



The creation of the Costa Rican Space Agency

A unique, self-sustainable design to take advantage of space 2.0

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Costa Rica Institute of Technology

Board Member, Costa Rica Space Agency

28th Workshop on Space Technology for Socio Economic Benefits:

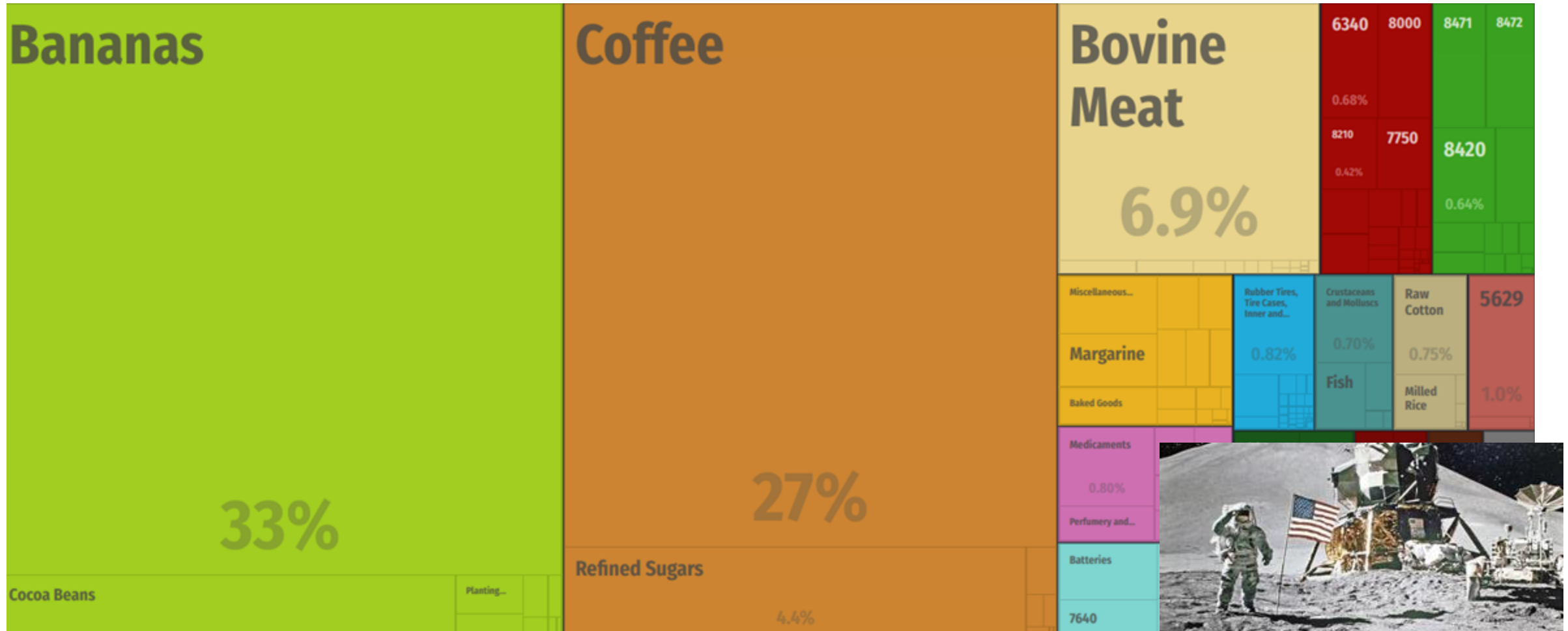
“Space Exploration – a source of inspiration, innovation and discovery”

Dubai , 22-24 October 2021

Introduction: the industrial advancement of Costa Rica

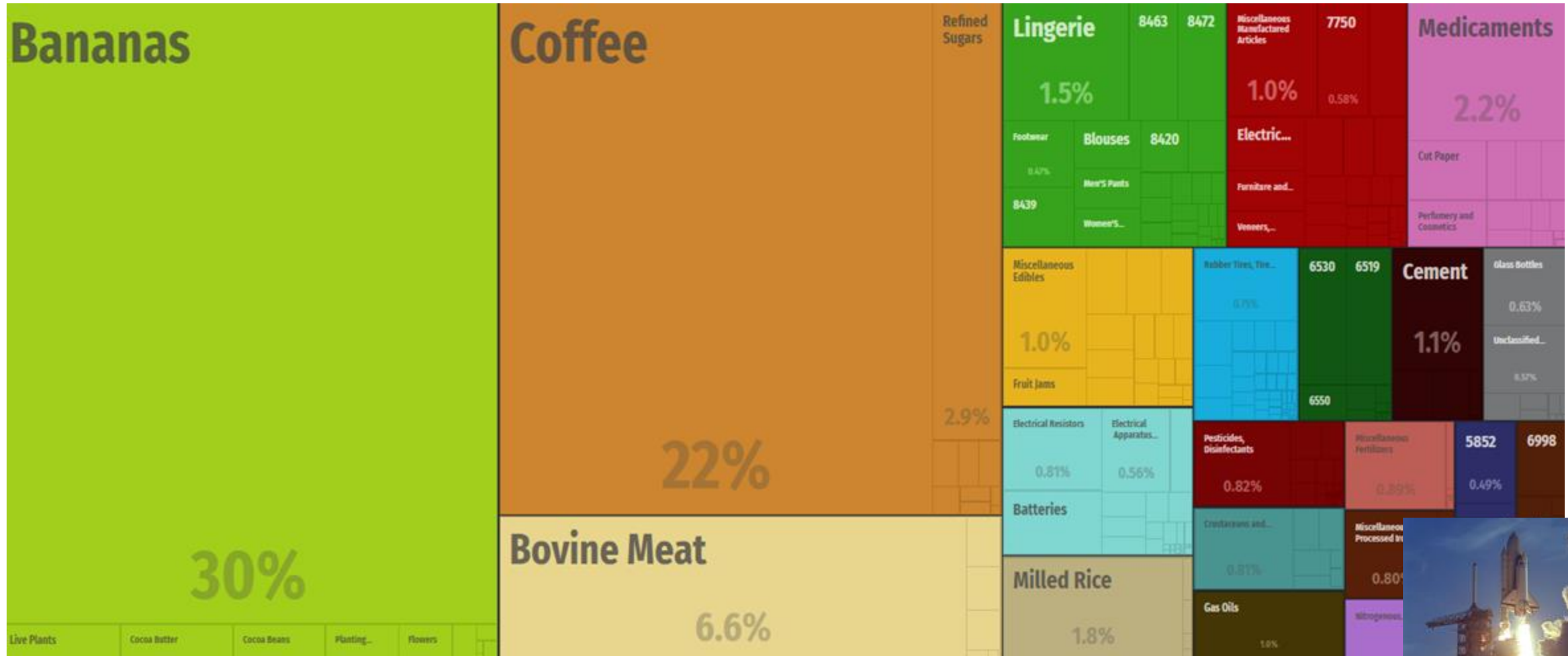
What does Costa Rica export in 1969?

