Space Debris Removal Market worth $1,779.94 million by 2030- Exclusive Report by 360iResearch

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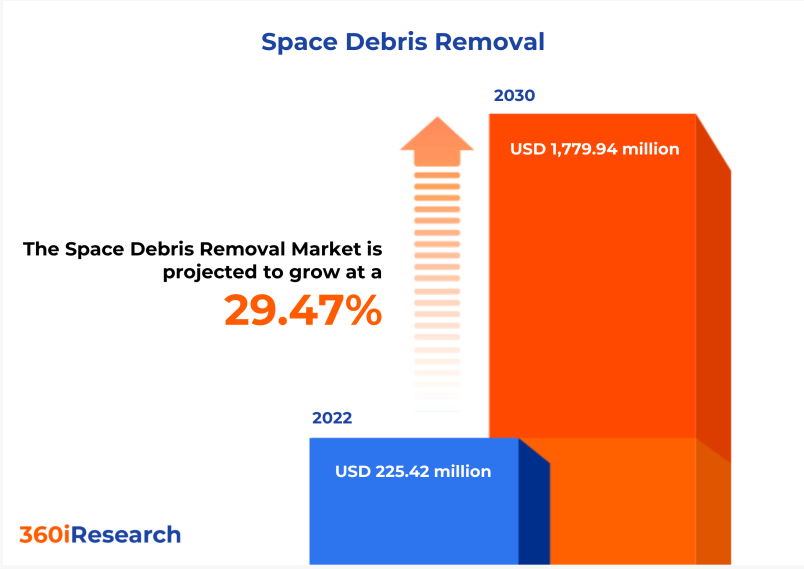

Space Debris Removal Market - Exclusive Report by 360iResearch

PUNE, MAHARASHTRA, INDIA , December 6, 2023 /EINPresswire.com/ -- The "Space Debris Removal Market by Debris Size (10mm to 100mm, Greater than 100mm, Less than 10mm), Orbit (Geostationary Equatorial Orbit, Low Earth Orbit, Medium Earth Orbit), Technology, End-User - Global Forecast 2023-2030" report has been added to 360iResearch.com's offering.

The Global Space Debris Removal Market to grow from USD 225.42 million in 2022 to USD 1,779.94 million by 2030, at a CAGR of 29.47%.

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Space debris removal refers to the process and methods involved in eliminating or mitigating man-made debris in space, which encompasses defunct satellites, spent rocket stages, and fragments resulting from satellite disintegration or collision. As the orbit around Earth becomes increasingly congested with defunct satellites and fragments, the likelihood of collisions, which can generate even more debris, escalates, posing risks to operational spacecraft, space stations, and satellite communications. Stemming from over six decades of space exploration and satellite launches, the proliferation of space debris has reached a point where it is a significant concern for space navigation and Earth's orbital environment. This issue necessitates proactive measures for debris removal, ensuring the preservation of the operational space environment for future missions. On the other hand, the high cost of technologies and technical and operational

complexities pose significant problems in effective space debris removal. However, the ongoing investment from government and private entities looking to develop cost-effective and scalable solutions, the emergence of new and advanced technology solutions, and the design of space debris mitigation technologies into satellites and space components provide considerable growth opportunities in the market.

Debris Size: Innovative approaches for space debris removal depending on debris size
Space debris of less than 10mm in size, also called 'small debris,' primarily consists of paint flecks, metal fragments, or solid rocket motor exhaust products that travel at high velocities, making them capable of causing significant damage upon impact with spacecraft or satellites. Clearance of small particles revolves around general debris reduction strategies such as shielding that significantly protects against small debris. Debris within the 10mm to 100mm size bracket, or 'medium-sized' debris, includes objects such as bolts, spring fragments, and small mechanical parts. Active removal strategies are being developed for this class of debris, with proposed solutions including nets, harpoons, and robotic arms to capture and dispose of the debris for effective space debris removal. Large debris, defined as being greater than 100mm, consists of defunct satellites, used rocket stages, and larger fragments from spacecraft disintegration. Space surveillance networks regularly track debris. The large debris greater than 100mm in size facilitates removal via various ADR methods such as robotic capture, netting, ropes, and directed energy systems.

