

# History of Rendezvous & Proximity Operations in Space

**Original Author** Kaila Pfrang

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**Update Author** Seth Walton

We'd like your feedback! Please direct any questions, comments, or corrections to [bweeden@swfound.org](mailto:bweeden@swfound.org)

## Overview

The goal of this spreadsheet is to document all rendezvous and proximity operations in space and any orbital debris created by those activities. Criteria for inclusion in this sheet are:

- 1) Known RPO conducted via commercial, civil, or military entities for non-aggressive purposes
- 2) Autonomous & robotic interaction between two or more satellites with low relative velocity

RPO activities involving human spaceflight, such as docking to the International Space Station, were not included in this database. A separate spreadsheet with the history of RPO associated with co-orbital anti-satellite testing can be found [here](#).

Information about RPO tests is compiled from a wide variety of public and open sources. Information about cataloged debris objects is primarily derived from the public [Space Track](#) website maintained by the U.S. military.

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"Getting in Your Space: Learning from Past Rendezvous and Proximity Operations"  
- REBECCA REESMAN, ANDREW ROGERS

Category	
Servicing	Satellite servicing, repair and refueling, life extension, debris removal
Intelligence	Surveillance and intelligence collection
Military	Military-funded R&D of dual-use capabilities

F	Date of Activity	Client Satellite	Service Satellite	Mission Type	Orbit	Launch Site	Orbit Reached	Total Pieces of Outgoing Data/ Collected	Total Pieces of Incoming Data/ Re-transmitted	Amount of Data (GB or TB)	Date of First Data Recovery	Life span of Data (years or days or weeks)	Note	Source
USA	Apr 14, 2005	MILCOM	DART	Servicing	LEO	Vandenberg AFB	-	0	0	0	-	-	MSA DART dumped into military satellite but did not cause damage or release tracked orbits.	<a href="https://www.nasa.gov/pdf/200504main_milcom_050414">https://www.nasa.gov/pdf/200504main_milcom_050414</a>
USA	Jan 2006	SDVO-2	Aggan-Sea	Servicing	LEO	Cape Canaveral	-	0	0	0	-	-	Customer mission ending - space navigation capabilities. Mission deployed from Aggan-Sea 1st of satellite deployed from SSC to practice communication and data exchange as well as interworking and integration.	<a href="https://www.nasa.gov/pdf/200601main_sdvo-2_060120">https://www.nasa.gov/pdf/200601main_sdvo-2_060120</a>
USA	Jan 25, 2000	Interim SDI	MEV1	Servicing	GEO	Balikesir	-	0	0	0	-	-	MEV1 successfully docked to provide mission extension services for Intersat 901	<a href="https://www.nasa.gov/pdf/200001main_interim_sdi_000125">https://www.nasa.gov/pdf/200001main_interim_sdi_000125</a>
USA	Jun 16-19 2020	Amaluzee 10-B	Amaluzee 10-A	Servicing	LEO	Wallops	-	0	0	0	-	-	AC-119 returned successfully orbit around AC-119A with a radius of 20 x 60 meters and used to dock contacts to take essential repairs. AC-119A while orbiting 600 kilometers in customer orbit. During another close approach, AC-119B was able to take photos from a mere 22 meters away.	<a href="https://www.nasa.gov/pdf/202006main_amaluzee-10-b_200616">https://www.nasa.gov/pdf/202006main_amaluzee-10-b_200616</a>
USA	Apr 10, 2021	Interim 10-G2	MEV2	Servicing	GEO	Guiana Space Center	-	0	0	0	-	-	Launched on August 16, 2020. On April 12, 2021, MEV2 docked successfully and is conducting close proximity operations on Intersat 10-G2 to extend its service life. The service will provide another 5 years of life for the rest of satellite.	<a href="https://www.nasa.gov/pdf/202104main_interim-10-g2_210410">https://www.nasa.gov/pdf/202104main_interim-10-g2_210410</a>