Same year as lunar landing by Apollo 11



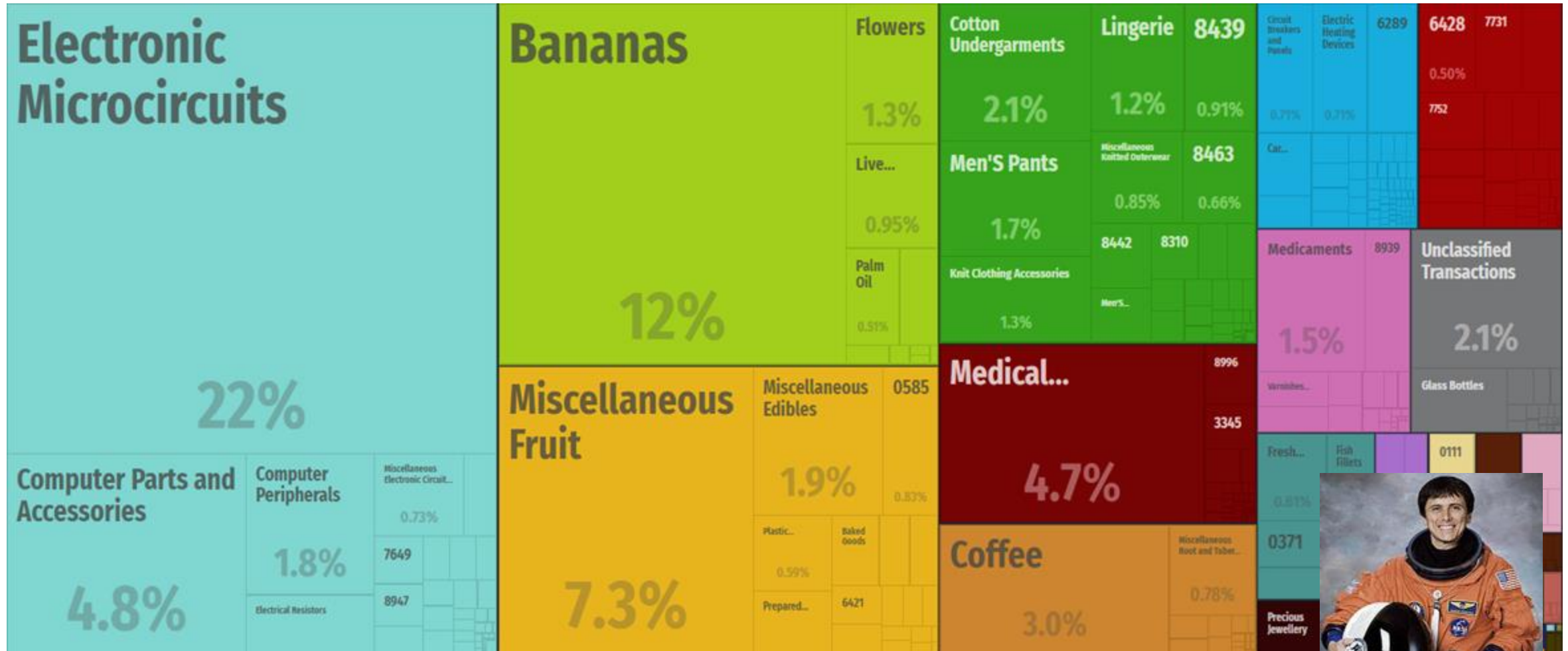
What does Costa Rica export in 1980?

Same year as shuttle first flight



What does Costa Rica export in 2002?

Same year as Dr. Chang last flight!



Source: The Observatory of Economic Complexity
<https://atlas.media.mit.edu>

What does Costa Rica export in 2016?

Creation of the Costa Rica Aerospace Cluster



Source: The Observatory of Economic Complexity
<https://atlas.media.mit.edu>

Space research, development, education and
promotion of space in Costa Rica

Chagas disease experiment with Costa Rican participation: (implemented in space by Costa Rican/American Astronaut Franklin Chang



