

Emergence of Small Satellite Industry and the Impacts on Space Sustainability



by Ts UMA SHANGERY ARULDASS

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TO KNOW ME



Our Sharing Session Today

- Space
- Small Satellite Industry
- Space Sustainability
- Malaysia and Small Satellite
- Research findings
- Call to Action





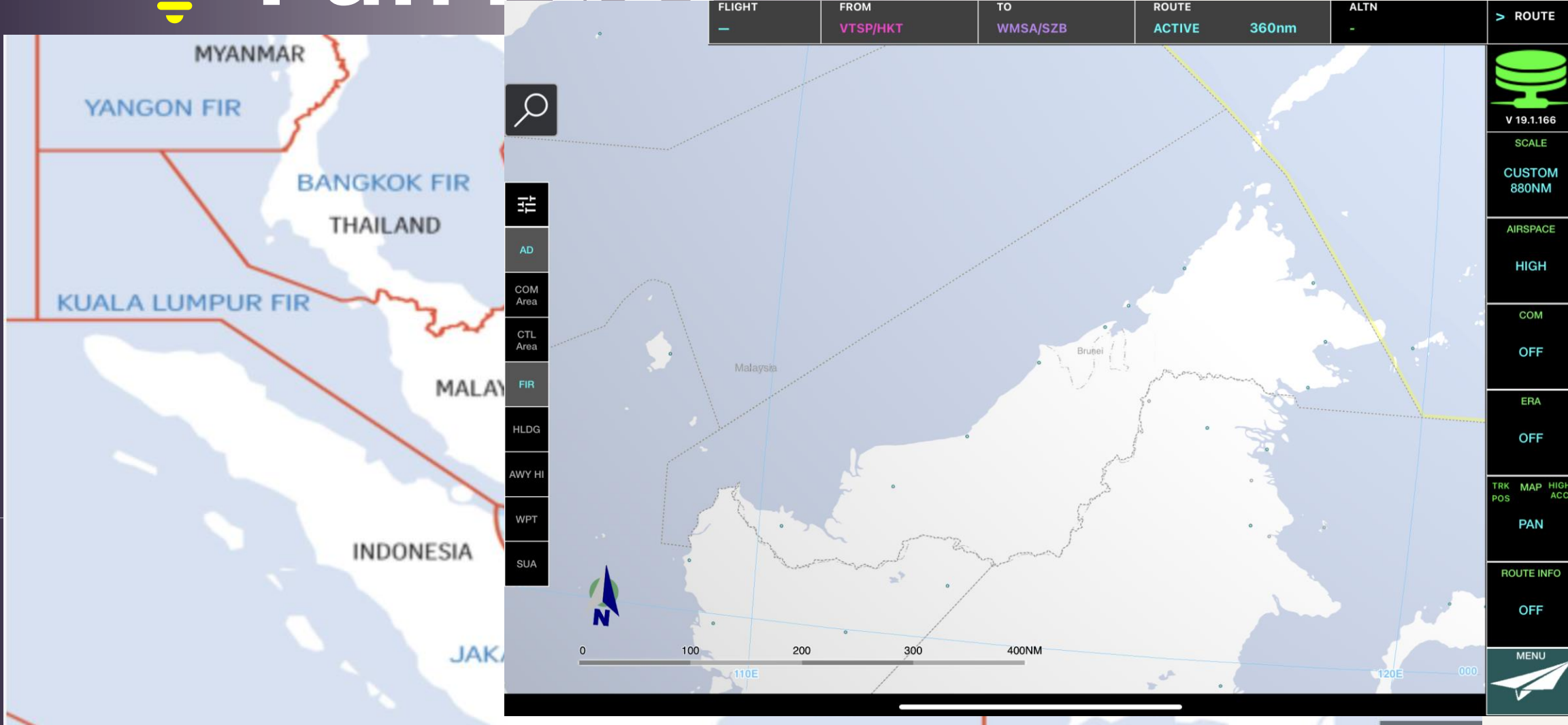
SPACE

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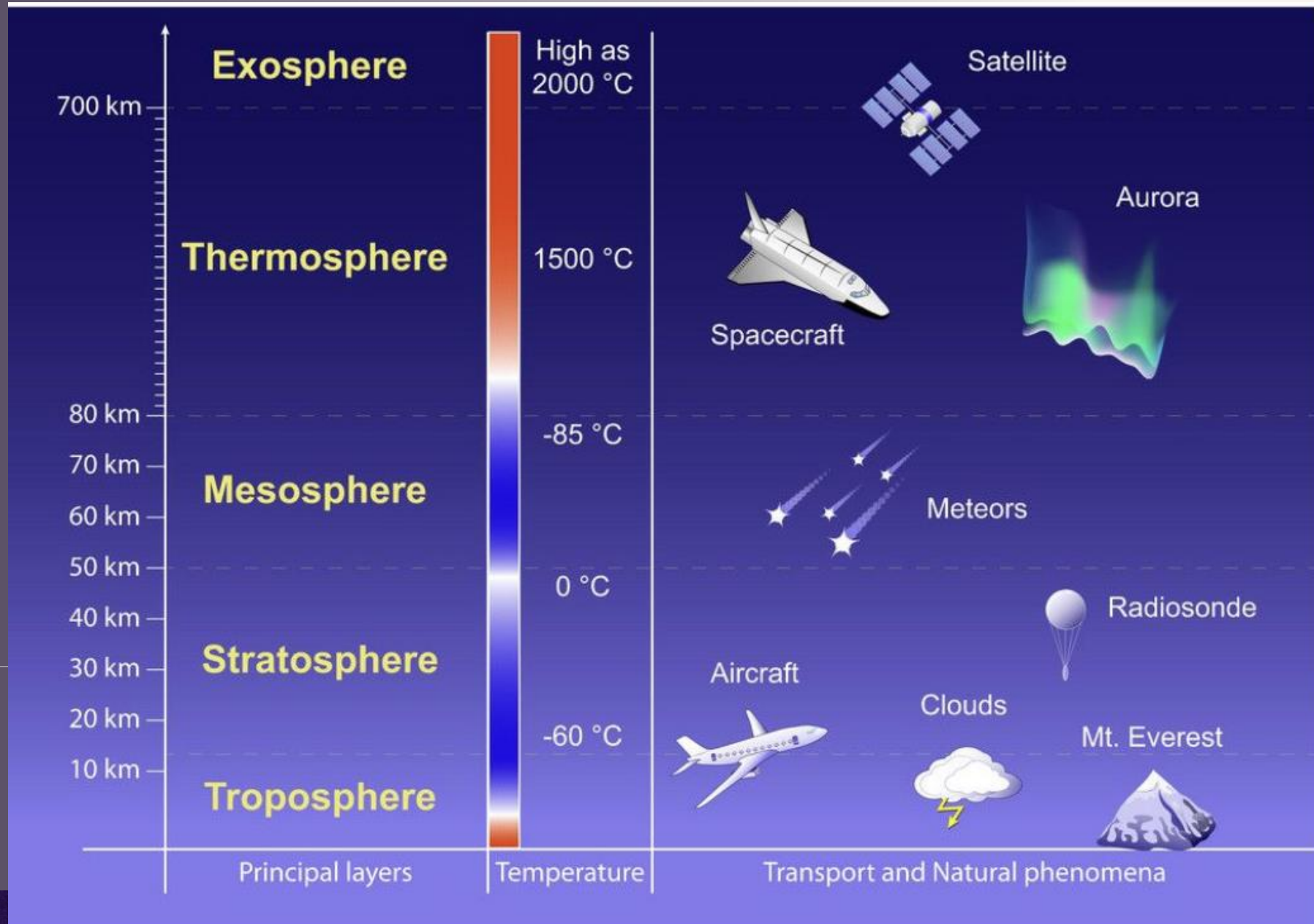