USA	April 2023	LINK501	LINK502	Servicing	GEO	Kennedy Space Center	-	0	0	0	-	-	Customers launched on November 16, 2022 by Lockheed Martin as part of the Lunar Expressions. They were deployed in the GEO. In April 2023, one orbital performed the test of servicing satellite to the other. The mission was used to test various algorithms, SGA, LAM and the test.	<a href="https://www.nasa.gov/pdf/202304main_link-501_230401">https://www.nasa.gov/pdf/202304main_link-501_230401</a>
Sweden	Aug 2010 - July 2011	PRISMA Target	PRISMA Main	Servicing	LEO	Dornsteden Air Base	-	0	0	0	-	-	Test launched as a pair and separated. Autonomous guidance and navigation experiments, GPS	<a href="https://www.nasa.gov/pdf/201008main_prisma_100820">https://www.nasa.gov/pdf/201008main_prisma_100820</a>
Japan	Nov 1997	ORF-ME	HERCULES	Servicing	LEO	Balikesir Cosmodrome	-	0	0	0	-	-	Demonstrated autonomous docking and satellite servicing with onboard mounted robot system.	<a href="https://www.nasa.gov/pdf/199711main_orf-me_971101">https://www.nasa.gov/pdf/199711main_orf-me_971101</a>
Japan	March 2021 - May 2022	ELSA-D Client	ELSA-D Servitor	Servicing	LEO	Balikesir Cosmodrome	-	0	0	0	-	-	The ELSA-D mission is designed specifically to demonstrate rendezvous by autonomous. Launched on March 22, 2021, ELSA-D magnetically docks with client satellite and demonstrates various rendezvous capabilities with multiple RPO. On August 26, 2021, ELSA-D successfully conducted a capture test of a client's spacecraft using the service's magnetically capture system.	<a href="https://www.nasa.gov/pdf/202103main_elsa-d_client_210303">https://www.nasa.gov/pdf/202103main_elsa-d_client_210303</a>
Italy	Sept 5 Oct 28 2020	Multiple	D-Orbit ION	Servicing	LEO	Guiana Space Center	-	0	0	0	-	-	Orbit to demonstrate orbital debris removal capabilities and	<a href="https://www.nasa.gov/pdf/202009main_d-orbit-ion_200905">https://www.nasa.gov/pdf/202009main_d-orbit-ion_200905</a>
China	April 27 2021 (launch)	Laohanshan	NDS-1	Servicing	LEO	Taiyuan Satellite Launch Center	-	0	0	0	-	-	NDS-1 will release a small satellite, spin, perform target and subsequently attempt capture using an arm. The successful will then use the spin using orbital debris propulsion. There is no known evidence of whether or not it completed the mission.	<a href="https://www.nasa.gov/pdf/202104main_laohanshan_210427">https://www.nasa.gov/pdf/202104main_laohanshan_210427</a>
China	Dec 2021 - Jan 2022	Balibo-2 G2	ShiJian-21 (S.J.21)	Servicing	GEO	Xi'angyang Satellite Launch Center	-	0	0	0	-	-	Launched on October 26, 2021, identified as a Chinese military relay satellite by Chinese government. On January 27, 2022, it docked with the defunct Chinese satellite Balibo-2 G2. The satellite remains locked above the targeted GEO slot, and provided the satellite in disposal. These capabilities possibly have only been demonstrated by the US.	<a href="https://www.nasa.gov/pdf/202201main_shijian-21_220101">https://www.nasa.gov/pdf/202201main_shijian-21_220101</a>

\*Orbits changed by the US, listing primary parent ID on in use and larger ID on after 2025 on track to track higher number of primary parent ID tracked by the SDN due to the full-power status of Color Data sets.

Note also that these numbers are based on the last updated time at which they have happened again or otherwise.



