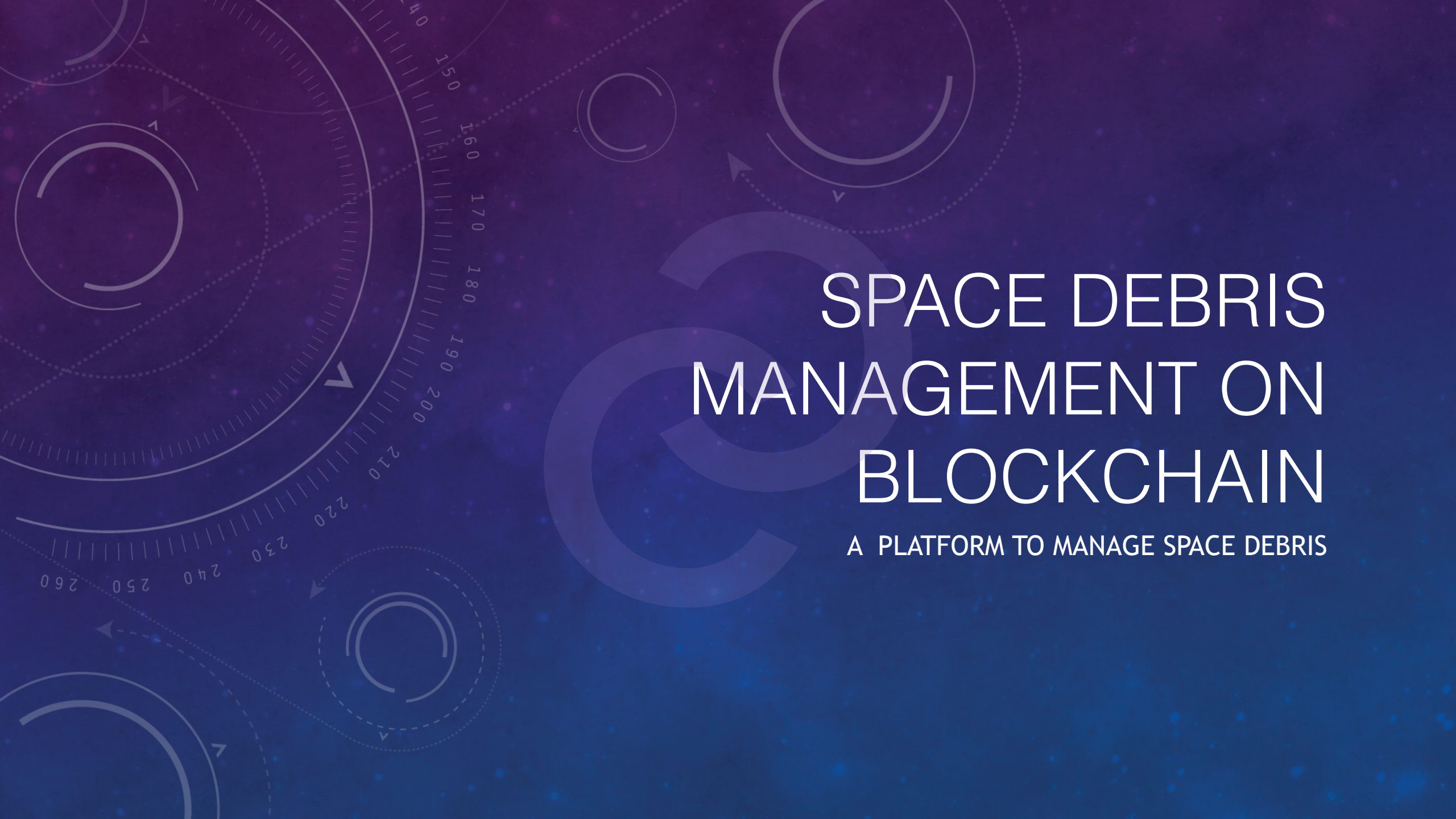




Blockchain**Army**

The background of the slide is a dark blue space-themed image with a starry field. Overlaid on this are several white and light blue circular and arc-like graphics. On the left side, there are concentric circles with tick marks and numerical labels (140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260) that resemble a circular scale or orbit diagram. In the center, there is a large, faint, semi-transparent watermark of a stylized '@' symbol. The main title is written in a clean, white, sans-serif font, stacked in three lines. Below the title, the subtitle is written in a smaller, white, sans-serif font.

