



GISTDA

สำนักงานพัฒนาเทคโนโลยีอวกาศและภูมิสารสนเทศ (องค์การมหาชน)
GEO-INFORMATICS AND SPACE TECHNOLOGY DEVELOPMENT AGENCY (PUBLIC ORGANIZATION)

UN virtual event on Space Sustainability
25 February 2021

Operational case-studies at GISTDA

Sittiporn Channumsin
Chief of Astrodynamics Research Laboratory (AstroLab)
Geo-Informatics and Space Technology Development Agency (GISTDA)

 www.gistda.or.th

 GISTDA

 GISTDA_Space

 gistda_space

 gistdaspace

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Outline

- Introduction
- Operational case-studies
 - Registration of space objects launched into outer space.
 - Safety of space operations
- Lesson Learned

Introduction

Geo-Informatics and Space Technology Development Agency (Public Organization): GISTDA

Headquarter

The Government Complex, Bangkok



Ground control station and research center

SPACE KRENOVATION PARK, Chonburi

Space and GIS Training Center

Bang Khen, Bangkok



Innovation Units @SKP

GALAXI : Aerospace Structures and Materials



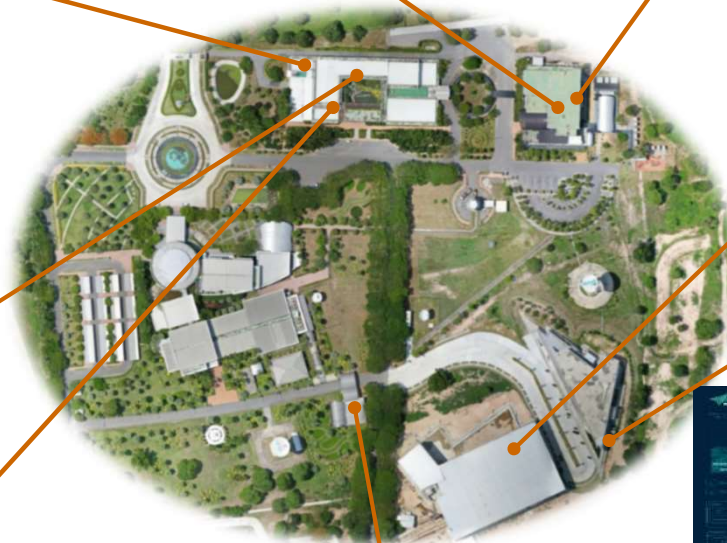
SCGI : Geo-informatics center



SOAR : Air-Space Management and Mission Planning



SPACE Inspirium : Space Learning Kingdom



GINNO : GNSS Innovation Center
GNSS INNOVATION CENTER

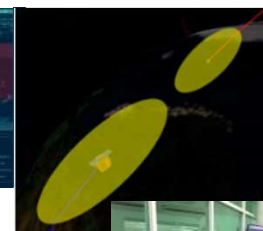
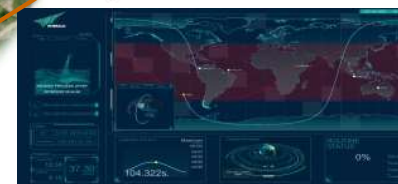


AIT : Satellite Assembly Integration and Test



ASTRO LAB

Astrodynamic Research Laboratory



SPACE INNOVATION PROJECTS

Space Innovation Projects : In-house Ground - Satellite Innovation





Operational case-studies

1.Registration of space objects launched into outer space.

The Implement of LTS Guidelines in Thailand

National Registry Information

- Thailand is not a party to the Convention on Registration on Objects Launched into Outer Space; Registration convention (1975).
- However, Thailand complied with the Resolution 1721 B (XVI) by having voluntarily registered the Satellite of Thailand Earth Observation System (THEOS) to UNOOSA.