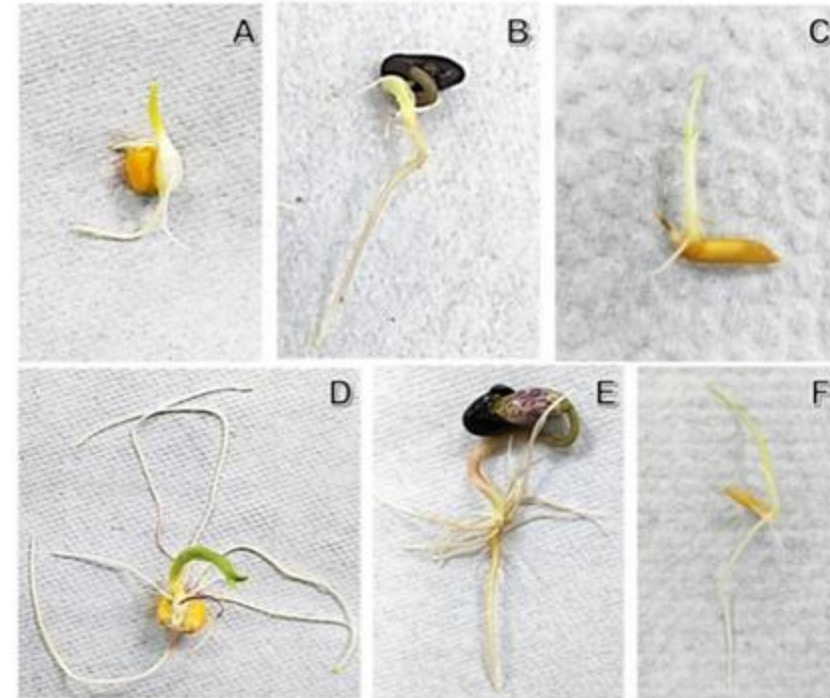
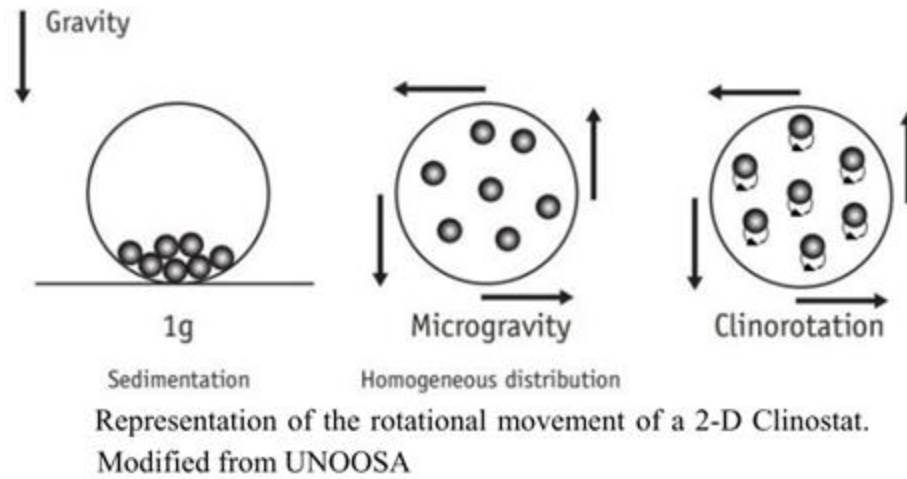
Drop Tower Experiment (TEC/UCR/UNOOSA)

DropTES, Series III: Experiment by Costa Rican Team at
ZARM Microgravity Tower



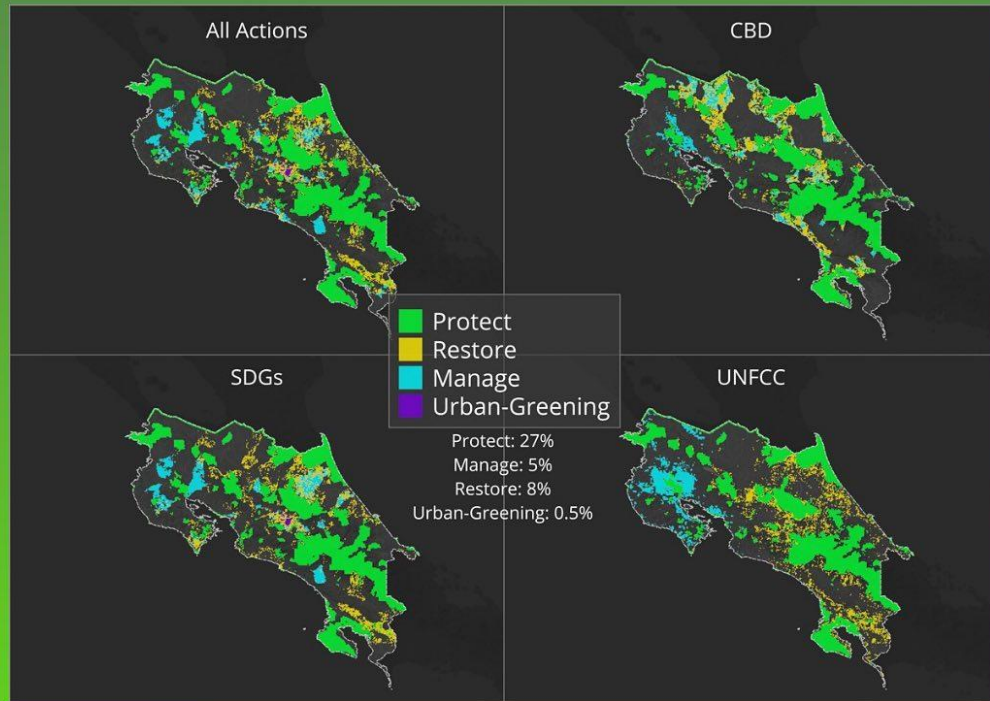
Team during experiment integration in Bremen: (from left to right) Moacir Fonseca, Dr. Renato Rímolo, Carlos Mayorga, Nicole Chaves y Ernesto Corrales. Courtesy of T. Könemann, ZARM.