Country	Date of Test	Org	Client	Service	Mission Type	Launch Site	Notes	Sources
USA	2022	NASA	CPOD B	CPOD A	Servicing	Cape Canaveral	RPO and inspection mission with pair of cubesats	<a href="https://www.nasa.gov/futureofspace/tech/small_satser@rhoad_project.html">https://www.nasa.gov/futureofspace/tech/small_satser@rhoad_project.html</a>
USA	Feb 2024	True Anomaly	Jackal-1	Jackal-2	Servicing	tbc	RPO and inspection mission as precursor to commercial service	<a href="https://spacebus.com/true-anomaly-to-pursue-military-contracts-for-yet-another-live-trailing-pod/">https://spacebus.com/true-anomaly-to-pursue-military-contracts-for-yet-another-live-trailing-pod/</a>
India	2024	ISRO	SPADEX	SPADEX	Servicing	Satish Dhawan Space Centre	Test BPO and robotic arm operations to support future servicing capabilities	<a href="https://space.skyrocket.de/doc_sdat/spadex.htm">https://space.skyrocket.de/doc_sdat/spadex.htm</a>
LX	2024	Astroscale		ELSA M	Servicing	tbd	In-orbit demonstration of a removal of a constellation customer satellite	<a href="https://astroscale.com/elsa-m/">https://astroscale.com/elsa-m/</a>
Switzerland	2025	ClearSpace SA	Vespa adapter	Clear-Space 1	Servicing	tbd	In-orbit demonstration of removal of a Vespa upper stage adapter	<a href="https://www.esa.int/Space_Energy/ESA_purchases_would_kill_600kg_of_debris_from_orbit">https://www.esa.int/Space_Energy/ESA_purchases_would_kill_600kg_of_debris_from_orbit</a>