Technique: Ongoing advancements in space debris removal techniques
Robotic arms offer a direct approach to debris removal by capturing and redirecting objects. This method involves a spacecraft equipped with robotic manipulators that physically grapple and secure pieces of debris. The robotic arms technique requires proximity operations and complex guidance, navigation, and control systems to safely approach and secure the debris. Harpoons and nets are contact methods designed for capturing and removing debris. Harpoons use a tethered projectile to pierce and secure debris for retrieval or disposal, enabling the removal of large and uncooperative objects. Nets are deployed to trap debris, allowing for the collection of multiple pieces or larger, tumbling targets. Laser Deorbit Systems, or laser brooms, involve ground-based or space-based lasers directed toward debris. The primary advantage of laser deorbit systems is their contactless nature, minimizing the risk of creating additional debris. Drag sail systems increase the surface area of space debris, thereby enhancing atmospheric drag. Drag sail systems are particularly suited for low Earth orbit, where the residual atmosphere facilitates orbital decay. Sails can be integrated into satellite designs for end-of-life deorbiting or deployed from a chase vehicle to attach to existing debris. The electrodynamic tether system leverages Lorentz forces developed in a long conductive tether moving through the Earth's magnetic field. When a current is induced along the tether, it interacts with the magnetic field to produce a force that can deorbit the debris. This technology allows for propellantless thrust generation and is adaptable to varying sizes of debris. The ion beam shepherd concept uses a spacecraft to direct a beam of ions to track debris fragments. The advantage of this method lies in its non-contact approach, which minimizes the risk of physical collision.

End-User: Robust research and development in debris removal technologies by Government entities
Commercial end-users in the space debris removal industry include satellite operators, space station operators, and other private companies with assets in space. As space becomes more congested, the risk of collisions increases, leading to potential damage or loss of assets and disruption of services. Commercial entities are, therefore, increasingly interested in ensuring the sustainability of space operations. Investment in debris removal technologies can be seen as a form of protecting their assets and services, ensuring operational continuity, and reducing liability risks. Government end-users comprise national space agencies, defense departments, and other regulatory bodies involved in space operations. The government's interest in space debris removal is multifaceted, encompassing concerns about national security, scientific research, and maintaining the orbital environment for future generations. Additionally, governments have a vested interest in setting and enforcing space traffic management regulations, necessitating capabilities for debris removal.

Orbit: Significant debris removal activities in medium earth orbit
Low Earth Orbit encompasses altitudes from about 160 to 2,000 kilometers above the Earth's surface. The congestion in LEO has resulted in a high risk of collision, generating space debris that poses threats to functional spacecraft and future space missions. Advances in debris capture technology, such as nets, harpoons, or robotic arms, are increasingly adopted in low earth orbit. Medium Earth Orbit (MEO) ranges from approximately 2,000 to 35,786 kilometers above the Earth and is primarily utilized for navigation satellite systems such as GPS, GLONASS, Galileo, and BeiDou. Space debris removal from MEO is essential for the integrity of global navigation systems. Removal strategies in MEO focus more on preventing future debris through mission planning and using on-board propulsion systems for deorbiting, as the natural forces for orbital decay are weaker compared to LEO. The Geostationary Equatorial Orbit (GEO)is circular, roughly 35,786 kilometers above the Earth's equator in the direction of the Earth's rotation. Space debris in GEO poses a long-term danger due to the lack of natural orbital decay for communications and meteorological satellites. Geostationary debris removal may entail high precision and station-keeping capabilities to avoid disrupting the operational satellites in this strategically important band.

Regional Insights:
The market for space debris removal in the Americas is currently characterized by significant investment in research and development, particularly in the United States, which houses significant industry players. Region's growth is driven by prominent space agencies, including the National Aeronautics and Space Administration (NASA), which is vested in maintaining the viability of key satellite orbits and the safety of crewed missions. Policy frameworks and collaborations between public and private entities support the development of debris mitigation technologies in the region. In APAC, the space debris removal market is burgeoning, with emerging space nations such as China and India increasingly advocating for debris mitigation initiatives amid their growing satellite programs. National space policies have begun to reflect a recognition of the hazards posed by space debris, propelling funding and partnerships directed

toward remediation technologies. EMEA's approach to space debris removal is heavily influenced by regional advancement and collaborative efforts, especially in Europe, where the European Space Agency (ESA) spearheads numerous initiatives, including the ADRIOS mission to demonstrate debris removal. Europe's established aerospace industry fosters innovation and development in removal technologies and services. The Middle East and Africa regions show potential for contributions to the debris removal market as countries, including the UAE, engage in space exploration and demonstrate a growing commitment to space sustainability.

FPNV Positioning Matrix:

The FPNV Positioning Matrix is essential for assessing the Space Debris Removal Market. It provides a comprehensive evaluation of vendors by examining key metrics within Business Strategy and Product Satisfaction, allowing users to make informed decisions based on their specific needs. This advanced analysis then organizes these vendors into four distinct quadrants, which represent varying levels of success: Forefront (F), Pathfinder (P), Niche (N), or Vital(V).