# SPACE DEBRIS MANAGEMENT ON BLOCKCHAIN

A PLATFORM TO MANAGE SPACE DEBRIS

# WHAT IS SPACE DEBRIS

- Space junk, space waste, space trash, or space garbage travel at speed of 17500 mph.
- fast enough for a relatively small piece of orbital debris to damage a satellite or a spacecraft.
- Orbital debris is any man-made object.

# SPACE DEBRIS POPULATION

~22,000



Softball size or larger  
(≥ 10 cm)

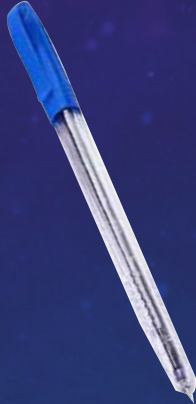
~500,000



Marble size or larger  
(≥ 1 cm)

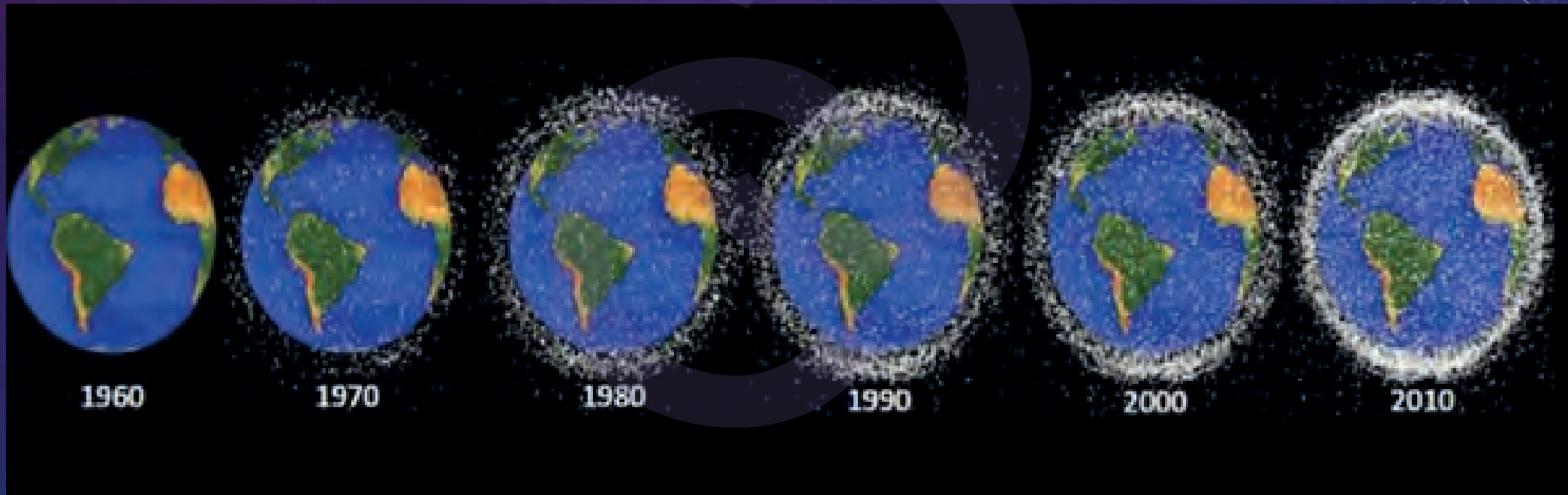
Total mass: 6,300 tonnes  
(2,700 tonnes in LEO)

~100,000,000



Ball-point pen tip  
(≥ 1 mm)