Last Updated: 21 Jun 2023  
Updated By: Brian Weeden

Catalog Number	Common Name	Orbital Design	Country (Byr)	Launch date	Launch site	Decay	Period	Incl.	Apogee	Perigee	RCS
45128	COSMOS 2491 DEB *	2013-076AA	CIS	41633	PKMTR		100.92	81.21	822	783	SMALL
45129	COSMOS 2491 DEB	2013-076AB	CIS	41633	PKMTR		114.11	82.43	1608	1222	SMALL
45130	COSMOS 2491 DEB	2013-076AC	CIS	41633	PKMTR		113.8	82.46	1540	1262	SMALL
45172	COSMOS 2491 DEB	2013-076AD	CIS	41633	PKMTR		113.99	82.45	1545	1274	SMALL
45173	COSMOS 2491 DEB	2013-076AE	CIS	41633	PKMTR		114.78	82.44	1648	1240	SMALL
47110	COSMOS 2491 DEB	2013-076AF	CIS	41633	PKMTR		114.8	82.46	1539	1354	SMALL
47111	COSMOS 2491 DEB	2013-076AG	CIS	41633	PKMTR		115.27	82.45	1589	1347	SMALL
47546	COSMOS 2491 DEB	2013-076AH	CIS	41633	PKMTR		112.65	82.43	1397	1300	SMALL
47547	COSMOS 2491 DEB	2013-076AJ	CIS	41633	PKMTR		115.59	82.46	1555	1409	SMALL
47548	COSMOS 2491 DEB	2013-076AK	CIS	41633	PKMTR		117.24	82.82	1595	1518	SMALL
47549	COSMOS 2491 DEB	2013-076AL	CIS	41633	PKMTR		115.54	82.46	1531	1246	SMALL
47550	COSMOS 2491 DEB	2013-076AM	CIS	41633	PKMTR		113.59	82.45	1565	1319	SMALL
47551	COSMOS 2491 DEB	2013-076AN	CIS	41633	PKMTR		115.71	82.44	1587	1388	SMALL
47552	COSMOS 2491 DEB	2013-076AP	CIS	41633	PKMTR		113.76	82.44	1562	1236	SMALL
47553	COSMOS 2491 DEB	2013-076AQ	CIS	41633	PKMTR		115.39	82.48	1582	1426	SMALL
47554	COSMOS 2491 DEB	2013-076AR	CIS	41633	PKMTR		112.45	82.48	1528	1456	SMALL
47555	COSMOS 2491 DEB	2013-076AS	CIS	41633	PKMTR		115.96	82.47	1543	1456	SMALL
47556	COSMOS 2491 DEB	2013-076AT	CIS	41633	PKMTR		115.56	82.48	1527	1435	SMALL
47557	COSMOS 2491 DEB	2013-076AU	CIS	41633	PKMTR		115.78	82.48	1548	1455	SMALL
47558	COSMOS 2491 DEB	2013-076AV	CIS	41633	PKMTR		115.54	82.47	1519	1441	SMALL
47559	COSMOS 2491 DEB	2013-076AW	CIS	41633	PKMTR		115.77	82.48	1512	1470	SMALL
47560	COSMOS 2491 DEB	2013-076AX	CIS	41633	PKMTR		115.3	82.48	1549	1390	SMALL
47561	COSMOS 2491 DEB	2013-076AV	CIS	41633	PKMTR		113.53	82.75	1485	1292	SMALL
47562	COSMOS 2491 DEB	2013-076AZ	CIS	41633	PKMTR		112.46	82.6	1344	1334	SMALL
47563	COSMOS 2491 DEB	2013-076BA	CIS	41633	PKMTR		114.78	82.48	1542	1349	SMALL
47564	COSMOS 2491 DEB	2013-076BB	CIS	41633	PKMTR		115.93	82.48	1515	1483	SMALL
47565	COSMOS 2491 DEB	2013-076BC	CIS	41633	PKMTR		116.01	82.49	1517	1487	SMALL
47566	COSMOS 2491 DEB	2013-076BD	CIS	41633	PKMTR		113.8	82.47	1558	1244	SMALL
47567	COSMOS 2491 DEB	2013-076BE	CIS	41633	PKMTR		114.98	82.47	1555	1354	SMALL
47568	COSMOS 2491 DEB	2013-076BF	CIS	41633	PKMTR		114.13	82.47	1497	1355	SMALL
47569	COSMOS 2491 DEB	2013-076BG	CIS	41633	PKMTR		115.16	82.47	1549	1376	SMALL
47570	COSMOS 2491 DEB	2013-076BH	CIS	41633	PKMTR		115.26	82.46	1569	1365	SMALL
39497	COSMOS 2491	2013-076E	CIS	41633	PKMTR		115.8	82.49	1582	1481	MEDIUM
44912	COSMOS 2491 DEB	2013-076F	CIS	41633	PKMTR		113.78	82.43	1569	1331	SMALL
44913	COSMOS 2491 DEB	2013-076G	CIS	41633	PKMTR		115.09	82.47	1584	1415	SMALL
44907	COSMOS 2491 DEB	2013-076H	CIS	41633	PKMTR		113.73	82.42	1551	1244	SMALL
44908	COSMOS 2491 DEB	2013-076J	CIS	41633	PKMTR		115.2	82.46	1489	1459	SMALL
44909	COSMOS 2491 DEB	2013-076K	CIS	41633	PKMTR		114.61	82.48	1498	1378	MEDIUM
44990	COSMOS 2491 DEB	2013-076L	CIS	41633	PKMTR		114.96	82.48	1491	1416	SMALL
44991	COSMOS 2491 DEB	2013-076M	CIS	41633	PKMTR		114.48	82.4	1487	1377	SMALL
44992	COSMOS 2491 DEB	2013-076N	CIS	41633	PKMTR		115.14	82.47	1555	1368	SMALL
44993	COSMOS 2491 DEB	2013-076P	CIS	41633	PKMTR		118.13	82.44	1705	1489	SMALL
44994	COSMOS 2491 DEB	2013-076Q	CIS	41633	PKMTR		114.15	82.48	1501	1332	SMALL
44996	COSMOS 2491 DEB	2013-076R	CIS	41633	PKMTR		115.84	82.48	1582	1485	SMALL
44998	COSMOS 2491 DEB	2013-076S	CIS	41633	PKMTR		113.98	82.46	1498	1320	SMALL
45030	COSMOS 2491 DEB	2013-076T	CIS	41633	PKMTR		113.96	82.39	1669	1147	SMALL
45031	COSMOS 2491 DEB	2013-076U	CIS	41633	PKMTR		114.43	82.44	1531	1328	SMALL
45032	COSMOS 2491 DEB	2013-076V	CIS	41633	PKMTR		114.44	82.49	1566	1354	SMALL
45033	COSMOS 2491 DEB	2013-076W	CIS	41633	PKMTR		118.14	82.45	1633	1562	SMALL
45108	COSMOS 2491 DEB	2013-076X	CIS	41633	PKMTR		117.35	82.49	1611	1513	SMALL
45109	COSMOS 2491 DEB	2013-076Y	CIS	41633	PKMTR		117.84	82.43	1694	1474	SMALL
45127	COSMOS 2491 DEB	2013-076Z	CIS	41633	PKMTR		114.47	82.45	1531	1332	SMALL

