

ENGINEERING CONCEPT FOR THE INITIAL STAGE MISSION OF AN ASTROBIOLOGICAL EXPLORATION MISSION USING A 6U CUBESAT A. F. Alvarado¹, J. D. Acevedo², S. Rincon³. ³ santiagorinconmartinez@gmail.com

Introduction: CubeSat opens a new low cost manner to the Solar System exploration, offers easy access to people interested in space science and technology, therefore, it is possible to create an educational project focused on the development of a real mission to the planet Venus. Currently enigmatic discoveries have been obtained in planet Venus sustained in Earth-based radio telescopes using James Clerk Maxwell Telescope (JCMT) in Hawaii, and the Atacama Large Millimeter Array (ALMA) observatory in Chile, such as phosphine signals emitted from clouds. A lot of discussion takes place around the question if: has phosphine of tentatively biological or geological origin has actually been detected?, or, is it possible to explain the phenomena observed with simpler hypotheses? In September 2020 a team led by Jane S. Greaves of Cardiff University, affirmed the fact that there are probabilities that these traces may be originated by living organisms, on the other hand, since that initial claim, other science teams have cast doubt on the reliability of the phosphine detection. Now, a team led by researchers at the University of Washington has used a robust model of the conditions within the atmosphere of Venus to revisit and comprehensively reinterpret the radio telescope observations underlying the initial phosphine claim. As they report in a paper accepted to the Astrophysical Journal and posted Jan. 25 to the preprint site arXiv, the U.K.-led group likely wasn't detecting phosphine at all. [1] In fact there are two proposals and opposite conclusions that try to give an explanation to the same phenomenon, that is why there is a need to carry out an exploration mission whose scientific data allows us to know the nature of that signal. Some of the most important questions we address cut across the traditional boundaries of the decadal surveys. The fundamental science quest to search for life elsewhere is one that requires advances in planetary sciences (e.g., understanding how geologic processes on Mars and on ocean-bearing worlds in our solar system might give rise to habitable environments) [2] Focus on the short-term this project will be mainly educational, in the first instance low-cost components will be used, for constructions of the first version of the CubeSat.

Mission concept: According to the recent discover respect the Phosphine detected in the Venus 'clouds, is proposed a mission concept as a initial state as a part of a more complex project, in which it sends in the first sate, a CubeSat with the capabilities to be developed

by current and economic technology, so that it can validate and demonstrate the presence of phosphine in the atmosphere of Venus, to later support the allocation of a larger budget to collate in situ phosphine samples and determine biotic or abiotic provenance.

Step 1, Select minimum two NASA's Strategic Plan objectives: According to NASA's CubeSat Launch Initiative (CSLI) our CubeSat investigation must benefit NASA and be aligned with NASA's Strategic Plan.

Strategic Objective 1.1: Understand the Sun, Earth, Solar System and Universe [3, p. 10], Contemplate planetary exploration and the search for biosignatures.

Strategic Objective 3.1: Develop and Transfer Revolutionary Technologies to Enable Exploration Capabilities for NASA and the Nation, [3, p. 24] it's engaged with the Next generation science mission.

Step 2, Define objective for the period 2021 - 2022:

- Design and construction of a 6U (10x22x36) cm CubeSat's structure using aluminum sheet, assembled with bolts and nuts.
- Calibration and test sensor of altitude, and orientation using a Raspberry Pi as the motherboard.
- Define payload, according to the research of biomarkers.

Notes:

- This concept mission it's planning to develop in the long-term, with the science goals proposed.
- It's essential to enhance knowledge in CubeSat development, therefore, this project has a wide educational purpose in the short-term.
- A low cost prototype will be built in the short-term.
- Financial support it's necessary to continue the next prototyping.

References

- [1] J. Urton, 27 01 2021. [Online]. Available: <https://www.washington.edu/news/2021/01/27/phosphine-venus-so2/>. [2] SCIENCE 2020-2024, [Online]. Available: https://science.nasa.gov/science-pink/s3fs-public/files/2020-2024_Science.pdf. [3] NASA 2018 Strategic Plan, 2018. [Online]. Available: https://www.nasa.gov/sites/default/files/atom_s/files/nasa_2018_strategic_plan.pdf.