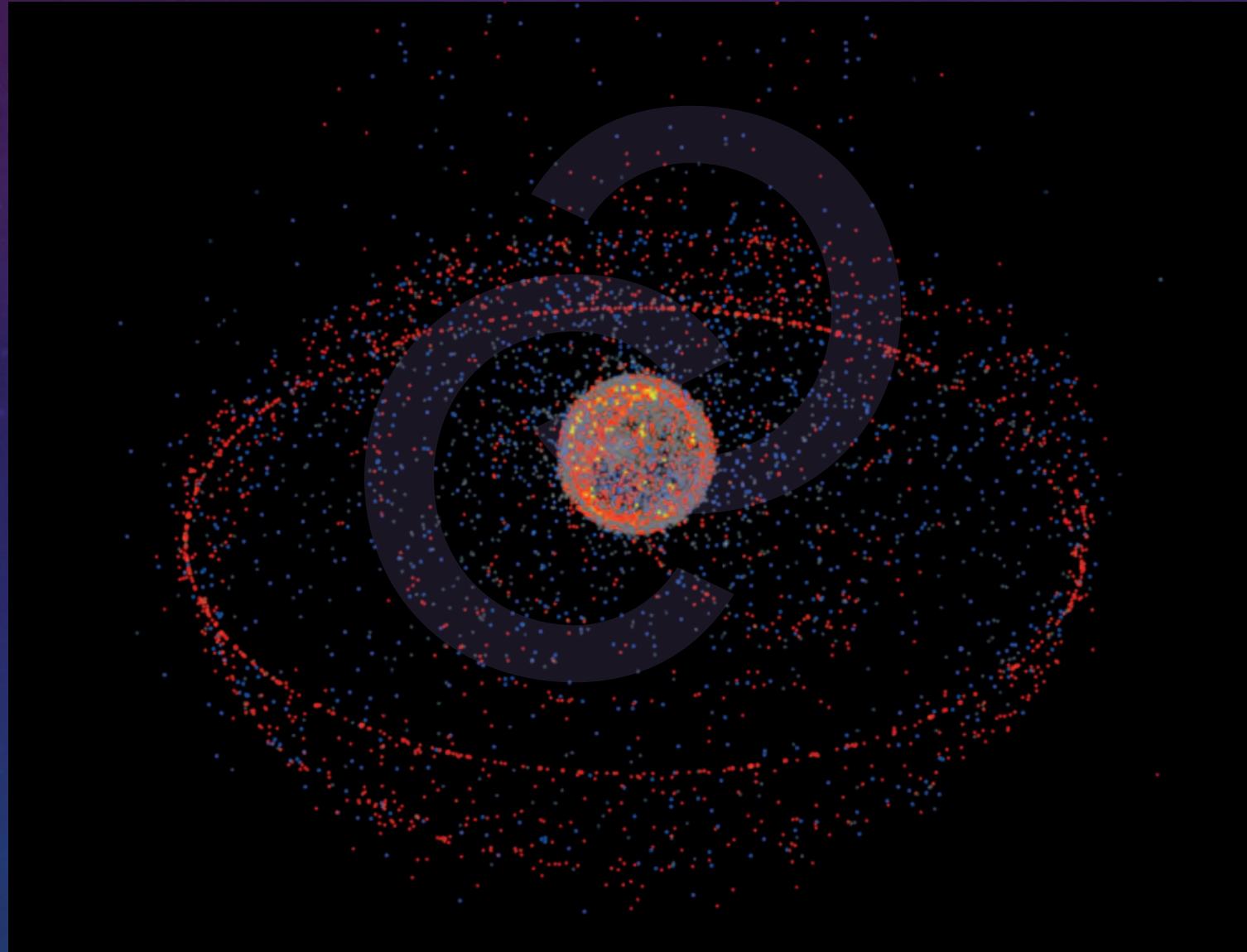
SPACE DEBRIS IS ESTIMATED TO BE OVER 128 MILLION PIECES OF DEBRIS SMALLER THAN 1 CM (0.39 IN) AS OF JANUARY 2019.



