Press release

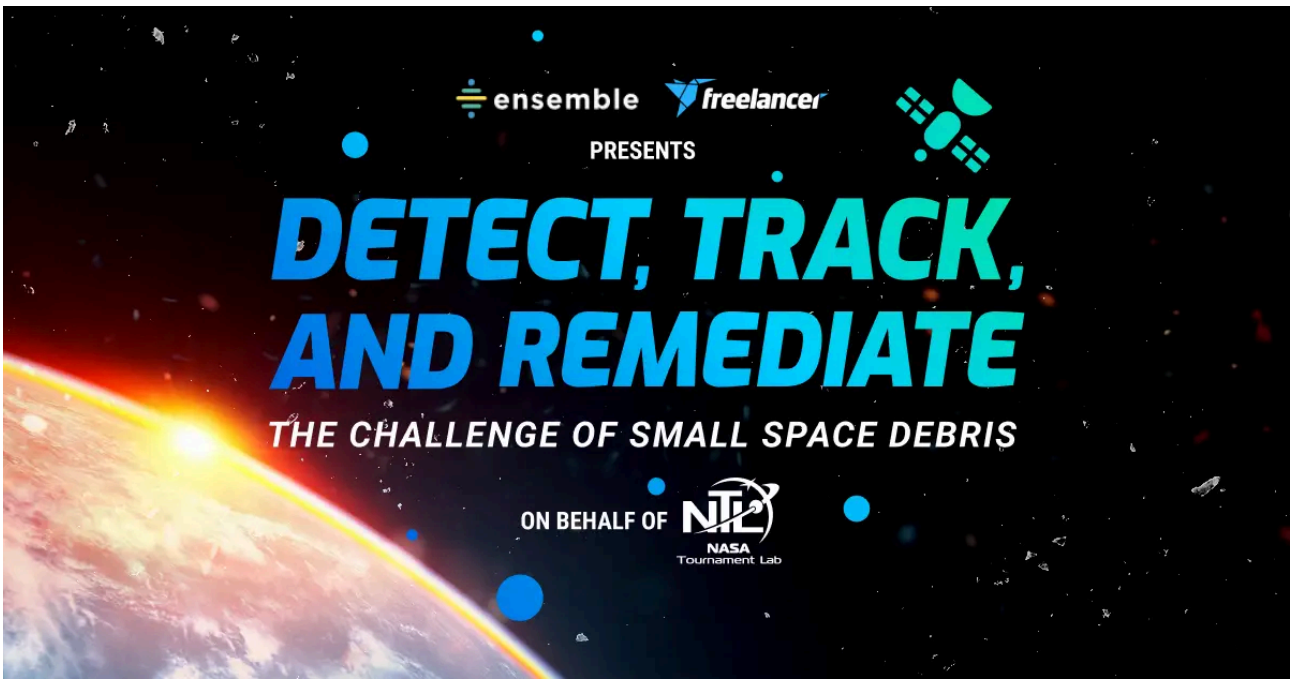
Winners of Small Space Debris Global Challenge Announced

The innovation solutions, aimed at tracking and remediating debris in Earth's low-earth orbit environment, were awarded a share of $120,000

SAN FRANCISCO, California - 14 March 2024 – Global freelancing marketplace Freelancer.com (ASX: FLN), and Ensemble Consultancy are thrilled to announce the winners of the Detect, Track, and Remediate: The Challenge of Small Space Debris competition.

Earth's orbital environment is marred by a growing population of space debris, colloquially known as "space junk." While larger debris is tracked by the US Space Surveillance Network (SSN), smaller objects with diameters between 1 millimeter and 10 centimeters are not tracked—or detected. The millions of such objects in Low Earth Orbit (LEO) can strike active spacecraft at very high velocities and pose a significant collision threat to both human spaceflight and robotic missions.

Hosted on behalf of NASA and run on Freelancer.com, the challenge aimed to source innovative concepts for detecting, tracking, or remediating small debris. The challenge encouraged the public to think creatively, considering technologies and processes that may be less explored but have the potential for significant impact. The total prize pool for the challenge was $120,000.



Challenge Winners

Challenge awarded winners in 3 categories: Detect & Characterize, Tracking, Remediation.