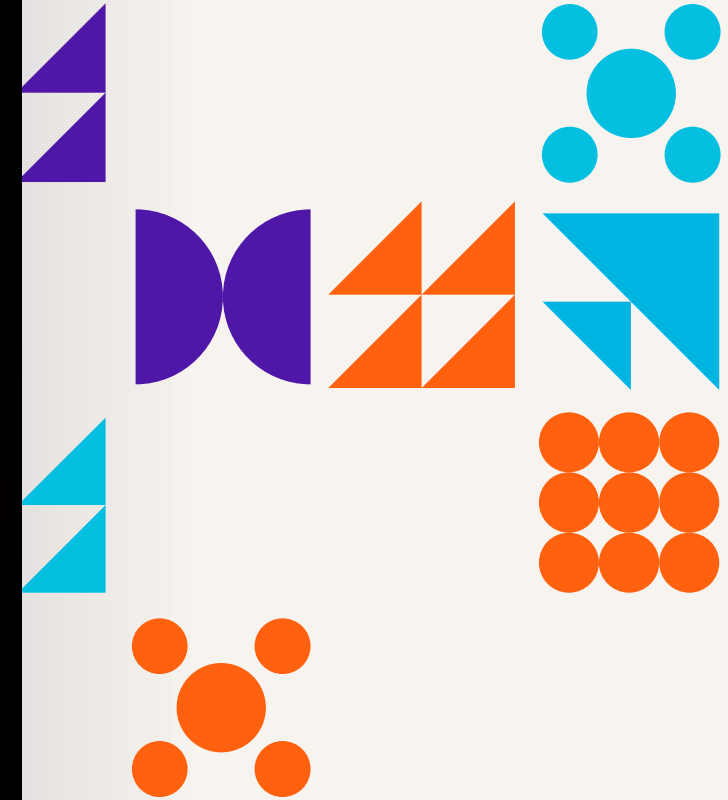
Fun Fact



Layers of Space

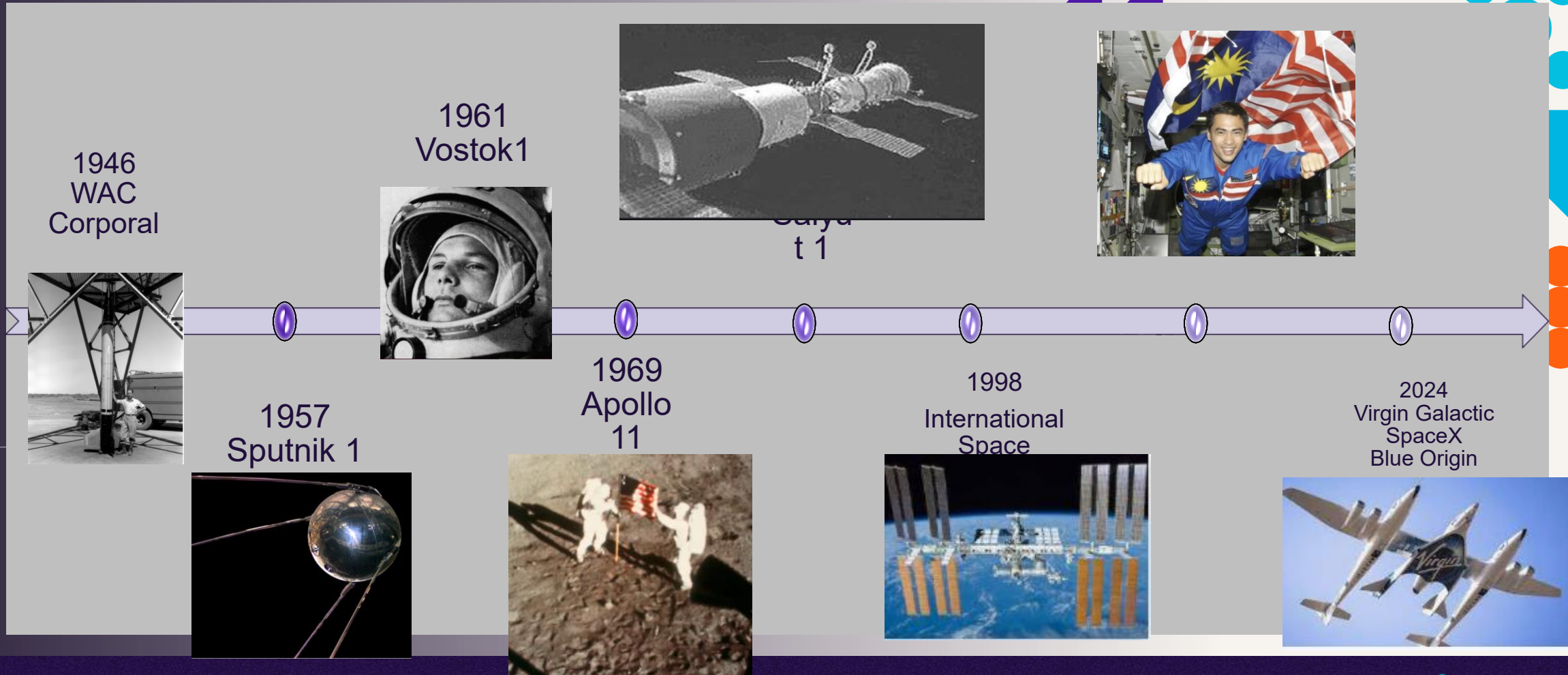