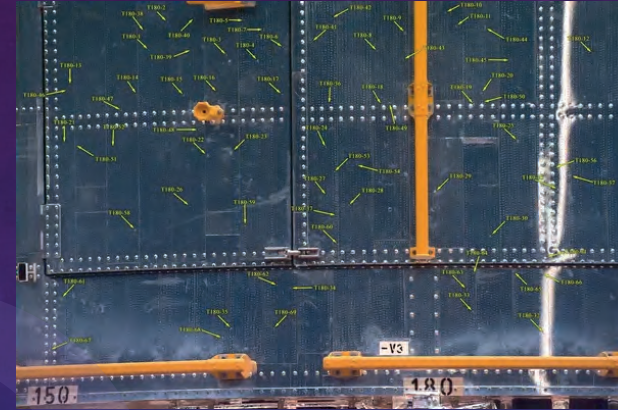
# PROBLEM

- Space debris is a massive issue,
- 100,000 Tons of debris flying in outer space.
- Total launches - 8,378
- Operational satellite - 1900
- Total satellite in orbit -4987
- More than 500,000 pieces of debris, or “space junk,” are tracked as they orbit the Earth.
- Debris hitting a launch vehicle, space ship and satellites flying in orbit.

# OUTER SPACE



# IMPACT OF SPACE DEBRIS



- Manned spacecraft, windows of both the ISS ([Micrometeoroid Hit ISS Cupola window #2](#), on June 10, 2012) and the space shuttle have been recorded as being damaged by “MMOD”s (Micrometeoroids and orbital debris).
- **Forty-five of the damages were large enough to warrant replacement of the window.**
- A panel from the Hubble Space Telescope, returned to earth after repairs, with over seventy impacts highlighted.



# CURRENT PARTICLES BEING TRACKED

- About 21,000 items larger than 10cm are being tracked orbiting earth.
- Each impact between particles creates more microparticles.
- There are an estimated 500,000 items larger than 1cm, but these are not all trackable reliably.
- An estimated 170,000,000 untrackable smaller particles.

# CONTRIBUTOR TO SPACE DEBRIS

- CHINA - anti satellite 10cm.
- NASA

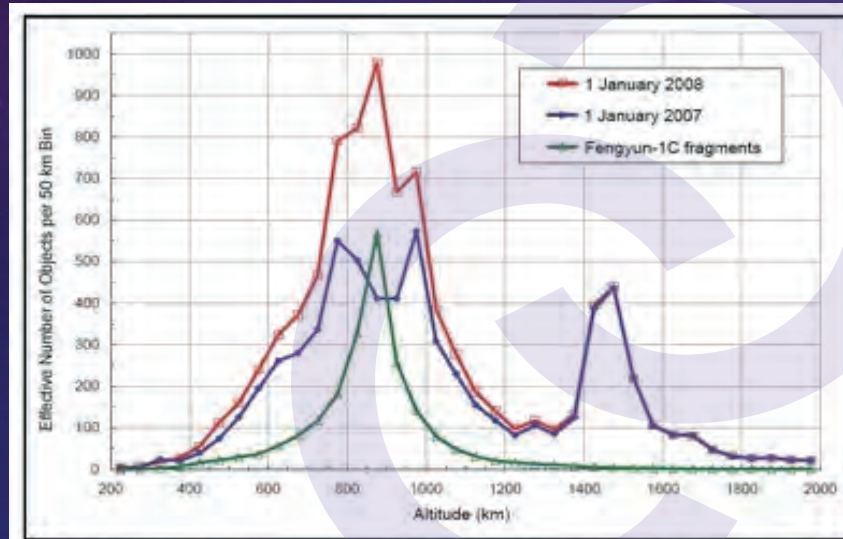


Figure 1. Distributions of the catalog populations in the low Earth orbit region in January 2007 (blue), January 2008 (red), and the officially cataloged Fengyun-1C fragments.

