



Design and Simulation of Nanosatellites

Ph.D. Ing. Avid Roman-Gonzalez

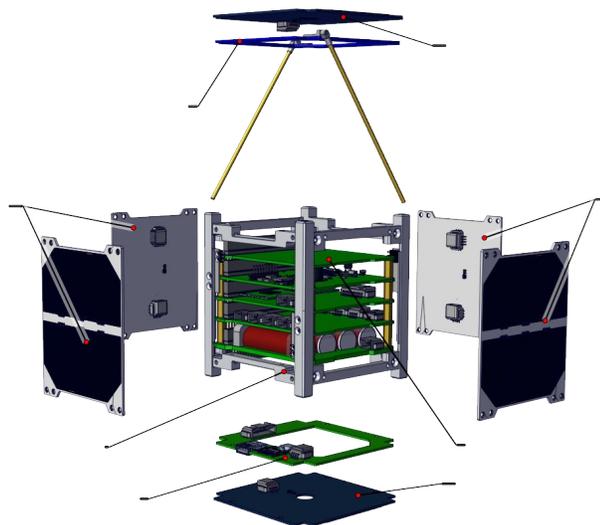


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Context

- Small satellites are an excellent platform to enter the aerospace field.
- The use of commercial EEE components known as Space COTS can reduce the cost, time, and gap in space incursions.
- A critical stage is the simulation of the mission.
- For the educational purpose, one has low-cost and/or free access tools, which allow us to carry out simulations of the various aspects in a small satellite mission.





Mission Simulation



- Mission Geometry.
- Payload.
- Platform.
- Ground Segment.