Earth before 1957

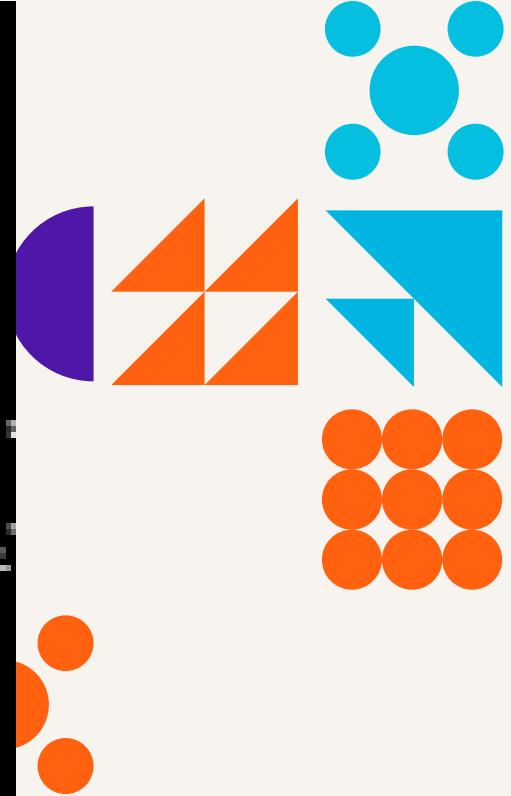
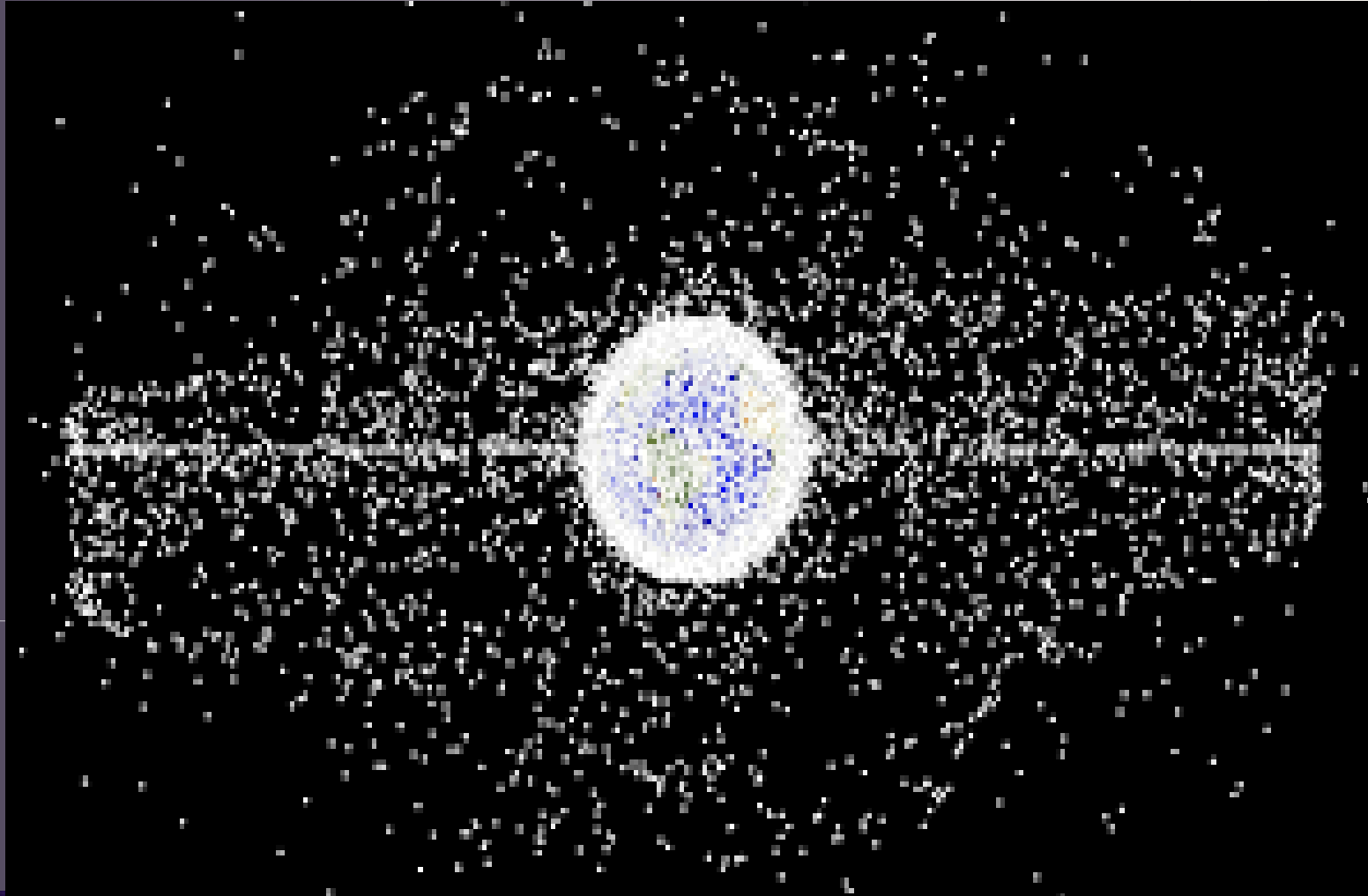


