

AEM

AGENCIA ESPACIAL MEXICANA



MEX-SAT Imaging Constellation

MexSat - Imaging Constellation

Sustaining Latinamerica Region

With a Land Imaging Program

MexSAT – CELAC SMALL SATELLITE

- Agencia Boliviana Espacial
- Agencia Espacial Brasileña
- Agencia Espacial Mexicana
- Agencia Bolivariana para Actividades Espaciales de Venezuela
- Comisión Nacional de Actividades Espaciales de Argentina
- Agencia Espacial Peruana
- Comisión Colombiana del Espacio
- Instituto Espacial Ecuatoriano

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Notice: The project that is the subject of this report was approved by the Governing Board of the Mexican Space Agency, whose members are drawn from the councils of Universidad

Nacional Autónoma de México, Korean Aerospace Research Institute (KARI) and Korean Nano-Satellite Manufacturer

TelePIX. The members committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

The Latin American nation's economy, security, and environmental vitality rely on routine observations of **Earth Surface to understand changes to the landscape** at LOCAL, REGIONAL, and GLOBAL Scales.

The Mexican Space Agency (AEM)

has conceived a first draft prototype of a LatinSat Satellite for research purpose and activities. LatinSat at purposes its to assume an operational character, with a diverse set of users reliant on the continuing availability of **MexSat Imaginery and derived data products**.

However, responsibility for funding, management, development, and operations of the LatinSat expected series could change on time. With responsibilities shifting among Latin American government agencies and private-sector entities. **While the Foreign Relations Office of Mexico and Mexican Space Agency has established and maintained management of Land Remote Sensing Data Acquisition, Archiving and Dissemination, no clearly defined and sustainable land imaging program has yet been created.**

The Statement of TASK for the Committee on Implementation of a Sustained Land Imaging Program, includes the recommendations to facilitate the transition of single-mission AEM research-based land imaging technology like CubeSats, to sustained Agricultural Land Imaging Program Technology or Missions. However, it is also important to recognize the limits to this charge given continuing instability in the National and Supranational policies for space-based land remote sensing. Even as the committee was writing its report, agencies' responsibilities for the future of land imaging appeared to be shifting once again in the fiscal year 2021 budget request. Consequently, in the present report, the committee does not make recommendations regarding particular agency responsibilities in any country for land imaging, which in any event are properly in the purview of the executive and congressional branches of any government. The Committee does comment on several overarching issues—for example, coordination among the relevant federal agencies alignment of agency responsibilities with budgets, steps that might lead to lower-cost implementations of successors in the MexSat series, and the desired elements of a future national land imaging system

- 1.- Imperative for a Sustained and Enhanced Land Imaging Program
- 2.- Technical Characteristics of the Core Program
- 3.- Enhancing Sustained Land Imaging Program
- 4.- Data Systems
- 5.- Opportunities on the Path Forward

“The Committee’s primary recommendation is that the CELAC Region should establish a Sustained and Enhanced Land Imaging Program with persistent funding to respond to current and future national needs. Such Program would:

- Develop a plan for a comprehensive, integrated program that capitalizes on the strengths of Latin American Agriculture Offices and CELAC, maintains current capability and the existing archive, and enhances the program as technology enables new imaging capabilities and data products.
- Ensure acquisition of Land Imaging Data continuously from Orbital Platforms and, periodically, from airborne platforms. To respond to the needs of producers and consumers of derived data products along with users who analyze imagery.
- Establish partnerships with commercial firms and International Land Imaging Programs to Leverage enhanced capabilities.
- Coordinate Land Imaging Data Buy Across all CELAC Government Offices and Agencies, and Include a research and development component to improve data products based on core measurements and to develop new measurement methods and consider evolving requirements.

For the Sustained and Enhanced Land Imaging Program to be Successful, program responsibilities should be divided between SRE and AEM at least the first year, being AEM such agency responsible for balancing science requirements with mission complexity and costs provided with the necessary Budget.

Both agencies should participate in an iterative process to design missions that meet the needs of research and operational communities, but final decisions should be made by the agency that has been given the Budget.

The Top Priorities for the Sustained and Enhanced Land Imaging Program should be to ensure that the core program provides for continuity of LatinSat products and coverage on secure and sustainable paths.

- Systematically monitor users and uses of MexSat Data so that the program can evolve with changing user requirements and
- Consider alternative implementations that continue to enable the collection of Global, moderate-resolution data with the full range of spectral capabilities.

SRE-AEM should

- Improve search capabilities and transparency to users and
- Continue to interface with the private sector to improve access to the public and private-domain land imaging data products and services.