Market Share Analysis:

The Market Share Analysis offers an insightful look at the current state of vendors in the Space Debris Removal Market. By comparing vendor contributions to overall revenue, customer base, and other key metrics, we can give companies a greater understanding of their performance and what they are up against when competing for market share. The analysis also sheds light on just how competitive any given sector is about accumulation, fragmentation dominance, and amalgamation traits over the base year period studied.

Key Company Profiles:

The report delves into recent significant developments in the Space Debris Removal Market, highlighting leading vendors and their innovative profiles. These include Airbus SE, Altius Space Machines by Voyager Space Holdings, Astroscale Holdings Inc., BAE Systems PLC, ClearSpace SA, Electro Optic Systems, Exodus Space Systems, Fujitsu Limited, Infinite Orbits SAS, Kall Morris Incorporated, Lockheed Martin Corporation, Maxar Technologies Holdings Inc., Neuraspace Lda., Northrop Grumman Corporation, Obruta Space Solutions Corp., OrbitGuardians, PIAP Space sp.z o.o., Redwire Corporation, Rocket Lab USA, Inc., Rogue Space Systems, RTX Corporation, SIMBA Chain, SKY Perfect JSAT Holdings Inc., Skyrora Limited, Solstorm.io., Starfish Space, Tethers Unlimited, Inc., Thales Group, The Aerospace Corporation, Turion Space, and Vyoma GmbH.

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Market Segmentation & Coverage:

This research report categorizes the Space Debris Removal Market in order to forecast the

revenues and analyze trends in each of following sub-markets:

Based on Debris Size, market is studied across 10mm to 100mm, Greater than 100mm, and Less than 10mm. The 10mm to 100mm commanded largest market share of 43.34% in 2022, followed by Greater than 100mm.

Based on Orbit, market is studied across Geostationary Equatorial Orbit, Low Earth Orbit, and Medium Earth Orbit. The Low Earth Orbit commanded largest market share of 38.89% in 2022, followed by Medium Earth Orbit.

Based on Technology, market is studied across Drag Sail Systems, Electrodynamic Tether, Harpoons & Nets, Ion Beam Shepherd, Laser Deorbit Systems, and Robotic Arms. The Laser Deorbit Systems commanded largest market share of 26.58% in 2022, followed by Electrodynamic Tether.

Based on End-User, market is studied across Commercial and Government. The Government commanded largest market share of 68.53% in 2022, followed by Commercial.

Based on Region, market is studied across Americas, Asia-Pacific, and Europe, Middle East & Africa. The Americas is further studied across Argentina, Brazil, Canada, Mexico, and United States. The United States is further studied across California, Florida, Illinois, New York, Ohio, Pennsylvania, and Texas. The Asia-Pacific is further studied across Australia, China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand, and Vietnam. The Europe, Middle East & Africa is further studied across Denmark, Egypt, Finland, France, Germany, Israel, Italy, Netherlands, Nigeria, Norway, Poland, Qatar, Russia, Saudi Arabia, South Africa, Spain, Sweden, Switzerland, Turkey, United Arab Emirates, and United Kingdom. The Americas commanded largest market share of 41.06% in 2022, followed by Asia-Pacific.

Key Topics Covered:

14. Competitive Portfolio
15. Appendix

The report provides insights on the following pointers:
1. Market Penetration: Provides comprehensive information on the market offered by the key players
2. Market Development: Provides in-depth information about lucrative emerging markets and analyzes penetration across mature segments of the markets
3. Market Diversification: Provides detailed information about new product launches, untapped geographies, recent developments, and investments
4. Competitive Assessment & Intelligence: Provides an exhaustive assessment of market shares, strategies, products, certification, regulatory approvals, patent landscape, and manufacturing capabilities of the leading players
5. Product Development & Innovation: Provides intelligent insights on future technologies, R&D activities, and breakthrough product developments

The report answers questions such as:
1. What is the market size and forecast of the Space Debris Removal Market?
2. Which are the products/segments/applications/areas to invest in over the forecast period in the Space Debris Removal Market?
3. What is the competitive strategic window for opportunities in the Space Debris Removal Market?
4. What are the technology trends and regulatory frameworks in the Space Debris Removal Market?
5. What is the market share of the leading vendors in the Space Debris Removal Market?
6. What modes and strategic moves are considered suitable for entering the Space Debris Removal Market?

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