Source:
Amazing Physics, 2020

Timeline of Space

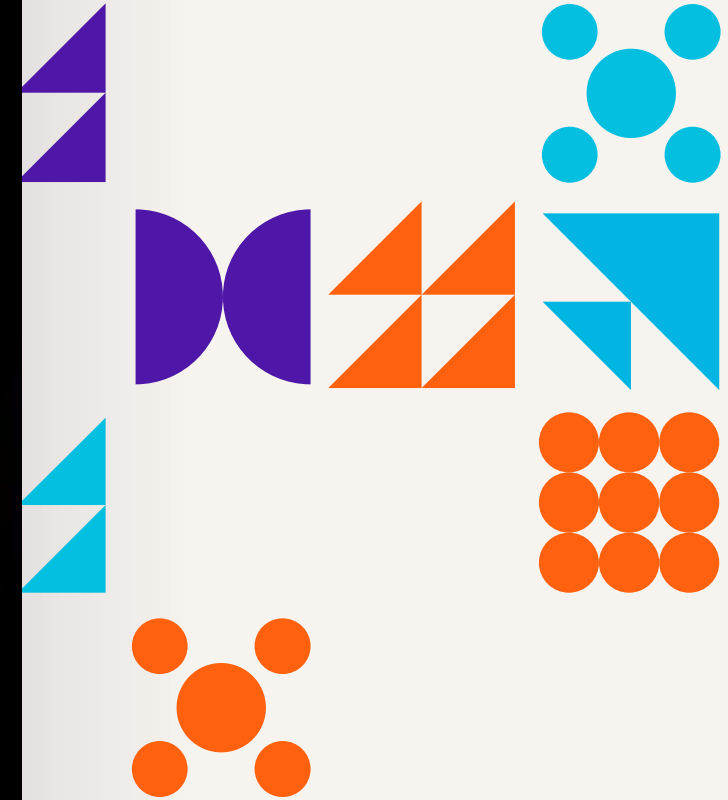


Earth TODAY!



Source:
NASA

Earth before 1957



Source:
Amazing Physics, 2020



Small Satellite Industry

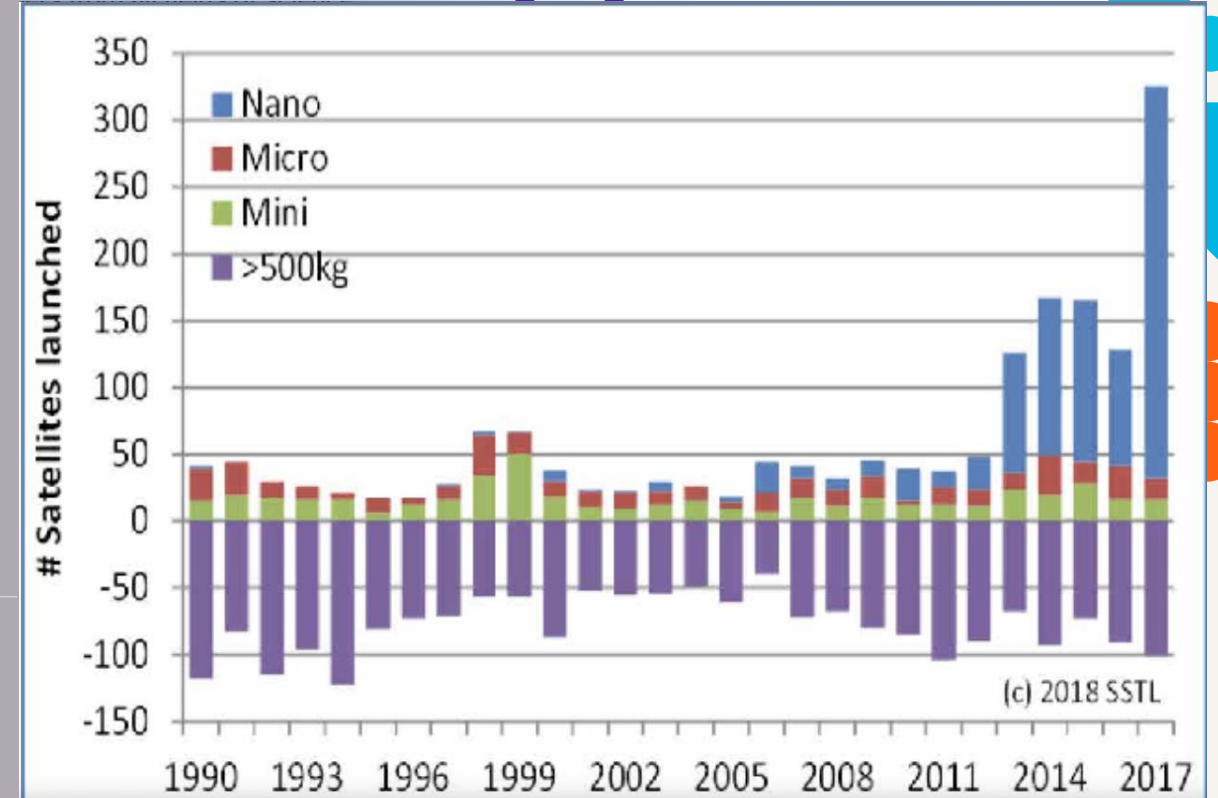
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Small Satellite Industry

| Class | Mass (kg) |
|-----------------|-------------|
| Large satellite | >1000 |
| Small satellite | 500 to 1000 |
| Mini-satellite | 100 to 500 |
| Micro-satellite | 10 to 100 |
| Nano-satellite | 1 to 10 |
| Pico-satellite | 0.1 to 1 |
| Femto-satellite | <0.1 |

Semantic Scholar - 2018



Semantic Scholar - 2018



Space Sustainability

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Use the environment of space to meet the current needs of society without compromising the needs of future generations. *–Secure World Foundation 2022*