Detect & Characterize

Place	Prize	Team lead name	Country	Submission Title	Summary of the submissions
1	$20,000	Daniel Gebhardt	United States	Synchronous Correlated Imaging for Detection of Debris On-Orbit (SCIDDOO)	The Synchronous Correlated Imaging for Detection of Debris On-Orbit (SCIDDOO) concept detects and characterizes small space debris (SSD) in low-earth orbit (LEO). The core component of SCIDDOO is a constellation of optical imaging satellites in, or just above, LEO. Collected data is shared within the constellation to identify likely SSD objects and provide their characterization.
2	$12,000	Christine Hartzell, University of Maryland	United States	Mapping Small Orbital Debris with a SmallSat Fleet via Plasma Soliton Detection	This concept proposed to map small (mm to 10-cm scale) orbital debris about Earth using a fleet of smallsats equipped with sensors to detect the plasma signature of the debris.
3	$4,000	Jesse Reynolds	United States	CODA (Characterizing Orbital Debris Affordably)	The CODA (Characterizing Orbital Debris Affordably) mission concept proposes to employ a novel interferometric radar technique on a fleet of low-cost CubeSat buses to identify and characterize millions of millimetric debris in orbit.
4	$3,000	Dr. Richárd Ádám Vécsey, team Rixel	Hungary	AI-ready Multimodal Camera System with Spectrograph and MIMO-FMCW Radar to Detect and Characterize Debris on LEO	This concept is to detect small debris between 1 mm and 10 cm on the most crowded part of the Low Earth Orbit with MIMO-FMCW radar and fine tune the detection together with characterisation with the help of a visible range image, an infrared image and a spectrograph record.

5	$1,000	Nevin Thinagar	United States	A Novel CubeSat-Based Beam-Break Array for Millimetric Orbital Debris Characterization	This concept proposes a laser beam-break array capable of detecting orbital debris as small as 0.1 cm that can be prototyped on a CubeSat platform.

Tracking

Place	Prize	Team lead name	Country	Submission Title	Summary of the submissions
1	$20,000	Christophe Choquet	France	A constellation of binocular twin satellites to track small space debris	This concept is based on a pair of satellites equipped with cameras able to detect debris of up to magnitude 9
1	$20,000	Paolo Petrinca	Italy	Ultraviolet Reflective Tracking System	ULTRAV is a Space Debris passive detector system able to detect and track space small orbiting objects with dimensions greater than 1 cm. The ULTRAV system is conceived to be installed on board of satellites (one or constellations) and is equipped with high-sensitive photons detectors that look toward the Earth, and is able to measure the ultraviolet radiation reflected by SD.

Remediation

Place	Prize	Team lead name	Country	Submission Title	Summary of the submissions
1	$20,250	Dmitri Garin	United States	The Challenge of Small Space Debris SPACE BAT	This concept offers a novel design of a space sweeper: a deployable rotating tethered sweeper. Unlike previous designs with a single solid shield, the new design features a 1-degree sectoral shield of large radius constantly rotating around the mass center of the spacecraft-sweeper system.

2	$12,250	Josep Rueda	Spain	Swarm of Satellites Equipped With Solar-pumped Lasers for Cheap and Efficient Space Debris Remova	This concept involves a design employing a swarm of small satellites, each fitted with a solar-pumped laser. These satellites would utilize laser ablation to individually target and decelerate space debris, lowering its altitude to facilitate safe absorption into the Earth's atmosphere.
3	$4,250	Jeffrey Morse	United States	Orbital Debris Skimmer (Skimmer for short)	This concept offers a crossbow-like design to remediate small space debris (less than 10 cm in size) - Skimmer. Skimmer can use the orbital momentum of the orbital debris object itself, in conjunction with a solar powered crossbow inspired ejector. It can essentially skip across a set of similar orbits, cross-bowing the object into a new lower energy orbit (that should deorbit in 100-1000 days) while providing Skimmer a bit of DV to move to the next object capture.
4	$3,250	Kyran McDonnell	Australia	NASA LEO Debris Challenge	This concept is the deployment of 7 multipurpose satellites, equipped with a 50kW laser and magnetic contrast agent. Using an Aluminium Air Battery for energy, these satellites employ a unique remediation method involving impact capture, chemical reactions, and magnetic nanoparticles to analyze and manage debris composition, velocity, and orbit characteristics, complemented by machine-learning models for real-time tracking and prediction beyond sensor range.

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