IAF EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM (IP)

Author: Ms. Dhanisha Sateesh
Space Generation Advisory Council (SGAC), India, dha.tulip@gmail.com

Mr. Nadir Atayev
Azercosmos, Space Agency of Republic of Azerbaijan, Azerbaijan, nadiratayev@gmail.com
Mr. Marco Acúrcio
Space Generation Advisory Council (SGAC), Austria, marco.acurcio03@gmail.com
Mr. Abishek Shrestha
Space Generation Advisory Council (SGAC), Austria, avistha95@gmail.com
Mr. Kathiravan Thangavel
Space Generation Advisory Council (SGAC), Italy, kathiravan199@gmail.com
Mr. Tahsin Hossain
Space Generation Advisory Council (SGAC), Bangladesh, tahsin.kuetme@gmail.com
Ms. Diana ALjbour
Blinc- Borderless lab, Jordan, aljbourdiana@gmail.com
Mrs. Alison Waterman
Space Generation Advisory Council (SGAC), United States, alison.waterman@spacegeneration.org
Mr. Daniel Wischert
European Space Agency (ESA), The Netherlands, daniel.wischert@esa.int
Mr. Saketh Mulakaluri
Space Generation Advisory Council (SGAC), Austria, sakethmulakaluri02@gmail.com

BUILDING A SUSTAINABLE CLIMATE CHANGE MONITORING SATELLITE MISSION THROUGH LIFE CYCLE ASSESSMENT

Abstract

Climate change poses a significant threat to our planet, and accurate monitoring of essential climate variables is crucial for understanding and mitigating its effects. However, current remote sensing missions do not provide systemic high quality spatial resolution data for large swath areas. It is also unclear as to whether these missions are sustainable and follow the recommended international guidelines for space missions.

The main objective of this research paper is to conceptualize a climate change monitoring satellite mission that is proven to be sustainable through life cycle assessment (LCA). LCA is an important tool that can help evaluate conceptual designs based on their environmental impact over their life cycles and when employed in the space mission design context, it can help determine efficient and sustainable alternatives to presently used materials and procesess in satellites.

This research focuses on the conceptual design of a constellation of low altitude remote sensing small satellites at SSO (Sun Synchronous Orbit) and orbits having a medium range inclination - MIO (Mid Inclination Orbit), in order to obtain frequent coverage at both higher and lower altitudes with greater revisit frequency.

These satellites monitor key climate change indicators as defined by the EPA, such as surface temperature, polar ice cap melting rates, percentage of sea level rise, precipitation rates and greenhouse gas emissions among many more through novel instruments that are designed following the heritage of missions like

Copernicus-Sentinel, LandSat and A-Train and improving upon the resolution obtained using recently introduced technology like hyperspectral imagery and high speed onboard data processing systems. The research also includes the design parameters of the satellite's structure, electronics and power handling system, orbit determination and attitude control system, onboard electric propulsion system and data handling and communication system. The proposed mission design also complies with the existing space law policies and has proper deorbit procedures like the recently introduced 5 year deorbit rule adopted by the FCC.

In summary, this paper outlines the conceptual design of a sustainable climate change monitoring satellite mission that provides high-resolution, frequent coverage of key climate indicators over large areas, thus providing a solution to the gap present in the existing remote sensing satellite missions.