Orbital Debris

Space Weather

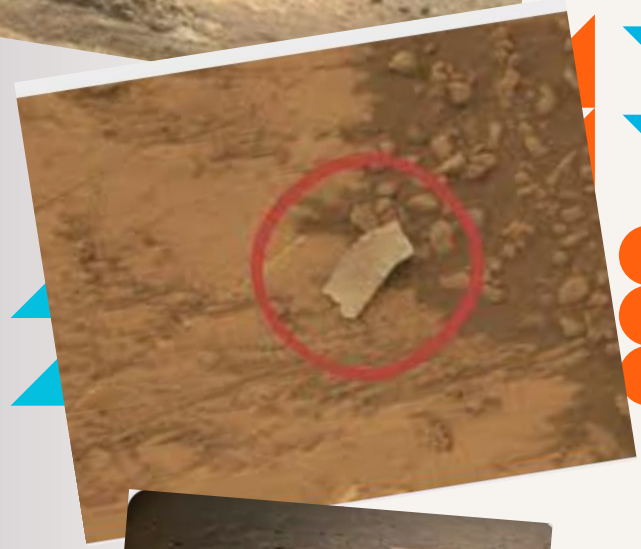
Overcrowding

End-of-Life protocol

Constellations



Fun Fact



Mars is littered with 15,694 pounds of human trash from 50 years of robotic exploration

Published: September 20, 2022 1.37pm BST

Rovers on Mars frequently come across debris – like this heat shield and spring – from their own or other missions. NASA/JPL-Caltech

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Significant Figures

15,694 lbs (7,119 kg)

Total weight of human-made debris on the surface of Mars

THE CONVERSATION

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Disclosure statement

Cagri Kilic does not work for, consult, own shares in or receive funding from any company or organisation that would benefit from this article, and has disclosed no relevant affiliations beyond their academic appointment.

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Orbital Debris

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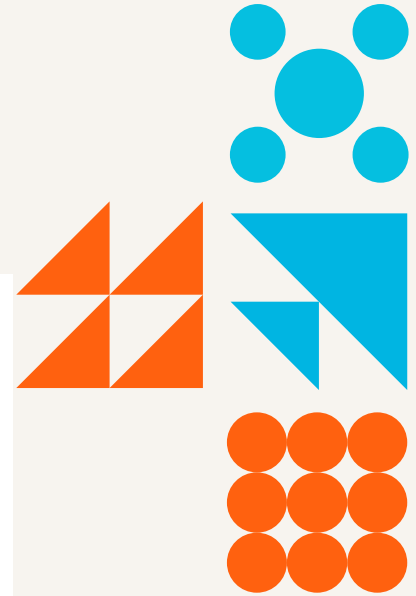
Constellations

Let's Track Anything !

<http://astria.tacc.utexas.edu/AstriaGraph/>

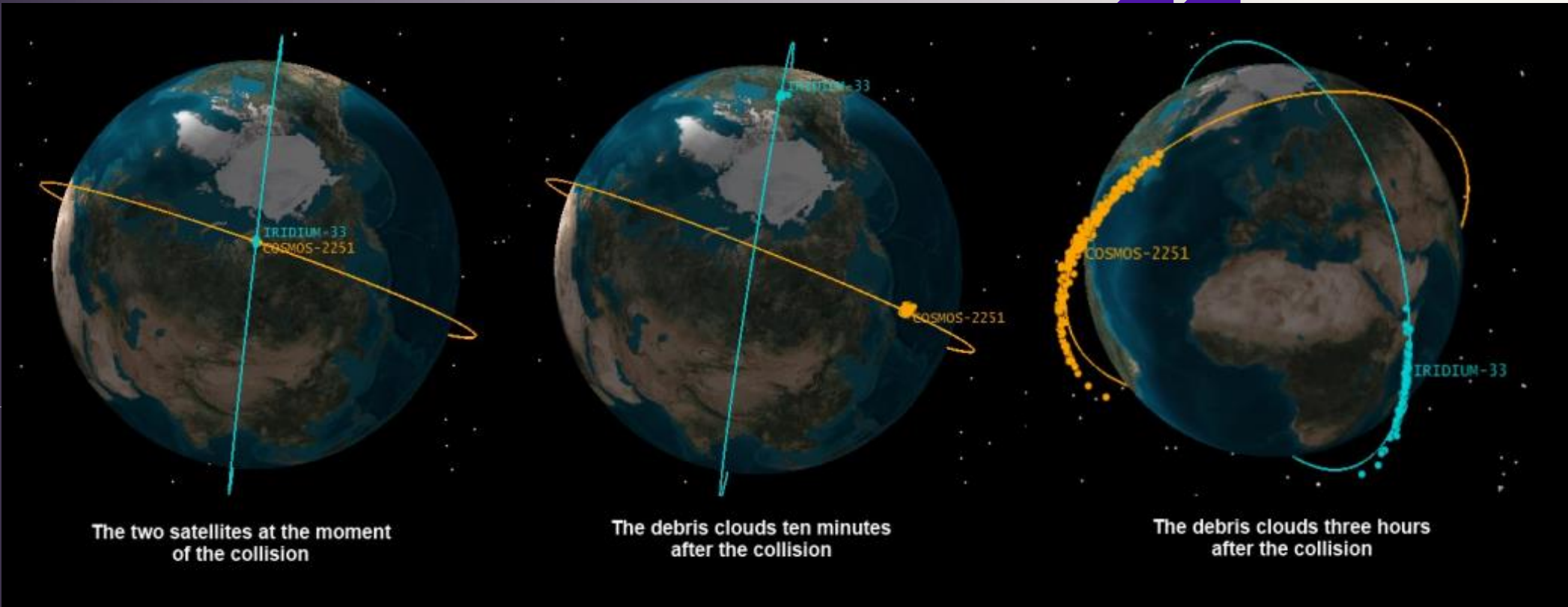
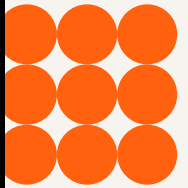


<https://www.privateer.com>



Accidents in Space!