A/AC.105/INF/419/Add.1	
Annex	
Registration data on an object launched into space by Thailand*	
International designator:	2008-049A
Name of space object:	Thailand Earth Observation Satellite (THEOS) ("Thaichote")
Name of launching State or States:	Thailand and Russian Federation
Date of launch:	1 October 2008
Location of launch:	Yasny, Russian Federation
Orbital parameters:	
Nodal period:	101.4 minutes
Inclination:	98.7 degrees
Apogee:	822 kilometres (sun-synchronous orbit)
Perigee:	822 kilometres (sun-synchronous orbit)
General function:	Earth observation
Operating agency:	Geo-Informatics and Space Technology Development Agency (Public Organization), Ministry of Science and Technology, Thailand

Registration of space objects

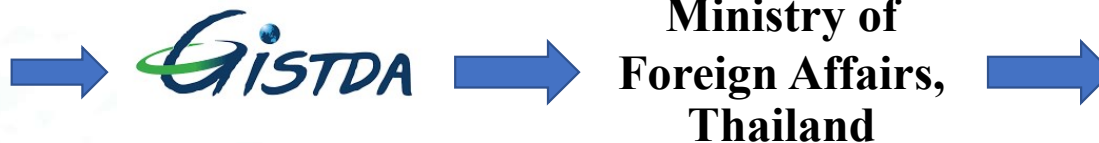
➤ The Procedure of Objects Launched into Outer Space Submissions (2020)

Responsible / Authority:

- Geo-Informatics and Space Technology Development Agency (GISTDA)
- Ministry of Foreign Affairs


Satellite owners

The image shows a sample of the United Nations Registration of Objects Launched into Outer Space form. It is a detailed document with multiple sections for providing information about the space object, including its name, purpose, and launch details. The form is titled 'United Nations Registration of Objects Launched into Outer Space' and includes a note about its use for registration purposes.



The image shows a document from the United Nations General Assembly, specifically A/AC.105/INF.419. It is titled 'Information furnished in conformity with General Assembly resolution 1721 B (XVI) by States launching objects into orbit or beyond'. The document is dated 27 January 2009 and is addressed to the Secretary-General. It contains information about the launch of the Thai Earth Observation Satellite (THEOS) on 1 October 2008.

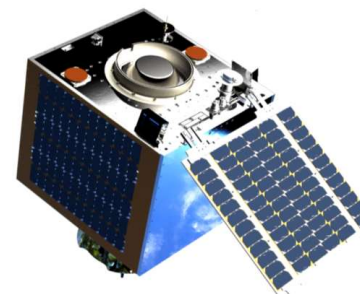
Example of Thailand's objects launched into Outer Space (LEO)

	 <p>Thailand Earth Observation System (THEOS)</p> <p>THAICHOTE (Launched: 1 October 2008) Completed Registration</p>	<p>A high-performance optical Earth Observation satellite</p>
	 <p>Nanosatellite</p> <p>NAPA-1 (Launched: 3 September 2020) In process to Complete Registration</p>	<p>6U-CubeSat satellite</p>
	 <p>Nanosatellite</p> <p>BCCSAT-1 (Launch scheduled: Early 2021) In process to Complete Registration</p>	<p>An Educational Multispectral 1U-CubeSat</p>

Future Planned Objects Launch into Outer Space



NAPA-2



THEOS-2 (Small SAT)



Operational case-studies

2. Safety of space operations



AstroLab introduction



Mission

1. Research areas

- 1.1 Space flight dynamics
- 1.2 On-board flight software for small satellites
- 1.3 Space debris and asteroid
- 1.4 Space weather

2. Cooperate and build Network/Cluster to research and develop space technology both on local and global level.

3. Academic services: (development of space course modules and space application lectures)

4. Support and provide solutions for space industries.



COSPAR Member News

Thailand's AstroLab, an Important New Player in SE Asia, to Focus on 4 Essential R&D Topics