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Mission Simulation



Mission Geometry



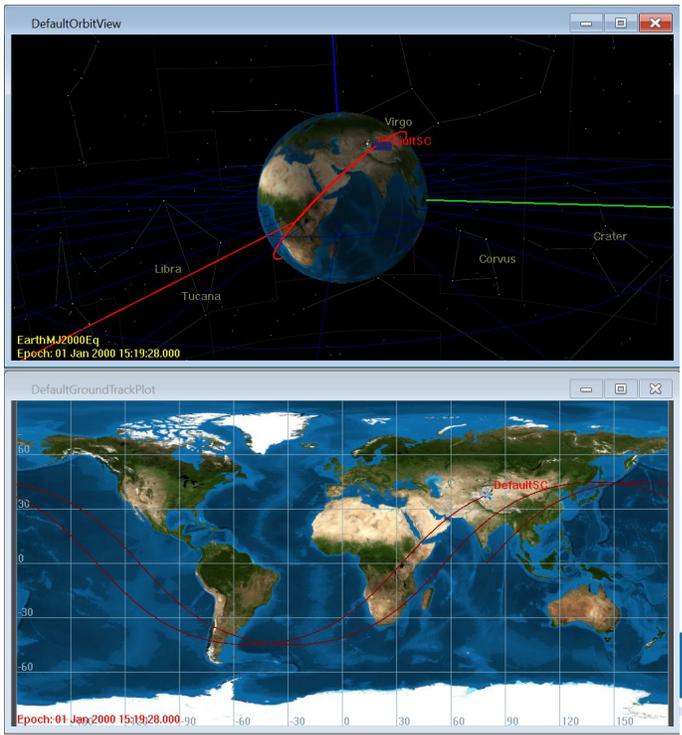
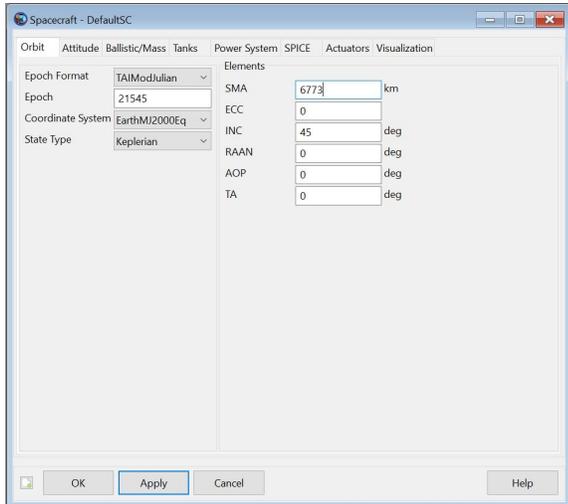
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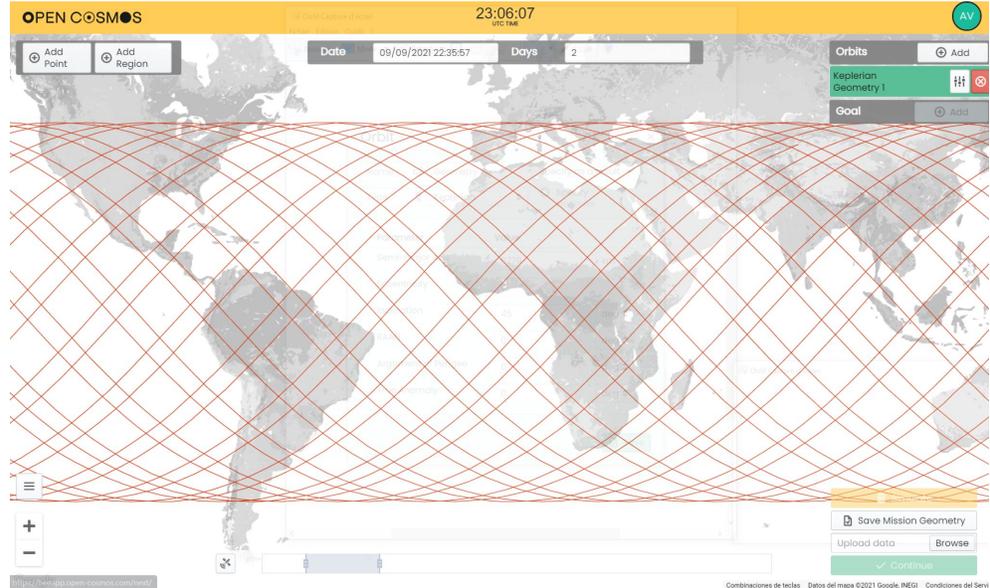
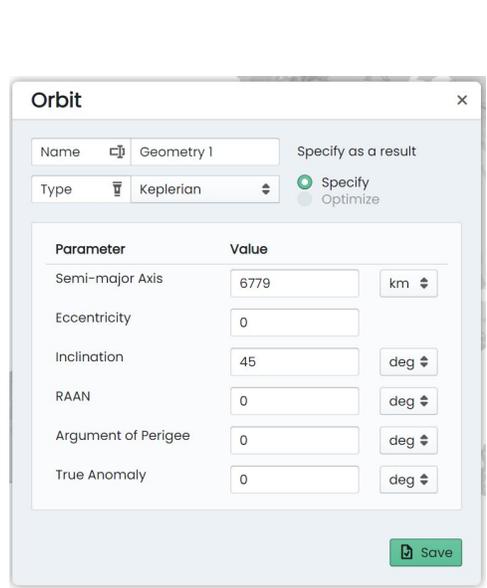
Mission Simulation

Mission Geometry



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Mission Simulation



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Mission Simulation

PayLoad

Type	Name	Mass [kg]	Volume [U]	Min Temp [°C]	Max Temp [°C]	Peak Power [W]	Selected
Optical	Sample - High Resolution Panchromatic Imager	8.00	8.44	-30	65	20.00	<input type="checkbox"/>
Optical	Sample - Hyperspectral Imager with DPU	5.45	7.59	-15	50	1.50	<input type="checkbox"/>
Optical	Sample - Compact Hyperspectral Imager	1.45	1.00	-45	80	5.00	<input type="checkbox"/>
Optical	Sample - Visible Imager	0.25	0.51	-40	85	0.80	<input checked="" type="checkbox"/>
Optical	Sample - RGB Imager	0.10	0.05	0	55	0.24	<input type="checkbox"/>
Optical	Sample - IR Spectrometer	0.23	0.29	-25	55	0.38	<input type="checkbox"/>
Communications	Sample - SDR with Dipole	0.33	0.24	-40	85	2.70	<input type="checkbox"/>
Communications	Sample - SDR with Helical	0.45	0.30	-40	80	2.10	<input type="checkbox"/>
Communications	Sample - IoT Receiver	0.50	1.25	-20	50	3.00	<input type="checkbox"/>
Research	Sample - Biological Pressurized Vessel	0.90	2.00	-20	40	60.00	<input type="checkbox"/>
Research	Sample - Biological Multi-experiment	0.90	2.00	-20	40	60.00	<input type="checkbox"/>