[Accident Simulation from YouTube](#)



Source: sworg.com

The Probability of Collision

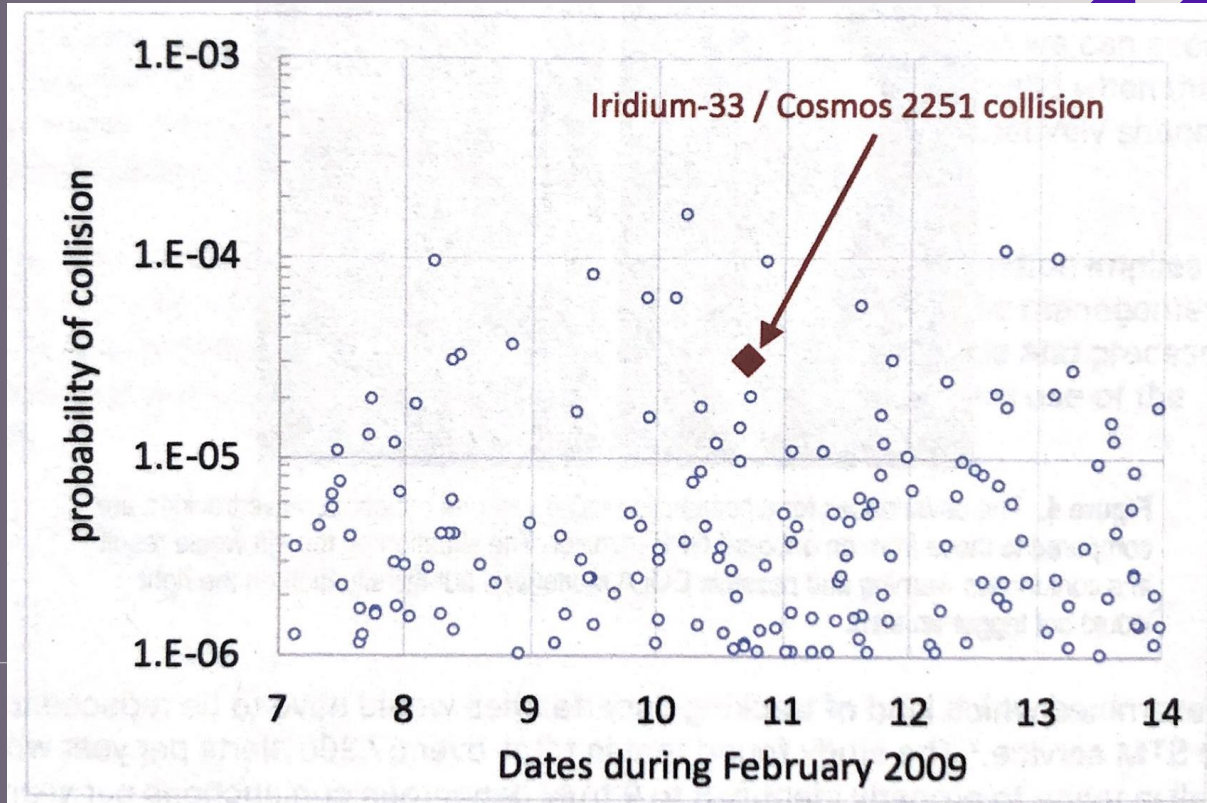
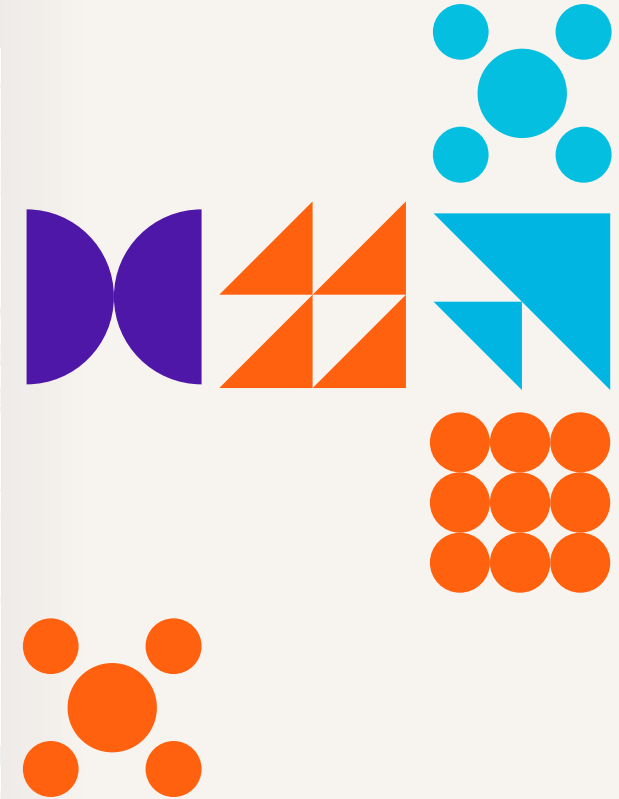
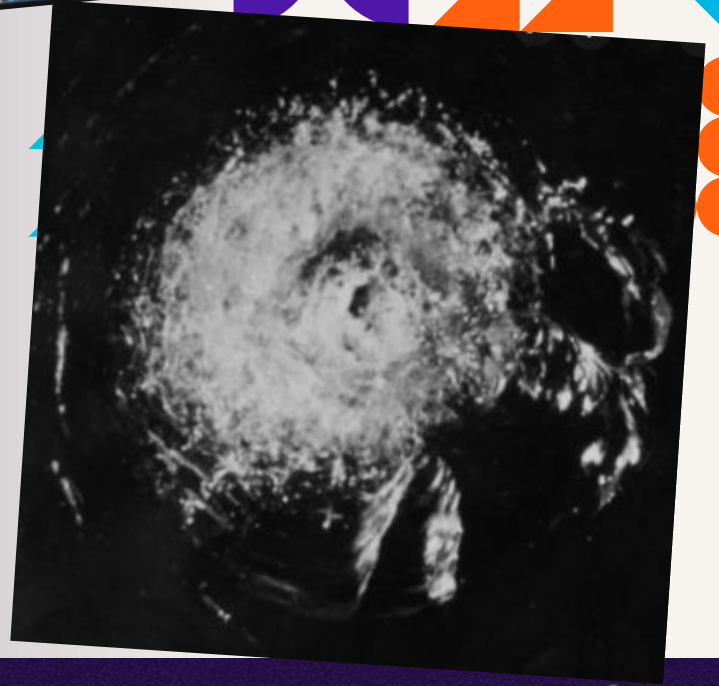
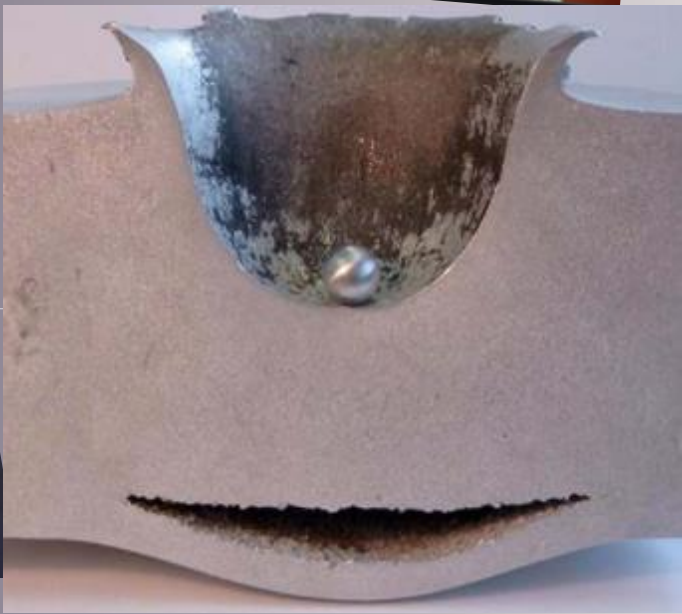
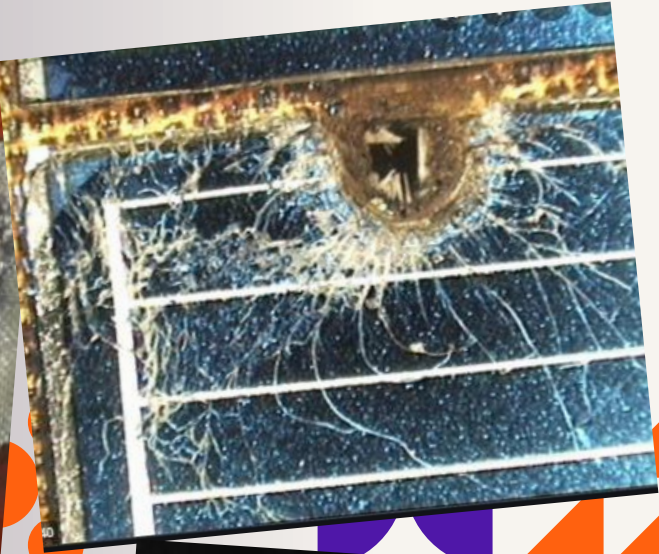
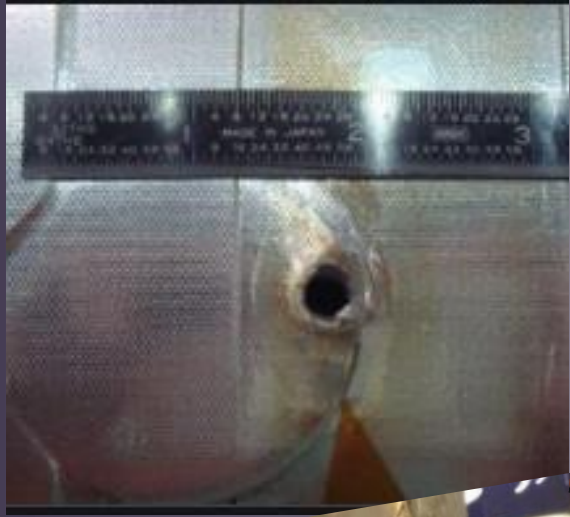