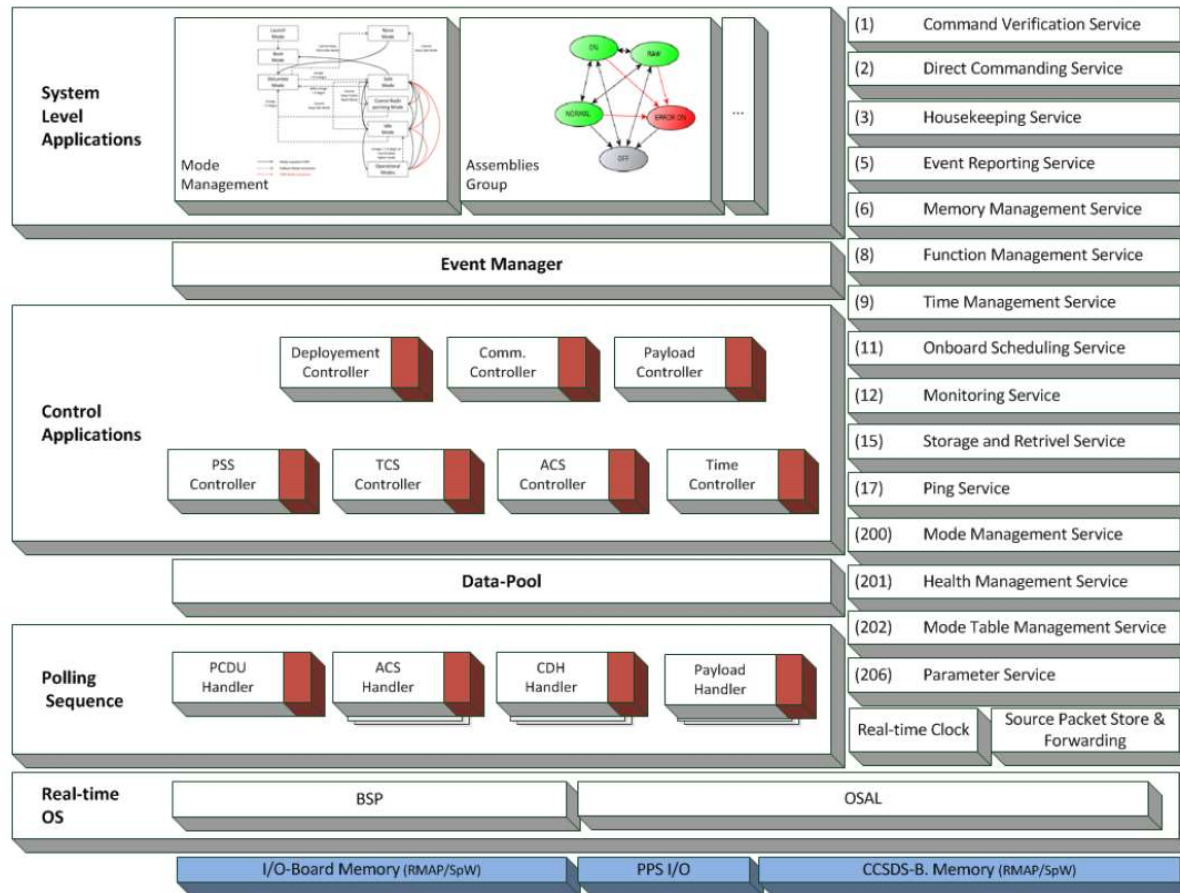
GISTDA (Geo-informatics and Space Technology Development Agency) initiates the Astrodynamics Research Laboratory, or "AstroLab" at Space Krenovation Park, Chonburi Province, Thailand. The AstroLab is expected to be the complete research and development center on astrodynamics and space technology innovation in Thailand and Southeast Asia region. The AstroLab team (pictured below) focuses on four essential R&D parts, find out more [here](#).

