

1. Brief mission description:
   The Sapling Constellation consists of 2 planned satellites: Sapling Sempervirens and Sapling Giganteum. The Sapling Sempervirens spacecraft will be launched first, and Sapling Giganteum is an improved version with a more cost effective structure. The Sapling spacecraft will attempt to take pictures of the Earth and downlink them, and will not attempt to take pictures of non- Earth objects. The Sapling Sempervirens spacecraft has no attitude control system, and the Sapling Giganteum spacecraft is equipped with an experimental coarse attitude control system (magnetorquers). Both spacecraft will process images to determine whether the Earth is in view before downlinking. This approach will mitigate the probability of accidental imaging of a non-Earth target. All code, designs, and data obtained through the launch of this mission will be published in the public domain. As a secondary mission goal, the Sapling Sempervirens spacecraft will attempt to demonstrate satellite-to-satellite and satellite-to- satellite-to-ground data relays with another spacecraft, Yearling, owned and operated by California Polytechnic State University, Pomona, in care of Bronco Space, deployed from the same deployer on the same launch vehicle as Sapling Sempervirens.

2. Remote Sensing Instrument(s) parameters (for each sensor):

Sensor type	Imaging/frame rate (FPS)	Spatial resolution (m)	Spectral range (nm)	Collection volume (km/unit of time)
PAN	15 Hz at 2592 x 1944	140	400-700	150,000^2/hour

   a. Ability of the remote sensing instrument to slew, point, or digitally look off-axis from the x, y, and z axes of travel:
      N/A

3. If any entity or individual other than the Licensee will own, control, or manage any *remote sensing instrument* in the System:

Name	Address	Number	Relationship
N/A	N/A	N/A	N/A

4. Spacecraft Upon Which the Remote Sensing Instrument(s) is (are) carried
   a. Description:
      Sapling Sempervirens and Sapling Giganteum are 1U CubeSats, with overall sizes of 10 cm x 10 cm x 11 cm. All spacecraft will fly the PyCubed flight computer and battery pack with minimal modifications, and body mounted silicon cell solar arrays. The primary structure of Sapling Sempervirens is made of 6061 aluminum, with bronze steel composite (with a melting point similar to that of bronze) additively manufactured secondary support structures. The primary structure of Sapling Giganteum is made of bent 5052 Aluminum sheet metal. The communications system on all spacecraft consists of commercial, off the shelf LoRa radios with both command, telemetry, and data downlink on 437.4 MHz.

b. Estimated launch date(s) in calendar quarter:
Sapling Sempervirens NET Q4 2022
Sapling Giganteum NET Q2 2023

c. Number of spacecraft (system total and maximum in-orbit at one time):
2

d. For each spacecraft, provide the following (or if an entire constellation will have substantially the same orbital characteristics, provide these values for the entire constellation and note whether or not all spacecraft will be evenly spaced):

Spacecraft or Constellation Characteristics			
Altitude (km)	Inclination (°)	Orbital Period (min)	Longitude (°)
250-600	95.68	94.63	150-165
Eccentricity	Argument of perigee (°)	Propulsion	
0.0	N/A	No	

e. Ability of the spacecraft to slew, point, or digitally look off-axis from the x, y, and z axes of travel:
Sapling Sempervirens is not equipped with attitude control. The Sapling Giganteum spacecraft is equipped with an experimental attitude control system consisting of PCB magnetorquer. The system is capable of pointing with accuracy of 10 degrees.

5. If any entity or individual other than the Licensee will own, control, or manage any *spacecraft* in the System

Name	Address	Number	Relationship	Citizenship Status
N/A	N/A	N/A	N/A	N/A

6. Ground Components: See Ground Station Appendix

7. If any entity or individual other than the Licensee will own, control, or manage any *mission control center(s)* with the ability to operate the System

Name	Address	Number	Relationship
N/A	N/A	N/A	N/A

8. Information Applicable to Multi-Spectral Imaging (MSI)

Number of spectral bands	Individual spectral bandwidths
3	400-510, 480-580, 570-700

Ground Station Appendix

NOAA must approve any Ground Station prior to the commencement of operations.

Type	Location	Coordinates
MCC	Stanford University Durand Building, 496 Lomita Mall Stanford, CA 94305	37.4269° N, 122.1733° W

Administrative Record Appendix

	Date	Description of Administrative Action Taken
1.	1/26/22	Issuance of License
2.	7/7/22	Updated Part D.1, Part D.4.a, Part D.4.b, Part D.4.c, and Part D.4.d
3.	8/8/22	Modified name from Sapling-1 to Sapling
4.	8/16/22	Updated name from Sapling to Sapling Sempervirens
5.	12/5/22	Updated the system name throughout the license, Updated Part D.1, Part D.4.a, Part D.4.b, Part D.4.c, Part D.4.d and Part D.4.e