Total Pieces of Cataloged Debris\* Created  
52

Total Pieces of Cataloged Debris Re-entered  
0

Amount of Debris Still on Orbit  
52

Date of Final Piece Re-entry Still On Orbit  
4.83

Last Updated 30-Jan-24  
Updated By Seth Walton

\* Debris cataloged by the U.S. military, generally pieces 10 cm in size and larger. Breakups from after 2003 are likely to have higher number of pieces detected and tracked by the SSN due to the full-power status of Cobra Dane radar.

Note also that these numbers are based on the last updated time as debris may have fragmented again or deorbited.

Catalog Number	Common Name	International Designator	Country (Byr)	Launch Date	Launch Site	Decay Date	Period	Incl.	Apogee	Perigee	RCS
49943	COSMOS 2499 DEB	2014-029AA	CIS	5/23/2014	PKMTR	111.29	82.52	1506	1066	SMALL	
49944	COSMOS 2499 DEB	2014-029AB	CIS	5/23/2014	PKMTR	112.49	82.45	1496	1187	SMALL	
50002	COSMOS 2499 DEB	2014-029AC	CIS	5/23/2014	PKMTR	110.5	82.54	1492	1088	SMALL	
55717	COSMOS 2499 DEB	2014-029AD	CIS	5/23/2014	PKMTR	112.24	82.37	1495	1164	SMALL	
55718	COSMOS 2499 DEB	2014-029AE	CIS	5/23/2014	PKMTR	112.24	82.38	1491	1168	SMALL	
55719	COSMOS 2499 DEB	2014-029AF	CIS	2014-05-23	PKMTR	112.13	82.38	1523	1126	SMALL	
55720	COSMOS 2499 DEB	2014-029AG	CIS	5/23/2014	PKMTR	113.22	82.51	1533	1216	SMALL	
55721	COSMOS 2499 DEB	2014-029AH	CIS	5/23/2014	PKMTR	112.2	82.94	1505	1151	SMALL	
55722	COSMOS 2499 DEB	2014-029AJ	CIS	5/23/2014	PKMTR	112.96	82.35	1503	1222	SMALL	
55723	COSMOS 2499 DEB	2014-029AK	CIS	5/23/2014	PKMTR	113.28	82.58	1546	1209	SMALL	
55724	COSMOS 2499 DEB	2014-029AL	CIS	5/23/2014	PKMTR	107.81	81.88	1538	894	SMALL	
55725	COSMOS 2499 DEB	2014-029AM	CIS	5/23/2014	PKMTR	110.87	82.29	1509	1024	SMALL	
55726	COSMOS 2499 DEB	2014-029AN	CIS	5/23/2014	PKMTR	112.26	82.32	1489	1172	SMALL	
55727	COSMOS 2499 DEB	2014-029AP	CIS	5/23/2014	PKMTR	112.58	82.24	1492	1198	SMALL	
55728	COSMOS 2499 DEB	2014-029AQ	CIS	5/23/2014	PKMTR	112.27	82.35	1478	1184	SMALL	
55729	COSMOS 2499 DEB	2014-029AR	CIS	5/23/2014	PKMTR	112.22	82.45	1508	1149	SMALL	
55730	COSMOS 2499 DEB	2014-029AS	CIS	5/23/2014	PKMTR	111.28	82.15	1471	1100	SMALL	
55731	COSMOS 2499 DEB	2014-029AT	CIS	5/23/2014	PKMTR	109.93	82.44	1323	1124	SMALL	
55732	COSMOS 2499 DEB	2014-029AU	CIS	5/23/2014	PKMTR	112.78	82.32	1472	1237	SMALL	
55733	COSMOS 2499 DEB	2014-029AV	CIS	5/23/2014	PKMTR	110.5	82.29	1499	1000	SMALL	
55734	COSMOS 2499 DEB	2014-029AW	CIS	5/23/2014	PKMTR	107.76	82.36	1288	938	SMALL	
55735	COSMOS 2499 DEB	2014-029AX	CIS	5/23/2014	PKMTR	111.83	82.42	1434	1188	SMALL	
55736	COSMOS 2499 DEB	2014-029AY	CIS	5/23/2014	PKMTR	111.08	82.36	1469	1084	LARGE	
56466	COSMOS 2499 DEB	2014-029AZ	CIS	5/23/2014	PKMTR	109.9	82.23	1453	992	SMALL	
56467	COSMOS 2499 DEB	2014-029BA	CIS	5/23/2014	PKMTR	113.43	82.63	1566	1201	SMALL	
56468	COSMOS 2499 DEB	2014-029BB	CIS	5/23/2014	PKMTR	109.85	82.34	1494	938	SMALL	