Team



Current projects

1. Onboard Fight Software



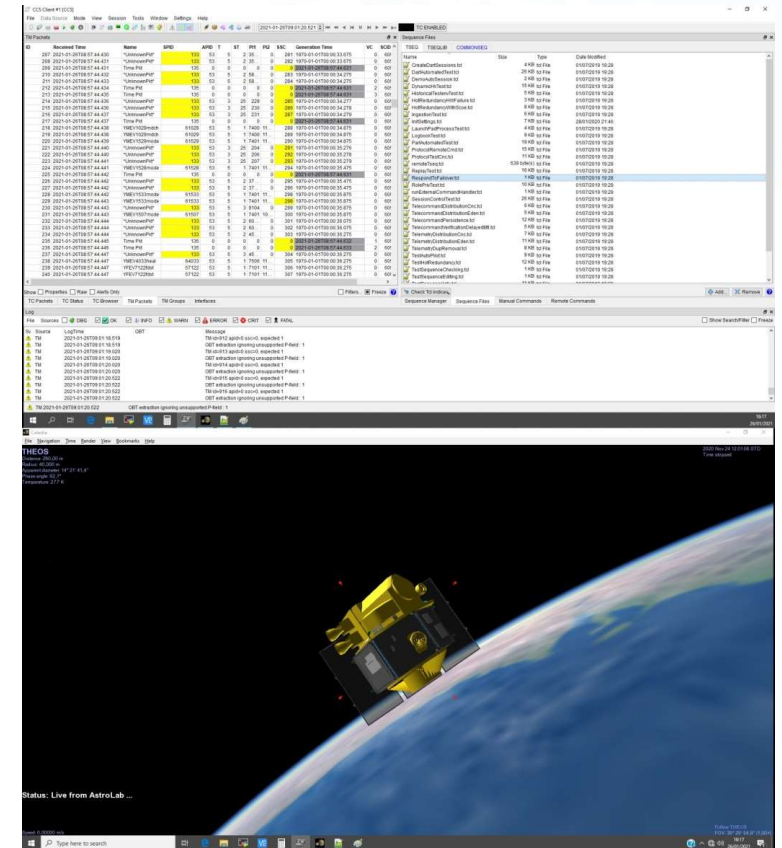
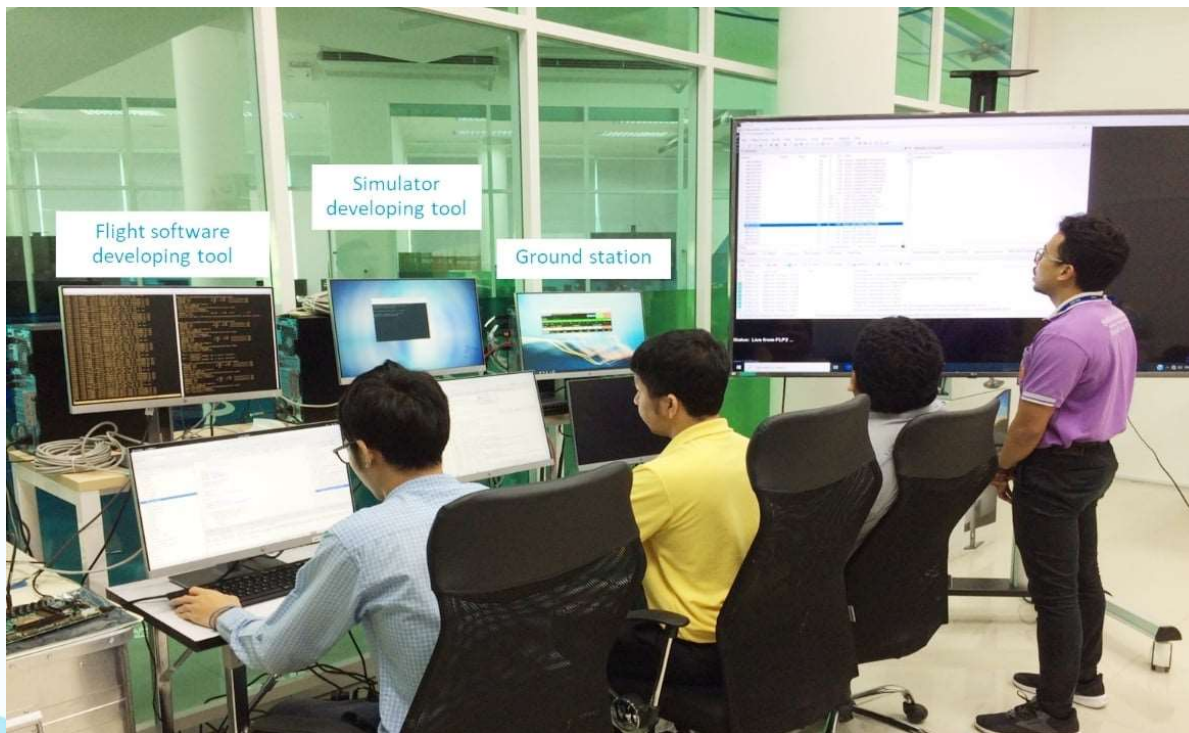
Credit : Eickhoff, Jens (Ed.), "The FLP Microsatellite Platform – Flight Operations Manual", Springer, 2016

Onboard Computer

- GR712RC dual-core 32-bit fault tolerant LEON3-FT SPARC V8 processor
- SpaceWire Interface
- Radiation tolerant



Development tool



2. Space traffic management (ZIRCON)

Internal web page

The screenshot shows the ZIRCON dashboard with the following data:

Category	Value	Icon
OK Ephemeris	OK	Green box with a green icon
Space Object Category	20758	Blue box with a blue icon
Conjunctions	78	Yellow box with a yellow icon
Setting	10 km	Red box with a red icon

Internal web page

The detailed sidebar menu shown in the inset includes:

- ZIRCON by AstroLab
- sittiporn@gistda.or.th
- MENU
 - Ephemeris
 - Space Object Category
 - Conjunctions
 - Visual

Space traffic management (ZIRCON)

Browser address bar: 172.27.181.218/zircon/public/conjunction

Navigation: Home Contact

Conjunctions

Report

Show 10 entries Search:

Report ID	Sattelite	Estimate Start	Estimate Stop	Duration (Minunte)	Date Create	Tools
297	THEOS_Orbit_ephe_20210218_120000_20210227_120000-0.txt	2021-02-18 12:00:00	2021-02-25 12:00:00	8.39	2021-02-18 16:15:07	Q
296	THEOS_Orbit_ephe_20210216_120000_20210225_120000-0.txt	2021-02-16 12:00:00	2021-02-23 12:00:00	8.50	2021-02-16 16:15:20	Q
295	THEOS_Orbit_ephe_20210215_120000_20210224_120000-0.txt	2021-02-15 12:00:00	2021-02-22 12:00:00	8.52	2021-02-15 16:15:22	Q
294	THEOS_Orbit_ephe_20210214_120000_20210223_120000-0.txt	2021-02-14 12:00:00	2021-02-21 12:00:00	8.2	2021-02-14 16:15:29	Q
293	THEOS_Orbit_ephe_20210212_120000_20210221_120000-0.txt	2021-02-12 12:00:00	2021-02-19 12:00:00	8.55	2021-02-12 16:15:23	Q
292	THEOS_Orbit_ephe_20210211_120000_20210220_120000-0.txt	2021-02-11 12:00:00	2021-02-18 12:00:00	8.5	2021-02-11 16:15:32	Q
291	THEOS_Orbit_ephe_20210210_120000_20210219_120000-0.txt	2021-02-10 12:00:00	2021-02-17 12:00:00	8.6	2021-02-10 16:05:21	Q
290	THEOS_Orbit_ephe_20210208_120000_20210217_120000-0.txt	2021-02-08 12:00:00	2021-02-15 12:00:00	8.0	2021-02-08 16:40:50	Q
289	THEOS_Orbit_ephe_20210207_120000_20210216_120000-0.txt	2021-02-07 12:00:00	2021-02-14 12:00:00	8.58	2021-02-07 12:00:44	Q
288	THEOS_Orbit_ephe_20210206_120000_20210215_120000-0.txt	2021-02-06 12:00:00	2021-02-13 12:00:00	8.53	2021-02-06 23:58:35	Q

Showing 1 to 10 of 10 entries

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Space traffic management (ZIRCON)

ZIRCON by AstroLab

osa@gistda.or.th

MENU

- Ephemeris
- Space Object Category
- Conjunctions
- Visual

Home Contact

Conjunctions

Detail

Show 10 entries Search:

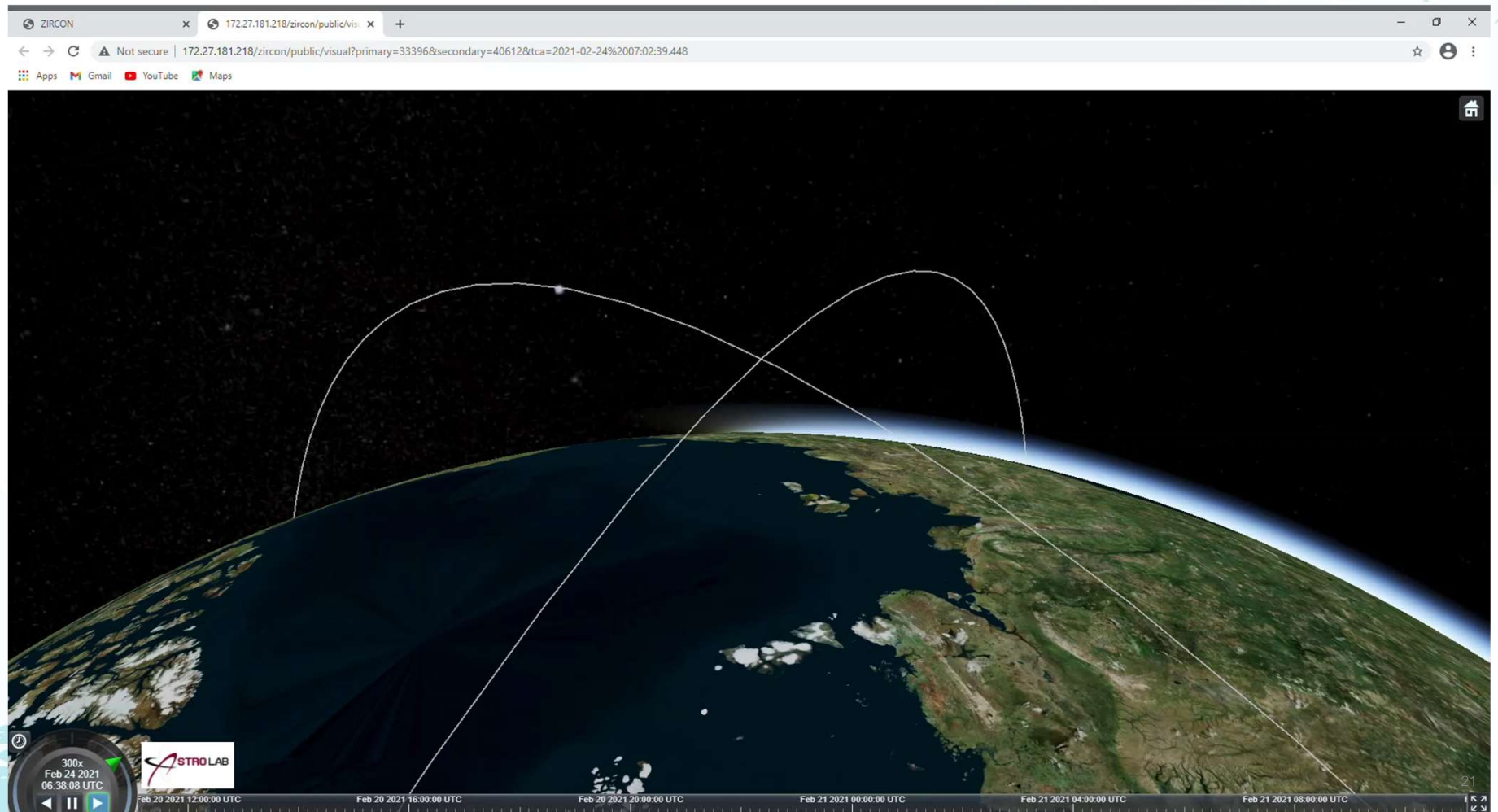
NORAD	TCA (UTC)	Miss distance (Km)	Probability	Method
39603	2021-02-19 12:50:53.418	9.391	3.7828e-7	MaxMethod
22816	2021-02-19 13:56:11.408	8.542	4.5606e-7	MaxMethod
22816	2021-02-19 15:37:38.670	8.048	5.1370e-7	MaxMethod
37241	2021-02-19 16:14:16.309	1.523	7.5671e-6	MaxMethod
37040	2021-02-19 17:58:22.644	4.928	4.7788e-7	MaxMethod
42671	2021-02-19 19:47:33.139	9.912	3.2568e-7	MaxMethod
31569	2021-02-19 21:43:09.302	4.962	1.3157e-6	MaxMethod
11166	2021-02-19 22:10:23.209	8.013	5.1905e-7	MaxMethod
36223	2021-02-19 23:03:19.573	2.382	4.0146e-6	MaxMethod
12257	2021-02-19 23:21:05.313	2.375	5.7762e-6	MaxMethod