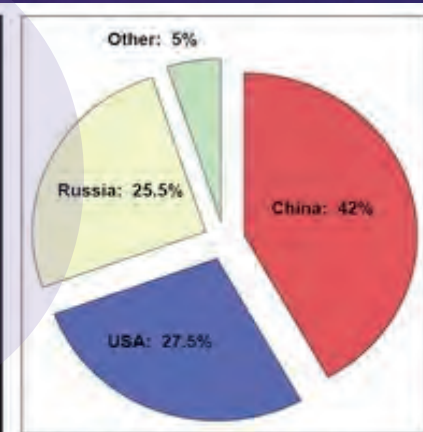


Figure 2. The People's Republic of China was responsible for nearly half of all known satellite breakup debris in orbit as of 1 January 2008. The primary source of this debris was the intentional destruction of the Fengyun-1C spacecraft.

icle above

# SPACE DEBRIS COLLISIONS

- In 1996, a French satellite was hit and damaged by debris from a French rocket that had exploded a decade earlier.
- On Feb. 10, 2009, a defunct Russian satellite collided with and destroyed a functioning U.S. Iridium commercial satellite. The collision added more than 2,000 pieces of trackable debris to the inventory of space junk.
- China's 2007 anti-satellite test, which used a missile to destroy an old weather satellite, added more than 3,000 pieces to the debris problem.

# AGENCIES MANAGING SPACE DEBRIS IN SILOS

- Nasa and US DEPARTMENT OF DEFENSE - Orbital Debris Program
- [North American Aerospace Defense Command](#)
- Britain's [Defence Evaluation and Research Agency](#)
- [NASA Orbital Debris Observatory](#)
- [ESA Space Debris Telescope, TIRA, the Goldstone, Haystack, and EISCAT radars and the Cobra Dane phased array](#)
- [European Space Operations Center \(ESOC\),](#)
- [Inter-Agency Space Debris Coordination Committee \(IADC\)](#), which included representatives from NASA, the [European Space Agency \(ESA\)](#), the [Japan Aerospace Exploration Agency \(JAXA\)](#) and the [Russian Space Agency \(Roscomos\)](#). the [China National Space Agency \(CNSA\)](#), the [Canadian Space Agency \(CSA\)](#), the [Korea Aerospace Research Institute \(KARI\)](#), the [India Space Research Organization \(ISRO\)](#), and the [State Space Agency of Ukraine \(NSAU\)](#).
- [Committee on the Peaceful Uses of Outer Space \(COPUOS\)](#), which is overseen by the [United Nations Office for Outer Space Affairs' \(UNOOSA\)](#).

# CHALLENGES

- Destroying or blowing up the debris creates more debris.
- A physical net to catch them all would not work, given their immense relative velocities.
- Larger items (orbiting rocket stages, etc) would require something to push them in order to change their velocity.
- Swiss CleanSpaceOne proposal
- ESA also plans to launch the 1.6 ton [e.Deorbit](#) mission into a low (sub 1000km) polar orbit in 2021, where it will rendezvous with a derelict satellite, grapple it, and deorbit. However, the grapple system that could grab a possibly-rapidly-tumbling satellite have not yet been designed: proposals include [tentacles, nets, harpoons, robot arms, and more](#).

# SOLUTION – BLOCKCHAIN BASED DEBRIS MANAGEMENT PLATFORM

- List all the particles on a dashboard
- Track particle from size of 10cmm. to all particle to size 1mm
- A single platform for multiple space agency to contribute the tracking information.
- All the space entities are submitting information on the platform using their access.
- They can define basic information about a particle to be shown to other entities and hide sensitive information
- Open for public to view and contribute to the platform.

- A blockchain based debris explorer.
- Click on an object view its path and trajectory



# BENEFITS

- Single platform for all the space debris particle
- Each particle can be tracked by anyone at any point in time.
- Transparency across the SPACE AGENCIES.
- Reduce time to access information from one agency by other.
- Under the umbrella create a smart contract system to allow space agencies to other to inform of any potential risk from a debris.
- Digitize the debris and maintain its entire information on blockchain
- All the research work being done to solve the space debris can be brought under one umbrella.
- Makes the future efforts across agencies quicker and efficient.



# MARKET OPPORTUNITY

- **Space debris removal a \$2.7 billion industry**
- 9000 satellite launched so far
- 100,000 tons of debris. Very small and hard to track
- ISS different method used currently to track these objects.



Thank you.