Clinostat experimentation (LANOTEC/UNOOSA)



Seeds of maize (*Zea mays*), beans (*Phaseolus vulgaris*) and rice (*Oryza sativa*), exposed to two different conditions of rotation and their respective control. **A. B** and **C**. Micro-g. **D. E** and **F**. Control. A two-dimensional clinostat (2-D) was used. Next conditions were considered: temperature at 23°C, humidity at 80% and 15 rpm. Plants were grown up until the 8th day

Mapeo de la naturaleza para crear un marco global de biodiversidad



From 2003, work class operations in space images analysis. Strong cooperation with NASA, DLR, ESA and more



Asociación Centroamericana de Aeronáutica y del Espacio (ACAÉ)
Simposio Aeroespacial Centroamericano
 Tecnología Aeroespacial colaborando con la nueva normalidad

Organiza



Patrocinan



Invitan



Sab. 7, 14 y 21 Nov. 9am - 4:30pm (GMT-6) <https://forms.gle/tdoX5g4Dtx87Yg2a7>

Le invitan al:

**Central American Space Generation Workshop
Costa Rica 2019**

Fecha:
22 y 23 de Febrero 2019

Lugar:
Auditorio del Colegio Federado de Ingenieros y de Arquitectos (CFIA),
San José, Costa Rica

Costo de Inscripción:
Estudiantes: \$50
Jóvenes Profesionales: \$100

Inscripción:
spacegeneration.org/casgw2019

Informes: valeria.alfaro@spacegeneration.org andres.felipe.arias@spacegeneration.com moacir.fonseca@spacegeneration.org

Asociación Centroamericana de Aeronáutica y del Espacio

**AEROESPACIO
EN TU CASA**

Introducción a Cohetería
Ing. Esteban Jiménez

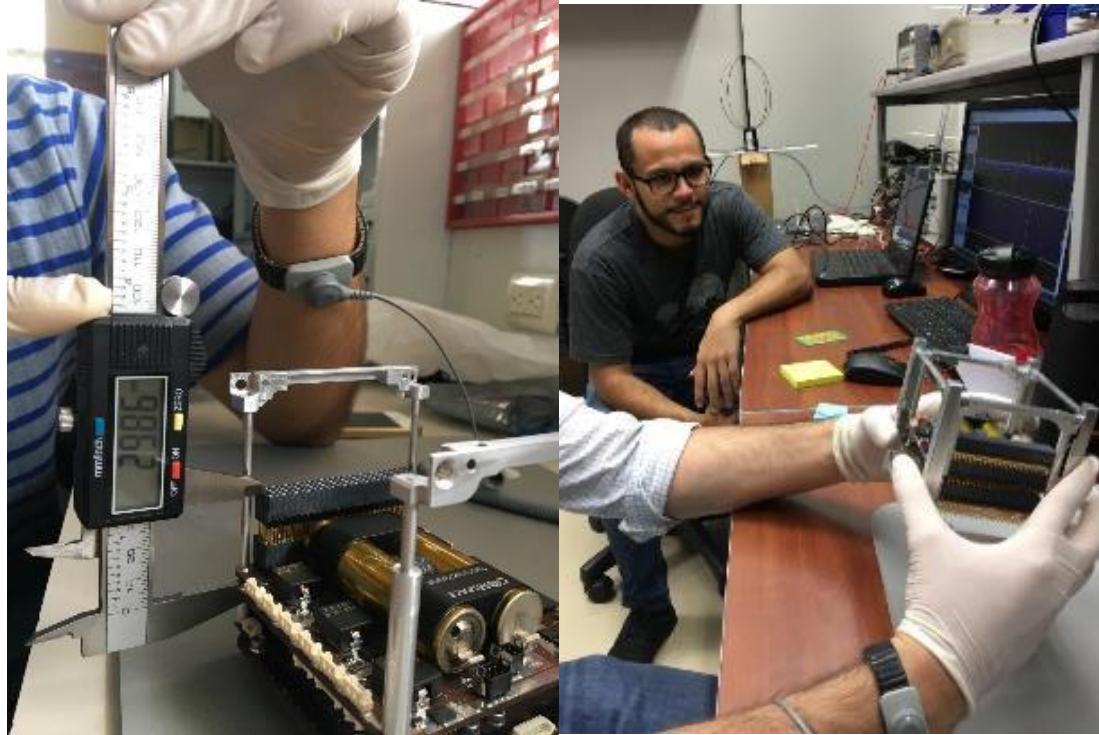
Martes 19 de enero, 2021
 6:30pm

CubeSat project (ACAE/TEC/Kyutech)



<https://www.tec.ac.cr/proyectos/proyecto-irazu>





Student Groups

University student groups	International organization with presence in Costa Rica
  Costa Rica Institute of Technology University of Costa Rica	  SPACE GENERATION ADVISORY COUNCIL

Students work

- Rocketry (UCR-TEC)
- Polaris conceptual mission: searching for conditions for life in Saturn. Participation from France, United States and Costa Rica. Lead by Costa Ricans.
- UNISEC World Mission Idea Contest (MIC) (UCR-TEC)
 - Winners 2019
- Group that won MIC created a startup “Orbital Space Technologies” to enable organizations to create biological experiments to be placed in space.



Mission Idea Contest (MIC)
December 3, 2019 · ...

Winners of MIC6

Category A: ICECubes

1st Place: MUSA: An ISS Experiment for research of a dual culture for Panama Disease, Costa Rica Institute of Technology(TEC)

Student Prize: MARGE Melanoma Apoptosis Reduced Gravity Experiment, Sapienza University of Rome

Category B: iSEEP

1st Place: Spectrum Monitoring from Space with i-SEEP (SMoSiS), University of the Philippines Diliman

Student Prize: Mountain VIEWS (Mountain Volcanoes Identification and Early Warning System, Telkom University)

IAA Award: MUSA: An ISS Experiment for research of a dual culture for Panama Disease, Costa Rica Institute of Technology



18 de Septiembre 2019 Por: Geovanni Jiménez Mata

Vida Estudiantil Investigación



La estudiante Fiorella Arias, de Ingeniería en Biotecnología, es parte del proyecto del grupo TECSpace. En la imagen, manipula la placa con los hongos que forman parte de su investigación. Foto: Geovanni Jiménez/OCM.