Mission Simulation

Platform

Configure your platform

Layout

Body

Form Factor:

Mounted Solar Cells:

Solar Panels

Configuration:

Size:

Orientation:

Sub-systems

Power Module

Open Cosmos EPS v4

Battery Module

Battery Pack IP4S

Communications

Open Cosmos COMMS v1

OBDH

Open Cosmos OBDH v1

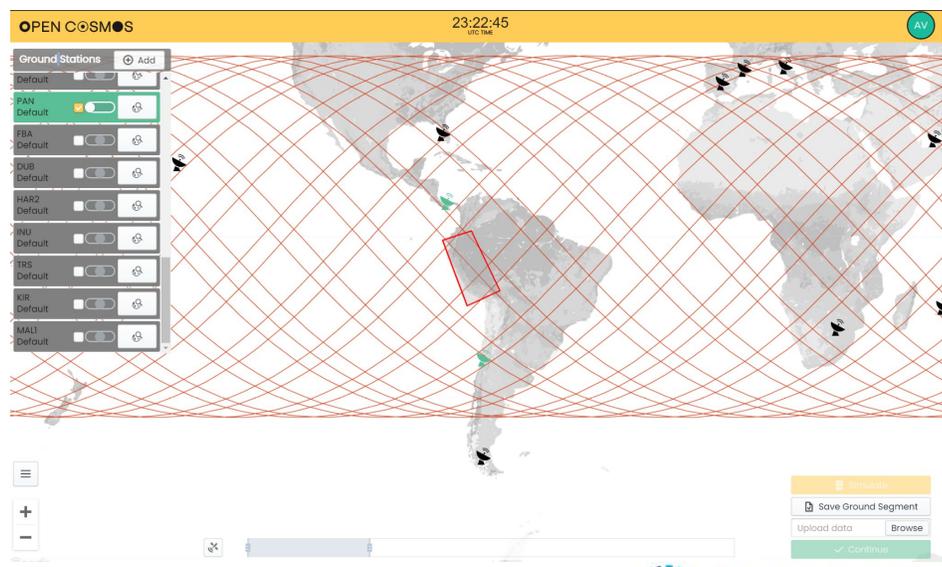
AOCS

Open Cosmos ADCS v1



Mission Simulation

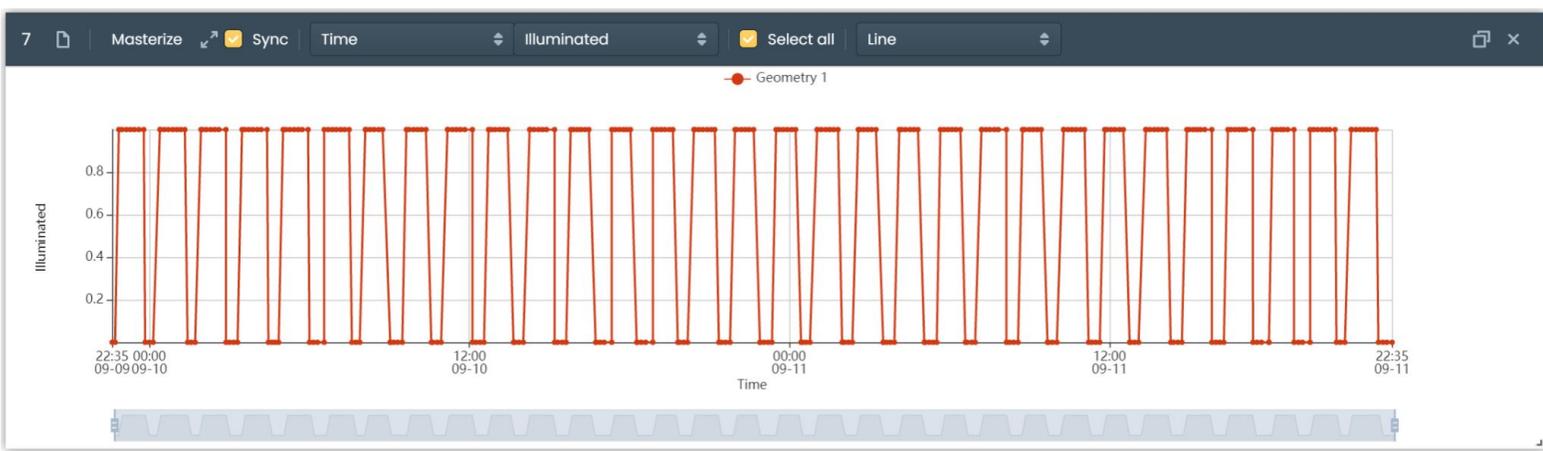
Ground Segment



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Results

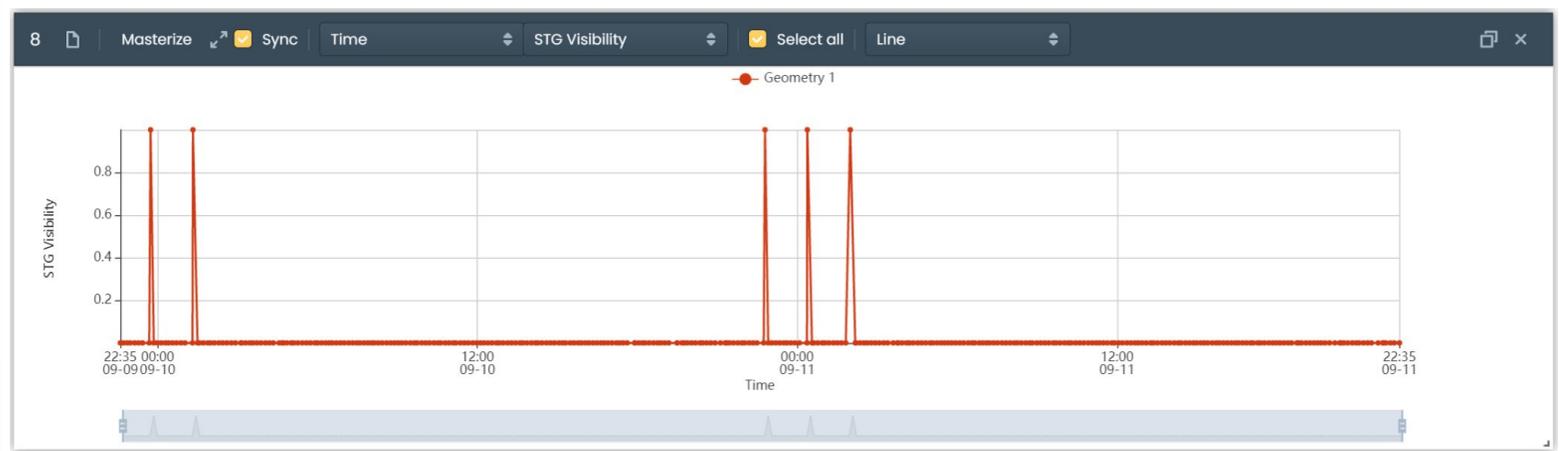


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Results



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Results



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Final Remarks

- According to the simulation, one can observe that there is more significant contact time with the Santiago ground station than Panama ground station under the established parameters.
- It is good to have these simulation tool options that allow the training of professionals with knowledge in the aerospace field, especially in developing countries.
- These tools are used in the final cycle of the electronic engineering undergraduate program of some universities in Peru, with outstanding results.

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Virtual Distinguished Lecturer Program
13 July 2023

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