



HCF HACKATHON

# TECH TITANS

# **PROBLEM STATEMENT**

**Space debris, also known as space junk, refers to defunct human-made objects in Earth's orbit that no longer serve a useful function.**

**Now, the European Space Agency (ESA) estimates there are about 44,700 pieces of space debris. The primary concern is the increasing risk of collisions.**



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# ***OUR SOLUTION***

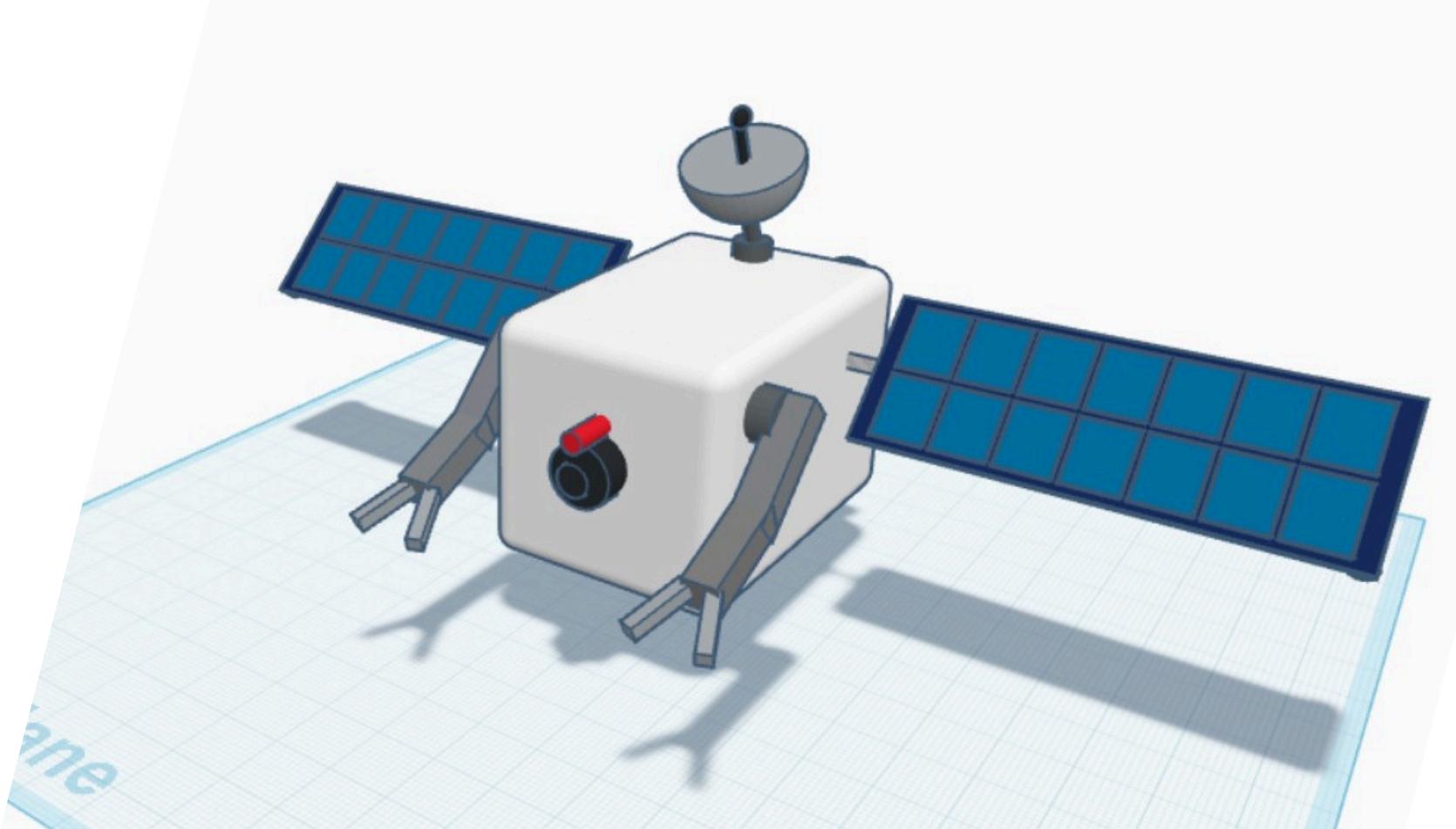
## **SU-01**



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## **SWACHHTA UPGRAH-01**

**An autonomous satellite designed to capture space debris and safely deorbit it to reduce orbital pollution and prevent satellite collisions.**