Clúster de 34 empresas superaría los \$100 millones en exportaciones

Industria aeroespacial costarricense amigable a la innovación



www.costaricaaerospace.com

AVIGNYX

Member:



SGCR
Sensor Specialists



Zollner

NUS
Machine Shop

PRECISION



tact:

eban Carrillo

esteban.carrillo@costaricaaerospace.com

Situation until 2021

**MICITT
RECTOR**

**CONIDA
Decreto 36102-RE-MICITT
25 de julio 2010**

**Laboratorios de
Sistemas Espaciales
TEC**

CeNAT

**Laboratorios y Grupos de
UCR**

**Cluster Aeroespacial
de Costa Rica**

Costa Rican Space Agency



DIPUTADA AIDA MARÍA MONTIEL
presenta
PROYECTO DE LEY DE CREACIÓN DE LA AGENCIA ESPACIAL COSTARRICENSE





**Dr. In fieri
Adolfo
Chaves Jiménez**
CONTEXTO Y NECESIDADES
EN EL ÁREA ESPACIAL EN
COSTA RICA



**Dr. In fieri
Johan
Carvajal Godínez**
INDUSTRIA ESPACIAL 4.0
MOTOR DE DESARROLLO
COSTARRICENSE

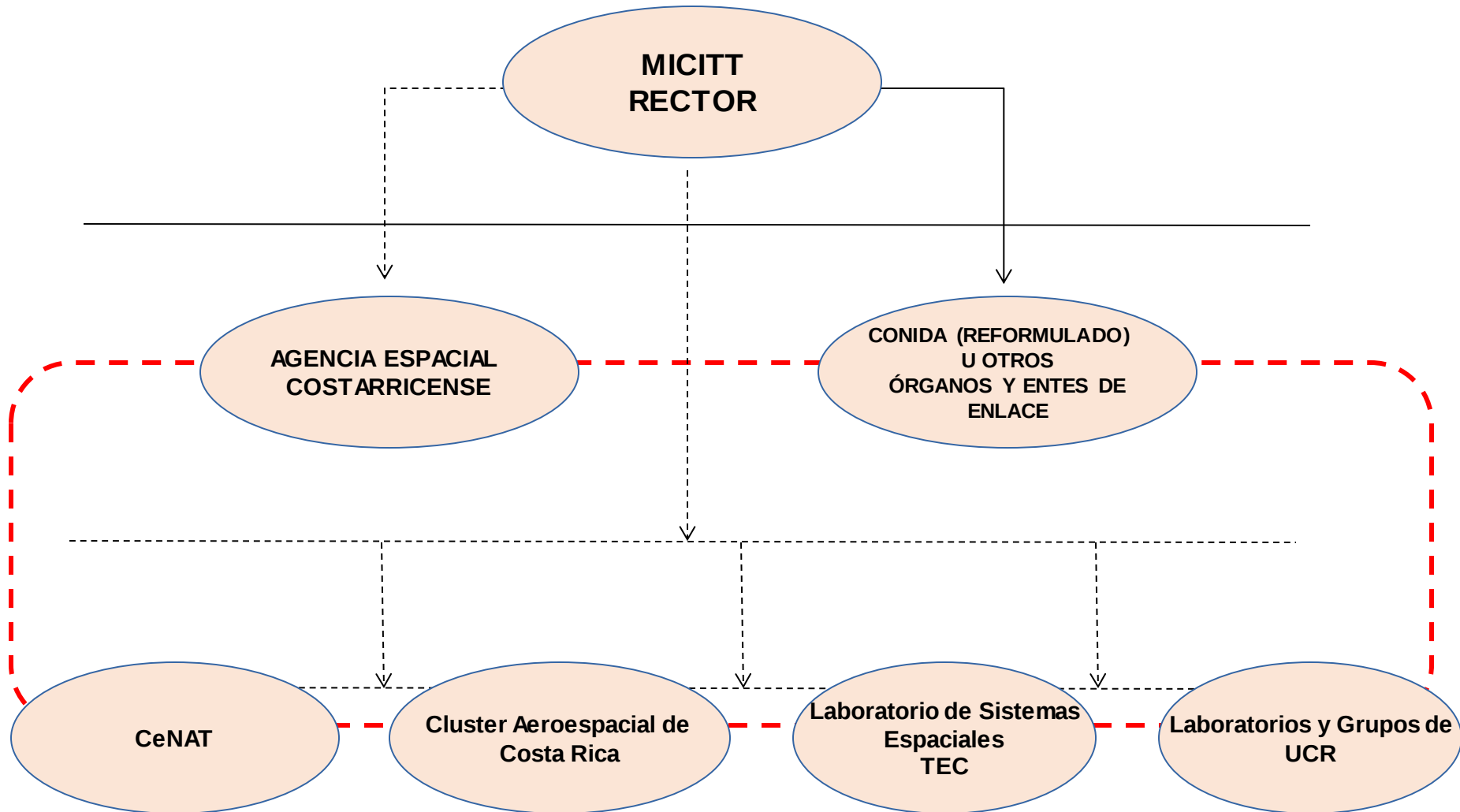


**Dr.
Eldon
Caldwell Marin**
CONTENIDO E
IMPLICACIONES DEL
PROYECTO DE LEY

EXPOSITORES Y PONENCIAS

📍 Salón de Expresidentes y Expresidentas de la República, Asamblea Legislativa
🕒 08 de abril del 2019 | 4:00 p.m.
RSVP: 2531-6578

Costa Rican Space Organization



Why is Costa Rica creating a Space Agency?

Needs

- Costa Rica joined COPOUS
- Subscribe agreements with other agencies
- No official advisor for space matters for the government
- Costa Rica subscribed the ALCE Agreement (Latin American Space Agency)

Opportunities

- Geographical location
- Diversify high value industries development
- Cooperation with countries with complementary capabilities
- Take advantages of the opportunities related to ALCE

What are the competitive
advantages of Costa Rica
with respect to space
research and development?