Figure 3. Iridium constellation conjunction probabilities during the week of February 7, 2009. Under current tracking accuracies, the actual collision between Iridium-33 and Cosmos 2251 did not stand out from other conjunctions that week as being noticeably dangerous.



Space Safety Compendium
2022

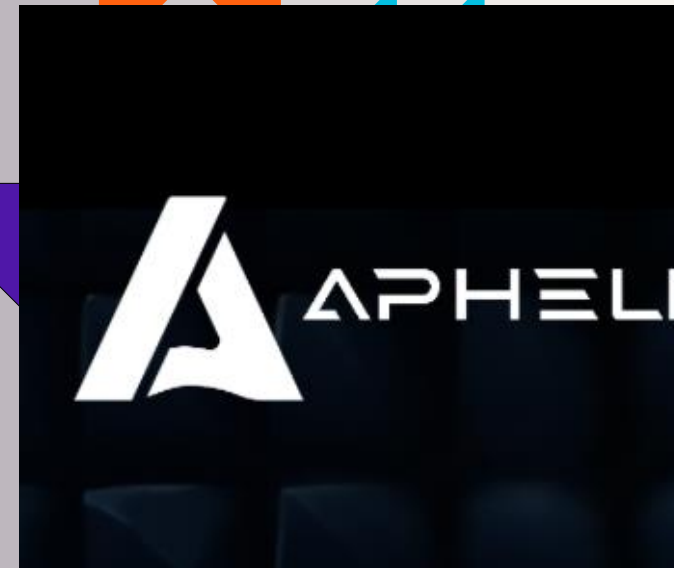
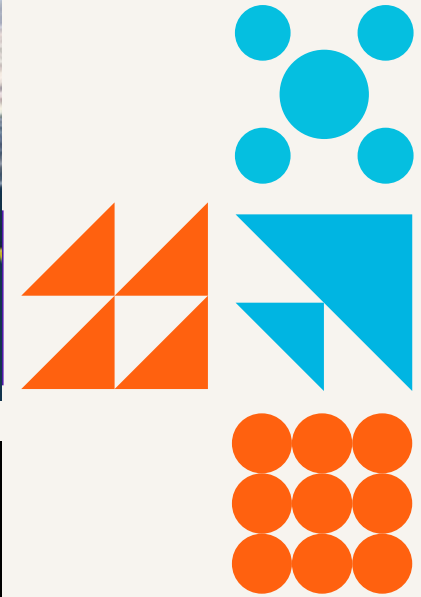
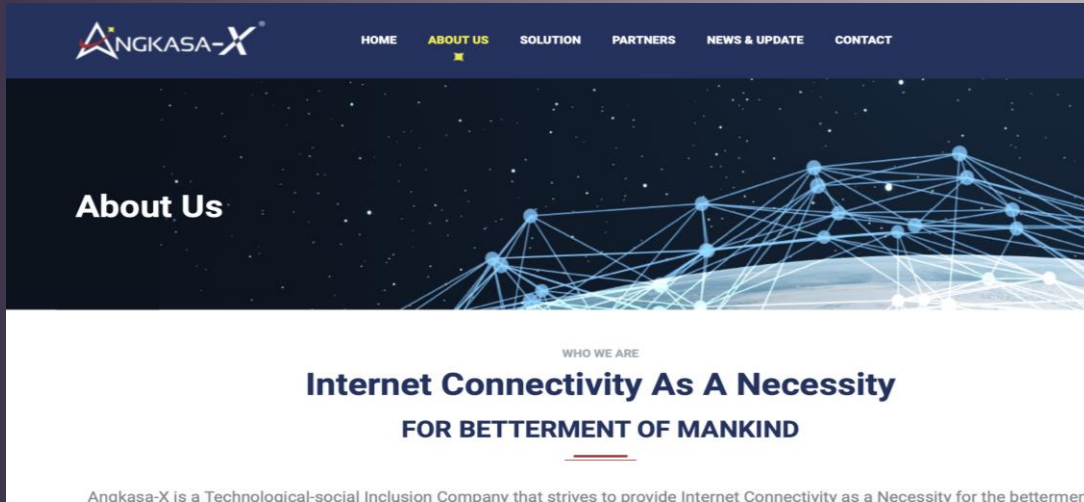