**Cleaning Earth's orbit, one fragment at a time.**

# HOW IT WORKS

**DETECTION & TRACKING:** IDENTIFY DEBRIS USING RADAR AND OPTICAL SENSORS.



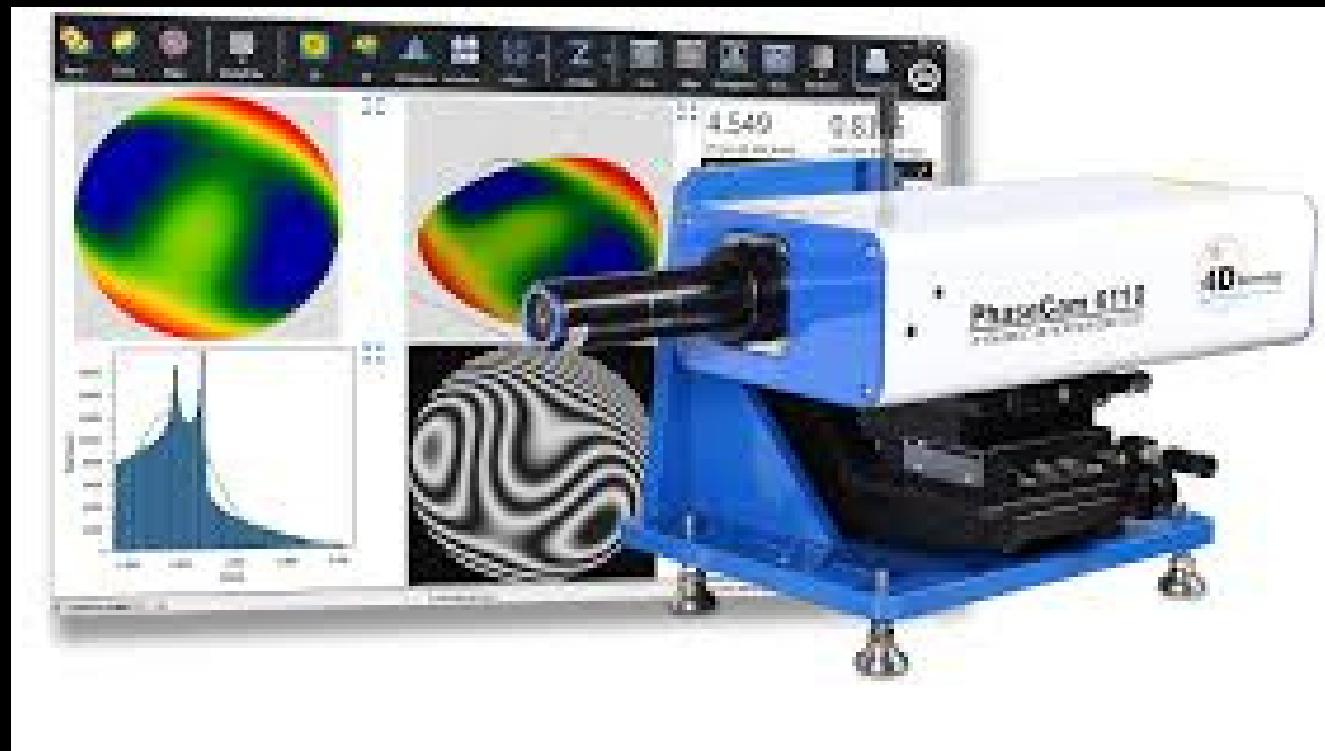
**AUTONOMOUS NAVIGATION:** AI-GUIDED LASERS TRACK THE DEBRIS' SPIN TO SYNCHRONIZE A PRECISE, AUTONOMOUS CAPTURE.



**MECHANICAL CAPTURES:** ROBOTIC ARMS WITH SILICONE OR RUBBER GRIPPERS TO SECURE DEBRIS.

**DE-ORBITING:** DIRECT DEBRIS INTO ATMOSPHERE FOR CONTROLLED DISINTEGRATION.

# CORE COMPONENTS



## VISION CAMERA SYSTEM

Debris detection and tracking

## ROBOTIC CAPTURE ARM

Grabbing and handling debris



## NAVIGATION & SENSOR SUITE

Positioning and target mapping

## LASER RANGEFINDER (LIDAR)

Precise distance measurement

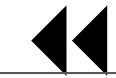
# CHALLENGES

**DEBRIS CAPTURE  
RISK – UNSTABLE,  
FRAGILE, AND  
COLLISION-PRONE  
TARGETS**



**THERMAL CONTROL  
SYSTEM (TCS)  
PROBLEM IS SPACE**

**ROBOTIC ARMS IN  
SPACE – PRECISION  
ENGINEERING  
UNDER EXTREME  
UNCERTAINTY**



**DEORBITING  
LOCATION  
CHALLENGE – SAFE  
AND CONTROLLED  
EARTH DISPOSAL**

**THANK  
you** »



**HARSHIT**

**VIDHI**

**VAIBHAVI**

**VANSH**

**RUTHUPARNA**