April 22th
2021

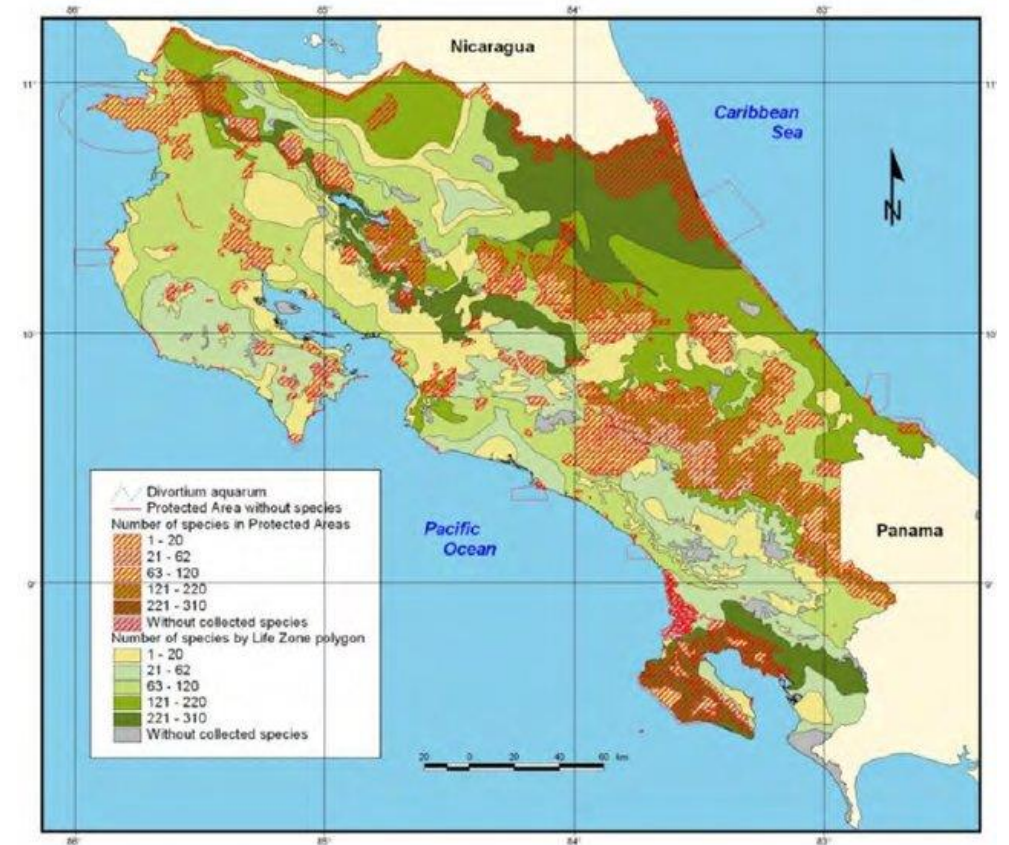


Biodiversity and biotechnology



<https://ticotimes.net/2020/12/01/places-to-visit-in-costa-rica-in-2021>

- Costa Rica is considered the most biodiverse country per area in the world by some standards



Overall species richness ranks, based on the totality of the studied groups and their overlap with the established protected areas. Areas in grey represent zones where no collecting has been undertaken. Divortium aquarum = watershed divide.

Reference:

https://www.researchgate.net/publication/221918038_Biodiversity_Conservation_in_Costa_Rica_-_An_Animal_and_Plant_Biodiversity_Atlas/figures

What is limiting Costa Rica creating a Space Agency?

Limitation

- Financing costs
- Lack of space infrastructure
- Lack of specialized human resources

Challenges

- Avoid the obstaculization that bureaucracy often creates
- Avoid duplication of capabilities in the government
- Depends highly on international cooperation
- Show the general public the benefits of space engineering for society in a developing country

Costa Rican Space Agency: Vision 2021

Becoming a international model of articulation and cooperation for research, development and innovation in the space area, contributing to the achivement of the UN SDG for social and environmental benefit.

SUSTAINABLE DEVELOPMENT GOALS



Implementation

Starting points

- AEC as a catalizer, not a bureocrating burden,
- No permanent expenses, no new taxes,
- Creation of a facility to promote space engineering in Guanacaste,
- Ability to sell services,
- Ability to receive contributions easily,
- Use the existing infrastructure (do not duplicate),
- AEC becomes the technical advisor of the government on space related matters,
- The agency is created from its conception to take advantage of the oportunities of space 2.0.

Initial investment by the government

How does it start

- There will be an initial, non permanent investment from the government
- No new expenses or taxes created
- But... the agency shall have a financing source by law

How is it implemented

- The agency will receive a percentage of the resources not expended and not compromised from certain institutions from the government
- Financing happens for five years only
- Current calculation: 5 M\$ for all 5 years

AEC: Sources of sustainable income

**Geographical location:
Remote operations and launches**



**Cooperation at international level.
Example: biodiversity research**



**Education, promotion of STEM:
Air and Space Museum**



AEC: Guanacaste Space Center

Presence of Ad Astra and LeoLabs

Proposals for the creation of industrial zones dedicated to aerospace engineering