Small Satellite Industry in Malaysia

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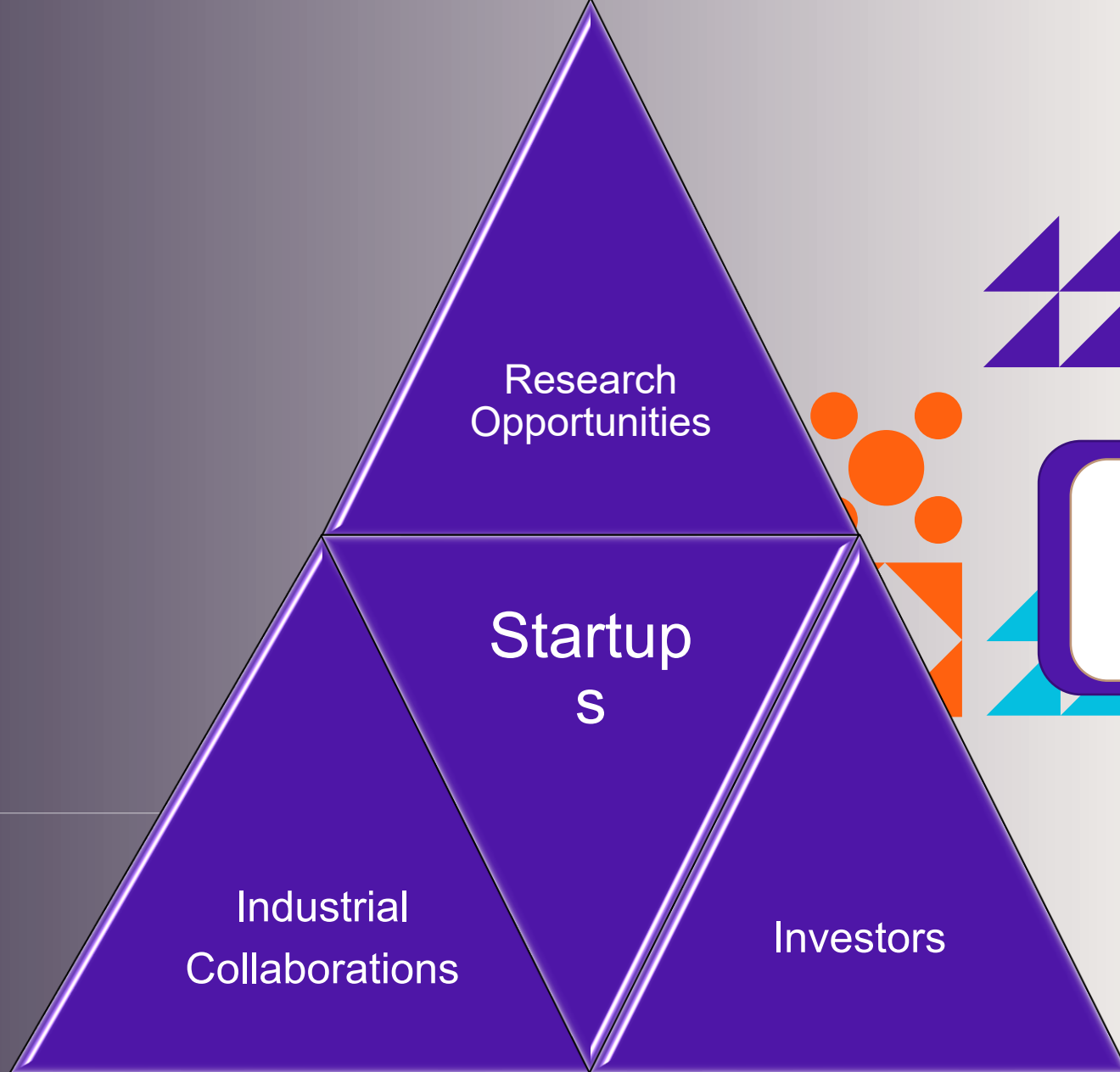
Small Satellite

International Satellite Program in Research and Education Constellation of Satellites





Call to Action



SPACE FOR ALL



**ASK ME ANY QUESTIONS,
Let's Learn Together!**



**SCAN HERE
TO KNOW ME**