56469	COSMOS 2499 DEB	2014-029BC	CIS	5/23/2014	PKMTR	111.54	82.32	1478	1101	SMALL	
56470	COSMOS 2499 DEB	2014-029BD	CIS	5/23/2014	PKMTR	112.66	82.44	1447	1250	SMALL	
56471	COSMOS 2499 DEB	2014-029BE	CIS	5/23/2014	PKMTR	109.87	81.99	1462	979	SMALL	
56472	COSMOS 2499 DEB	2014-029BF	CIS	5/23/2014	PKMTR	111.48	82.68	1421	1158	SMALL	
56473	COSMOS 2499 DEB	2014-029BG	CIS	5/23/2014	PKMTR	109.35	82.25	1499	894	SMALL	
56474	COSMOS 2499 DEB	2014-029BH	CIS	5/23/2014	PKMTR	111.76	82.44	1463	1152	SMALL	
56475	COSMOS 2499 DEB	2014-029BI	CIS	5/23/2014	PKMTR	112.41	82.29	1494	1181	SMALL	
56476	COSMOS 2499 DEB	2014-029BK	CIS	5/23/2014	PKMTR	112.34	82.4	1577	1112	SMALL	
56477	COSMOS 2499 DEB	2014-029BL	CIS	5/23/2014	PKMTR	111.9	82.32	1460	1168	SMALL	
56478	COSMOS 2499 DEB	2014-029BM	CIS	5/23/2014	PKMTR	109.57	82.23	1383	1011	SMALL	
56479	COSMOS 2499 DEB	2014-029BN	CIS	5/23/2014	PKMTR	112.39	82.27	1452	1222	SMALL	
56480	COSMOS 2499 DEB	2014-029BP	CIS	5/23/2014	PKMTR	109.37	82.34	1443	951	SMALL	
56481	COSMOS 2499 DEB	2014-029BQ	CIS	5/23/2014	PKMTR	109.69	82.25	1465	939	SMALL	
57759	COSMOS 2499 DEB	2014-029BR	CIS	5/23/2014	PKMTR	110.52	82.27	1454	1047	LARGE	
59265	COSMOS 2499 DEB	2014-029C	CIS	5/23/2014	PKMTR	112.25	82.45	1508	1152	MEDIUM	
49924	COSMOS 2499 DEB	2014-029D	CIS	5/23/2014	PKMTR	111.46	82.5	1506	1081	SMALL	
49925	COSMOS 2499 DEB	2014-029E	CIS	5/23/2014	PKMTR	110.69	82.51	1493	1024	SMALL	
49926	COSMOS 2499 DEB	2014-029F	CIS	5/23/2014	PKMTR	111.82	82.4	1584	1017	SMALL	
49927	COSMOS 2499 DEB	2014-029G	CIS	5/23/2014	PKMTR	111.55	82.48	1527	1008	SMALL	
49928	COSMOS 2499 DEB	2014-029H	CIS	5/23/2014	PKMTR	112.48	82.45	1498	1183	SMALL	
49929	COSMOS 2499 DEB	2014-029I	CIS	5/23/2014	PKMTR	111.78	82.54	1529	1086	SMALL	
49930	COSMOS 2499 DEB	2014-029J	CIS	5/23/2014	PKMTR	111.88	82.55	1499	1127	SMALL	
49931	COSMOS 2499 DEB	2014-029K	CIS	5/23/2014	PKMTR	111.77	82.54	1518	1099	SMALL	
49932	COSMOS 2499 DEB	2014-029L	CIS	5/23/2014	PKMTR	111.62	82.52	1560	1042	SMALL	
49933	COSMOS 2499 DEB	2014-029M	CIS	5/23/2014	PKMTR	111.63	82.53	1520	1084	SMALL	
49934	COSMOS 2499 DEB	2014-029N	CIS	5/23/2014	PKMTR	110.98	82.51	1452	0901	SMALL	
49935	COSMOS 2499 DEB	2014-029S	CIS	5/23/2014	PKMTR	110.99	82.52	1507	1017	SMALL	
49936	COSMOS 2499 DEB	2014-029T	CIS	5/23/2014	PKMTR	111.21	82.52	1568	997	SMALL	
49937	COSMOS 2499 DEB	2014-029U	CIS	5/23/2014	PKMTR	111.57	82.49	1571	1027	SMALL	
49938	COSMOS 2499 DEB	2014-029V	CIS	5/23/2014	PKMTR	110.86	82.56	1501	1011	SMALL	
49939	COSMOS 2499 DEB	2014-029W	CIS	5/23/2014	PKMTR	112.02	82.5	1542	1097	SMALL	
49940	COSMOS 2499 DEB	2014-029X	CIS	5/23/2014	PKMTR	110.97	82.49	1512	1039	SMALL	
49941	COSMOS 2499 DEB	2014-029Y	CIS	5/23/2014	PKMTR	111.72	82.55	1519	1092	SMALL	
49942	COSMOS 2499 DEB	2014-029Z	CIS	5/23/2014	PKMTR	112.33	82.45	1509	1158	SMALL	