Showing 1 to 10 of 75 entries

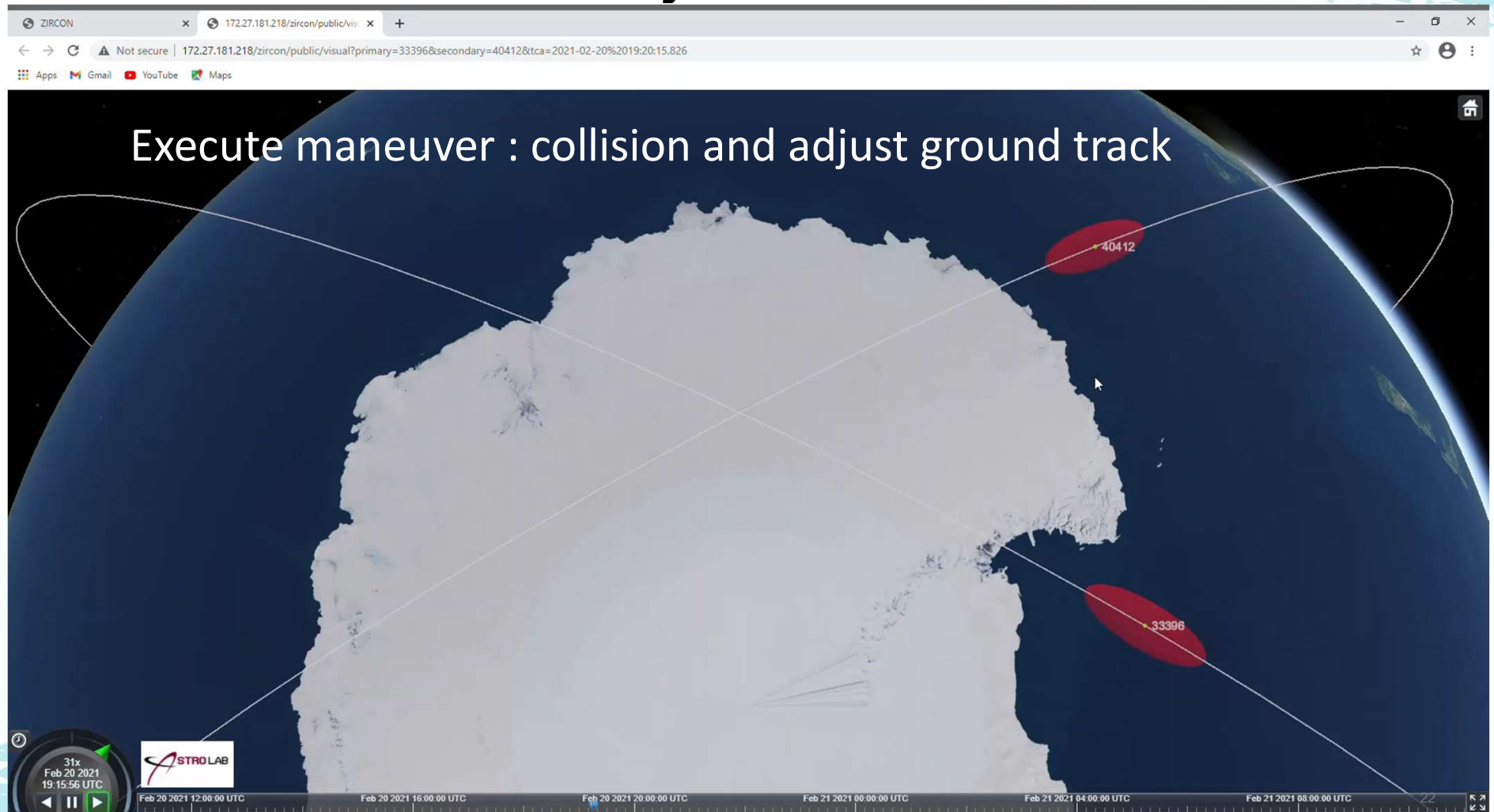
Previous 1 2 3 4 5 ... 8 Next

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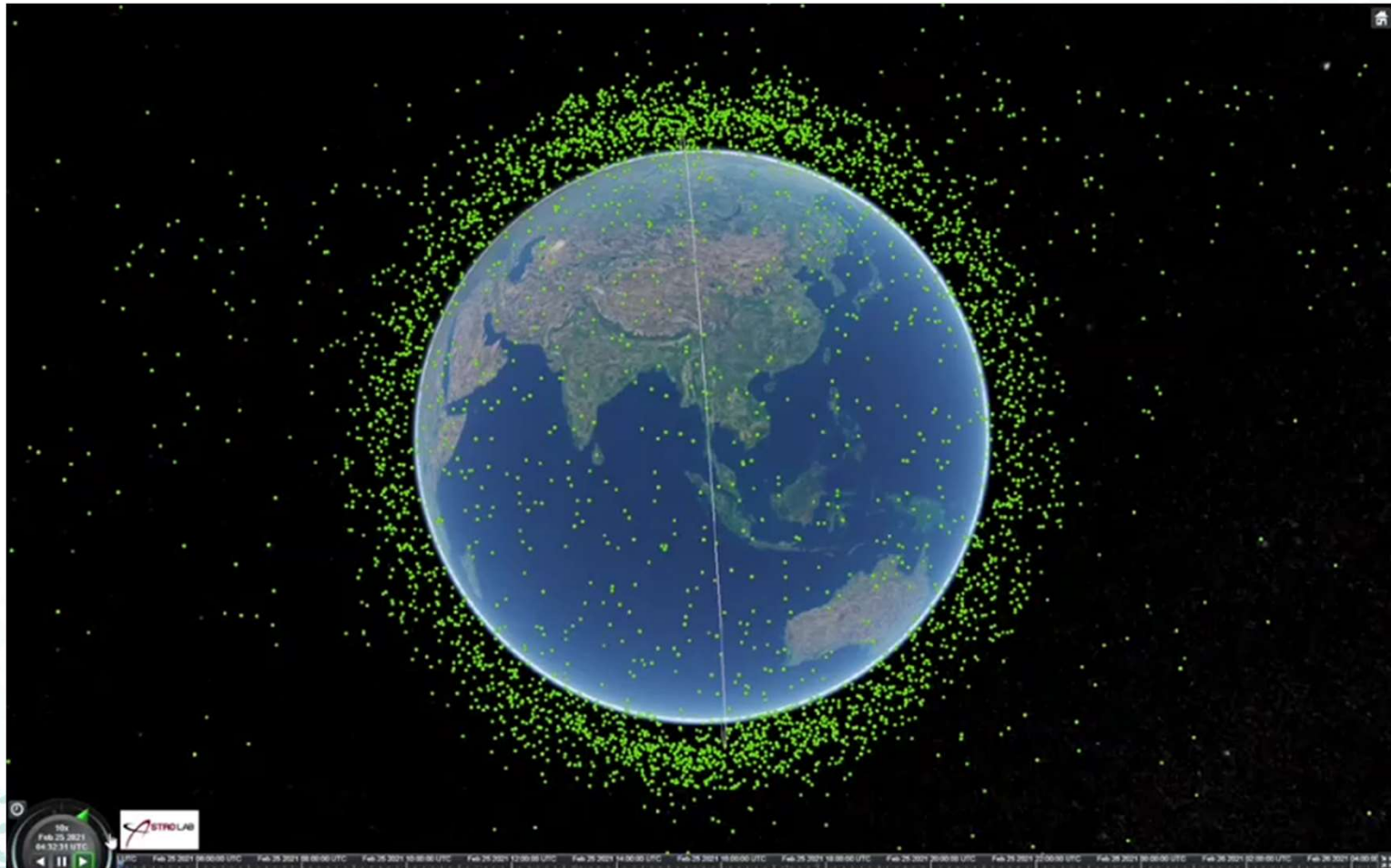
Conjunction visualization



Latest conjunction event



Visualization



Future development of ZIRCON

- Autonomous maneuver planning
- Radio frequency interference
- Space weather monitoring and forecast
- Launch and re-entry conjunction assessment

Connection with the LTS Guidelines

Current

- A.5: enhance the practice of registering space objects.
- B.4 Perform conjunction assessment during all orbital phases of controlled flight
- C.3 Promote and support capacity-building.

Near future

- B.5 Develop approaches for pre-launch conjunction assessment
- B.6 Share operational space weather data and forecasts
- B.7 Develop space weather models and tools and collect established practices on the mitigation of space weather effects

Lesson learned

Lesson learned

- **Registration of space objects launched into outer space.**

: the National Space Policy Committee (of Thailand) realized the importance of the registration. The endorsement of the procedure of objects launched into outer space submissions was officially approved by the cabinet of Thailand.

Safety of space operations

: The successfulness of this assurance on safety of satellite operation can be increase reliability of the operators for other space missions. ZIRCON can be one part to support full international space traffic management system in the future and promote the adopted LTS Guidelines with practices implemented by a developing country.

Thank you for your attention



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Geo-Informatics and Space Technology Development Agency (Public Organization)



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