The Sustained and Enhanced Land Imaging Program should develop a systematic process for identifying and prioritizing a wider suite of products, including essential climate variables, that can be derived from moderate-resolution land imagery, and for documenting and validating algorithms, including their modifications or replacements. In doing so, the program should

- Define criteria that government-provided authoritative data sets should meet, among them such attributes as calibration accuracy assessment, and validation, and including ground truth

- Define criteria for which products should be provided by the government and which by the private sector
- Implement procedures for development, cost estimation, peer review, and publication of algorithms that produce derived products; and
- Implement plans, procedures, and budgets for ongoing validation

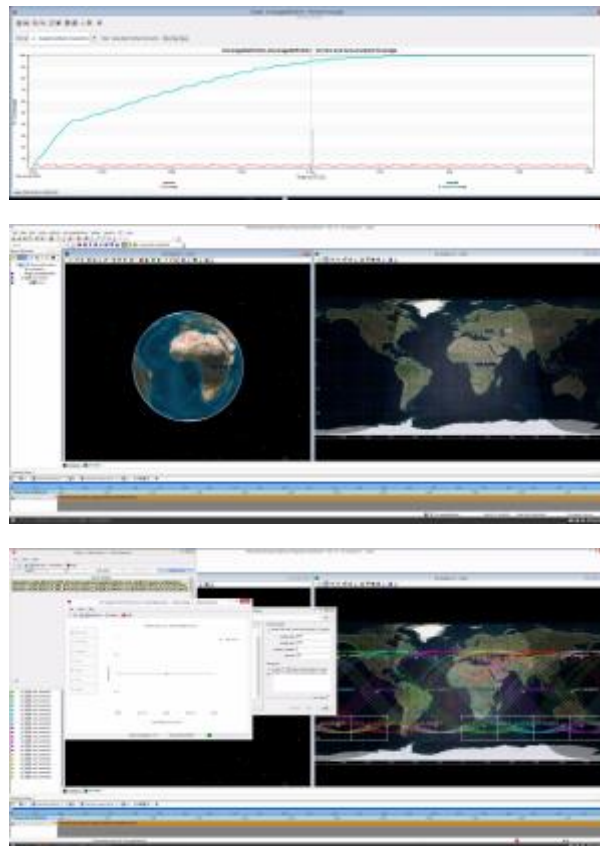
Digital Mission Engineering (DME): Constellation Design and Coverage

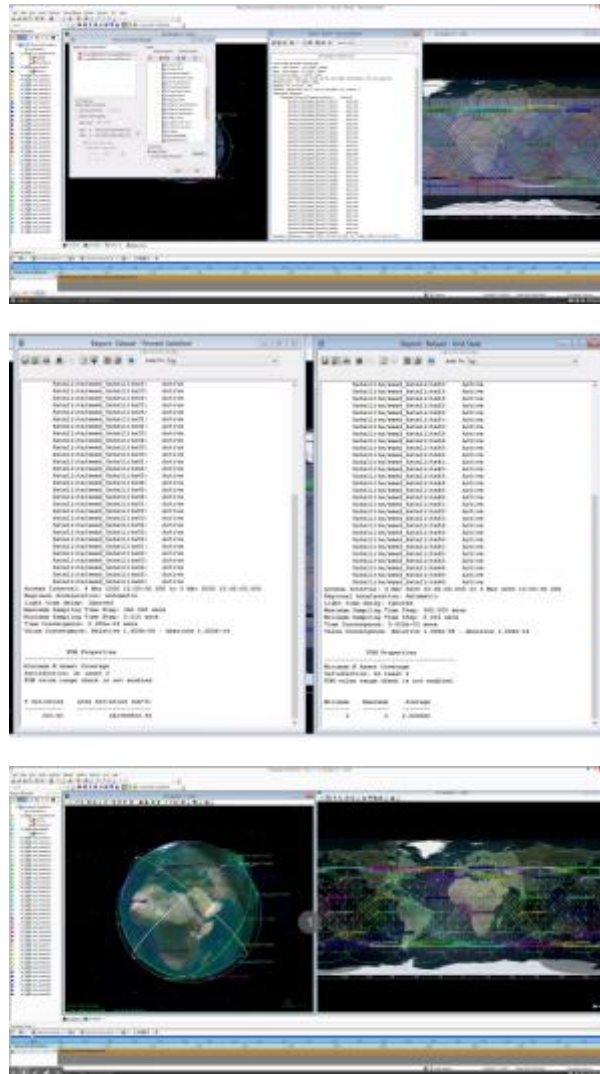
The goal of this exercise is to understand how you can maximize the level of coverage with a global network of satellites. The main components to analyze are the RevisitTime (this is the gap time) STARTING FROM THE DEVELOPMENT OF A FIRST MEXSAT and the number of assets that have visibility to the ground for a Total Coverage of 20,455,701 square km and the benefit of a 622,196,181 Million Population conforming a total of 9.6 Billions of US Dollars or the THIRD Largest GDP in the WORLD.

NOTE for the development of a MEXSAT: 500km of Attitude, 6 Unit CUBESAT with Circular 50 Deg Inclination

Sensors set for Min and Max Lat of 60 Deg and a Coverage Definition of 100 Percent Territories Satisfaction

If you consider cost, which might be tied to a higher orbit, you can find a lower semi-major axis that also reduces costs





<https://sway.office.com/eNzjhFplCdmELl#content=xYZmdaHd1qxmPZ>

WHY MEXSAT SHOULD DEVELOP AT LEAST TWO SATELLITES?

Future: The goal was to minimize the semi-major axis and the total number of satellites. At the same time, we want to minimize the revisit time (no gaps) and have **two satellites maintain access with a point on the ground**. Let's load in the data and examine it.

https://agencia.sharepoint.com/:u:/s/LatinSat/EfZqApQSI-JFipbXURYja1EBEmo97zjBj3t6_e8Nj-3ECw?e=grGSBZ