Total Pieces of Cataloged Debris Created  
60

Last Updated 30-Jan-24  
Updated By Seth Walton

Total Pieces of Cataloged Debris Re-entered  
0

Amount of Debris Still on Orbit  
60

Date of Final Piece Re-entry  
Still On Orbit

Lifespan of Debris  
175

\* Debris cataloged by the U.S. military, generally pieces 10 cm in size and larger. Breakups from after 2003 are likely to have higher number of pieces detected and tracked by the SSN due to the full-power status of Cobra Dane radar.

Note also that these numbers are based on the last updated time as debris may have fragmented again or deorbited.

Catalog Number	Common Name	International Designator	Country (Key)	Launch Date	Launch Site (Key)	Decay Date	Period	Incl.	Apogee	Perigee	RCS
40556	BREEZE-KM R/B	2015-020E	CIS	2015-03-31	PKMTR		112.45	82.49	1504	1174	LARGE
41718	BREEZE-KM DEB	2015-020F	CIS	3/31/2015	PKMTR		111.52	82.49	1473	1120	SMALL
41719	BREEZE-KM DEB	2015-020G	CIS	3/31/2015	PKMTR		112.93	82.49	1532	1190	SMALL
41720	BREEZE-KM DEB	2015-020H	CIS	3/31/2015	PKMTR		111.55	82.49	1475	1121	SMALL
41721	BREEZE-KM DEB	2015-020J	CIS	3/31/2015	PKMTR		112.97	82.49	1552	1174	SMALL
41722	BREEZE-KM DEB	2015-020K	CIS	3/31/2015	PKMTR		113.34	82.49	1519	1241	SMALL
41723	BREEZE-KM DEB	2015-020L	CIS	3/31/2015	PKMTR		111.42	82.48	1464	1121	SMALL

**Total Pieces of Cataloged Debris\* Created**

7

**Total Pieces Cataloged Debris Re-entered**

0

**Amount of Debris Still on Orbit**

7

**Date of Final Piece Re-entry**

Still On Orbit

**Lifespan of Debris**

6.00

**Last Updated 30-Jan-24  
Updated By Seth Walton**

\* Debris cataloged by the U. S. military, generally pieces 10 cm in size and larger. Breakups from after 2003 are likely to have higher number of pieces detected and tracked by the SSN due to the full-power status of Cobra Dane radar.

Note also that these numbers are based on the last updated time as debris may have fragmented again or deorbited