Dry weather, excellent line of sight, access to an international airport

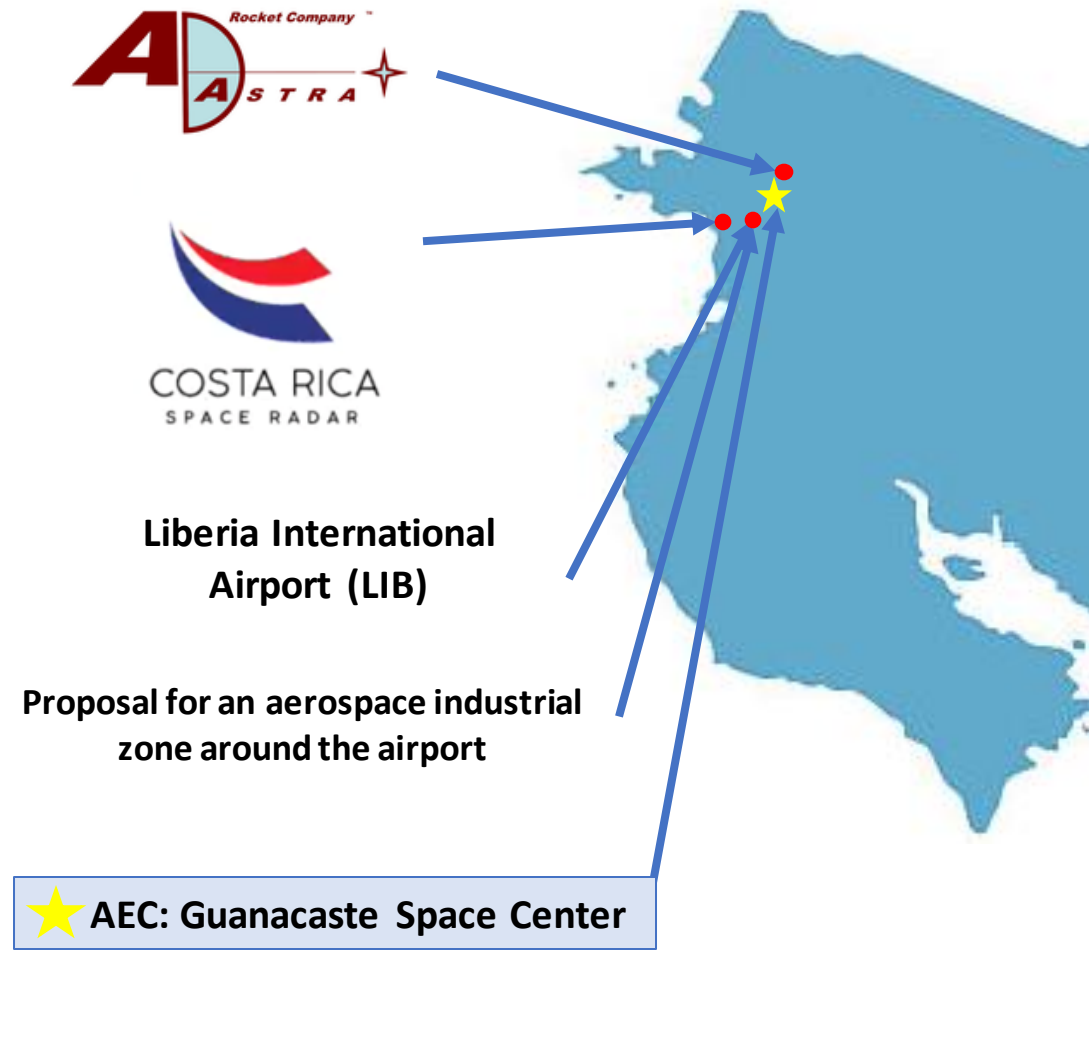
Promotion of high value industry in an area highly dependent on tourism

Government vision to 2050: area focus on aerospace development

Potencial for space tourism

To implement:

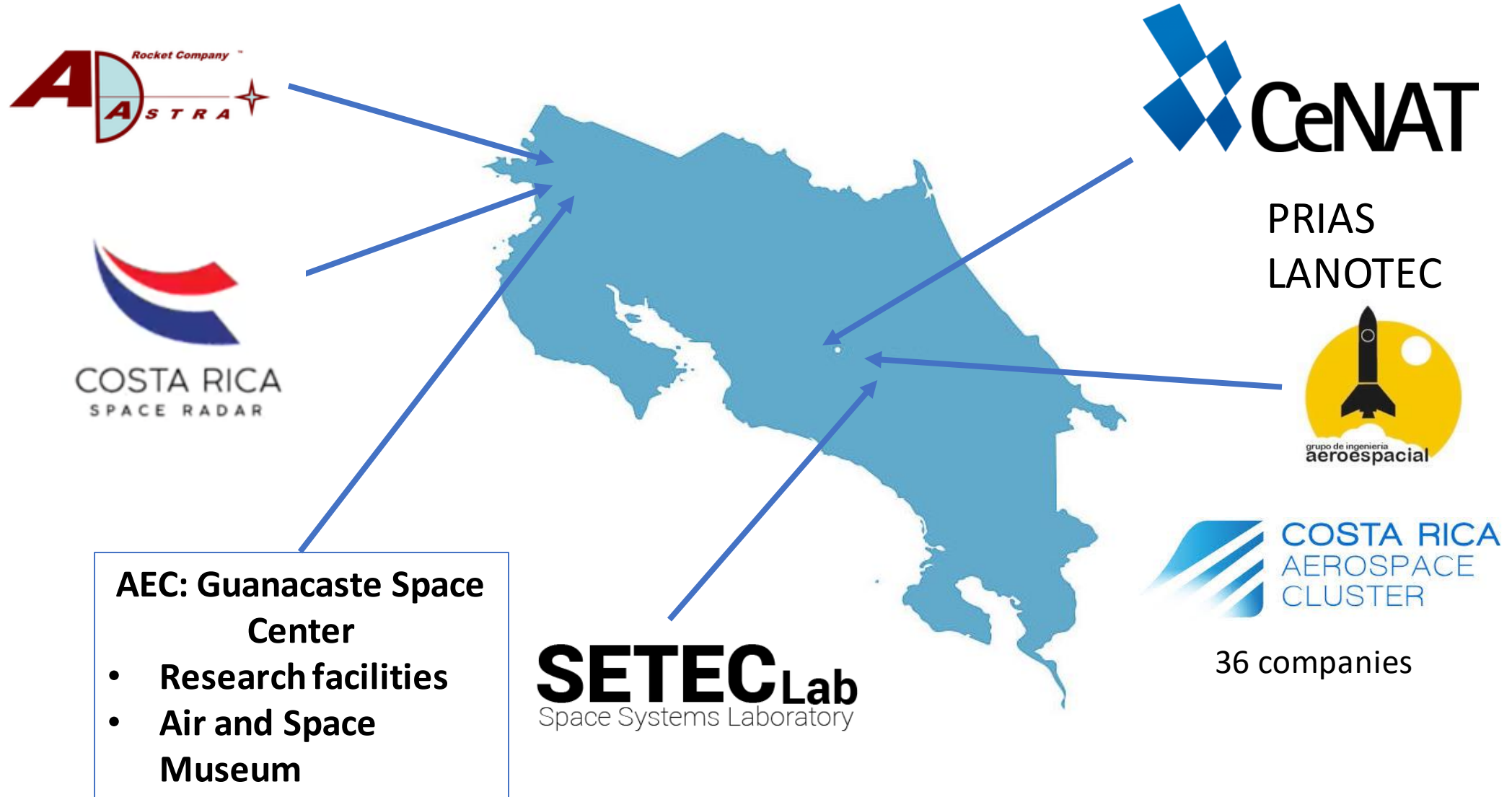
- Research facilities
- Remote operations for international partners
- Air and Space Museum
- Capabilities to be used by startups (e.g. clean room)



AEC: The governance model

	Private	Public/ maximum decentralization	Public/ autonomous	Public/ centralized
Independent				
Easy to do business	✓	✓	✓	✗
Easy to receive donations	✓	✓	✗	✗
No permanent government expense	✓	✓	✗	✗
Represents government	✗	✓	✓	✓
No new infrastructure	✗	✗	✗	✓
Example	CINDE	PROCOMER	Public Universities	Office from MICITT

AEC: potentiate current infrastructure



AEC Directive Board (5 members)

- President: the ministry of Science, Technology and Telecommunications
- Representative from
 - the space industry,
 - the Ministry of Foreign Relations,
 - the Civil Aviation Administration,
 - the public universities.



2021: Litoff!

Law approval
February 18th



Image source: Delfino.cr

Law signature
March 27th

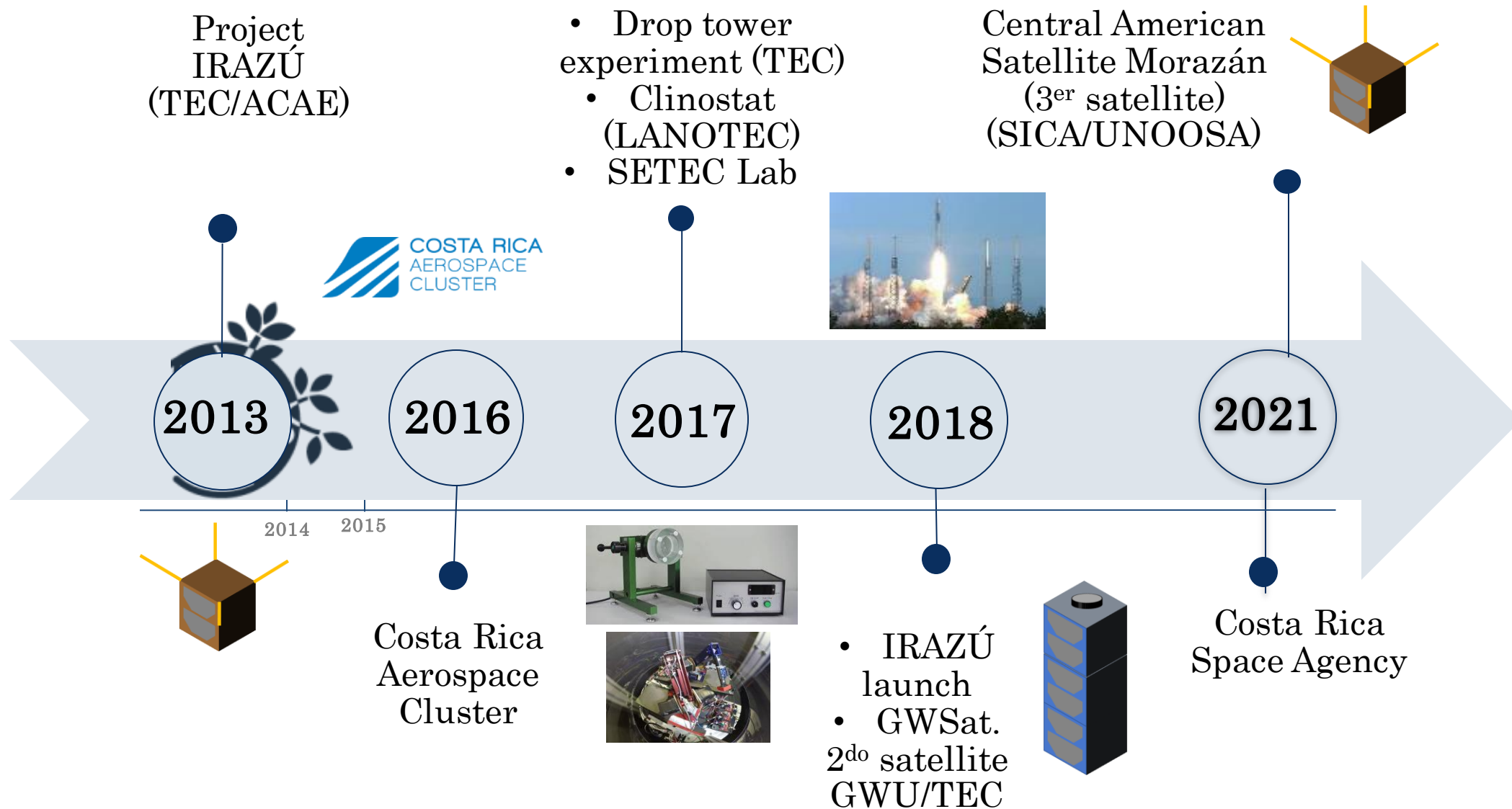


Image source: <https://www.elmundo.cr>

First meeting of the Directive Board
August 5th



Costa Rica: past, present and future





Thank you!

<https://www.tec.ac.cr/unidades/laboratorio-sistemas-espaciales>

<https://www.facebook.com/SETTECLab/>

<https://www.researchgate.net/project/SETec-Laboratory>