DUST COURIER

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Cosmic Dust
Code SN2
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News concerning NASA's collection, curation and allocation of interplanetary dust, spacecraft debris impact features and stratospheric dust.

Note from the Curator

With this expanded Courier we are advertising the availability of space exposed surfaces and terrestrial dust samples collected in the stratosphere. In doing so we hope to better serve the needs of the larger Earth and space science community.

Although our primary reason for collecting dust in the stratosphere has been to supply researchers with interplanetary dust, we have always recognized that we also collect a significant amount of terrestrial dust. While this terrestrial material, principally wind-blown dust, volcanic ash and aerosols, and re-entering spacecraft debris particulates, has held little interest for most interplanetary dust workers, we realize that to other scientists this material is an important resource. We therefore invite requests for terrestrial dust from qualified workers, employing the same request guidelines set out below.

We also have expanded the Courier to include information concerning the curation and availability of space-exposed surfaces. We have a limited number of thermal control blankets and louvers from the Solar Maximum and Palapa Satellites available for study. However, we have a large number of space-exposed surfaces from the Long Duration Exposure Facility (LDEF), all exhibiting meteoroid and space debris impact features. Accordingly, in this Courier we summarize the available holdings

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of LDEF surfaces at the Curatorial Facility, and provide a guide for writing sample requests for this material. We also summarize recent results from LDEF surfaces with regards to meteoroid and space debris research. There already exists an independent newsletter dedicated to LDEF results; for information concerning this free newsletter please contact: LDEF Newsletter, PO Box 10518, Silver Spring, MD 20914, USA.

Availability of Volcanic Dust

NASA has been collecting dust in the stratosphere since the beginning of 1981, employing U-2, ER-2 and WB-57 aircraft. These flights have ranged over most of the USA (as far north as Alaska) and Central America. We typically fly several collectors at a time on any particular aircraft. However, in the succeeding years full-scale particle collection has been suspended during periods of heavy volcanic particulate and aerosol content of the stratosphere. During these latter periods we have flown only one or two collectors at a time on the aircraft. Nevertheless, these particular collectors carry a record of the volcanic emissions present in the stratosphere following major eruptions.

Since 1981 the following volcanic eruptions are known to have placed material directly into the stratosphere: El Chichon (March, 1982), Nevado del Ruiz (Nov. 1985), Mt. Augustine (March, 1986) and Mt. Pinatubo (June, 1991). (As we go to press the activity of Mt. Pinatubo is

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Cluster Particle Relationships for Collector L2005

Cluster #	Particle #, L2005
1	A1
2	A2
3	A3
4	A4
5	A5, A7, A8
6	A6
7	B7
8	S8
9	B9
10	B10, B19, B20
11	B11, B21, B22
12	B12, B13, B14, B15, B16, B17, B18
13	C1, C13, C25, C26, C31, C34, C38
14	C2, C3, C14, C29, C30, C33, C36
15	C4, C15, C27, C28, C32, C35, C39
16	C16
17	C17, C19, C20, C21
18	C5, C18, C22, C23, C24, C37, C40
19	D1, D19, D25, D26, D27, D35
20	D2, D3, D20, D28, D29, D31
21	D21
24	D24, D30, D32, D33, D34
25	E1, E2, E3, E25, E31, E32, E36
26	E4, E5, E26, E33, E37, E38, E40
28	E28, E34, E35, E39, E41
30	E30
31	F1, F2, F3, F31, F37, F38, F39
32	F32
33	F4, F33
34	F34
36	F36
38	G1, G38, G43
39	G39
40	G40
42	G2, G3, G42
43	H43
44	H1, H44
45	H45, H49, H50
46	H46
48	H48

Cluster Particle Relationships for Collector L2006

Cluster #	Particle #, L2006
1	A1, A2
2	A3, A4, A19, A24, A26, A27, A29
3	A5, A6, A7, A8, A9, A10, A20, A25, A30
4	A11, A12, A13, A21, A28, A31
5	A14
6	A15, A16, A22, A32
7	A17
8	A18, A23
9	B1, B2, B3, B4
10	B5, B6, B7, B22
11	B8, B9, B10, B11, B19
12	B12, B13
13	B14
14	B15, B16, B17, B18, B20, B21

Cluster Particle Relationships for Collector L2011

Cluster #	Particle #, L2011
1	A1
2	A2
3	A3, A5
4	A4, A6
5	B1, B5
6	B2, B6
7	B3, B7
8	B4, B8
9	C1, C2
10	C3, C4
11	C5, C6, C8
12	C7
13	D1, D2
14	D3, D4
15	D5, D7
16	D6, D8
17	E1, E2, E8
18	E3, E4
19	E5
20	E6, E7
21	F1, F4
22	F2, F5
23	F3

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ongoing) After each of these eruptions we have noted the presence of (generally) submicrometer-sized ash particles and aerosol droplets on collectors, although we cannot always be certain of the identity of the volcano responsible for the material. For example, collectors from March, 1981 contain abundant silicic volcanic ash although no volcanic eruption was known to have directly penetrated the stratosphere (Zolensky and Mackinnon, *J. Geophysical Research 90*, No. D3, pp 5801-5808, 1985). In addition, we have noted the presence of coarse-grained ($\lesssim$25 μm) volcanic ash on collectors which sampled from Aug. 1989 to April 1990, which cannot have been derived from any of the aforementioned eruptions.

We invite requests for these volcanic materials. At present they are still contained within silicone oil (polydimethylsiloxane) on the original collectors. We have noted a tendency for the liquid aerosols (presumably sulfuric acid, predominantly) to crystallize over time in the oil. For the requested format for these requests see that given below for interplanetary dust requests (page 8).

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W7061	AT JSC	Volcanic aerosol
W7062	AT JSC	Volcanic areosol
W7063	AT JSC	Volcanic aerosol
W7064	AT JSC	Volcanic aerosol
W7065	AT JSC	Volcanic aerosol and ash. Hardly any particles
W7066	AT JSC	Few particles. Picked light ash/aerosol,crystal. (~2 mounts)
W7067	AT JSC	Reserved. Light ash/aerosol,crystal. (~1 mount)
W7068	AT JSC	Picked. Ash/aerosol,crystal. Some thinning of oil (~1 mount)
W7069	AT JSC	Picked. Light ash/some aerosol. Some oil thinning. (~3mount)
W7070	AT JSC	Reserved. Aerosol/ash. Only a few particles
W7071	AT JSC	Some picked. Good flag; should pick. Some aerosol/ash
W7072	AT JSC	Previously allocated to Walker
W7073	AT JSC	Picked some particles. Earlier contamination aero,ash&cryst
W7074	AT JSC	Picked 9 mounts. One cluster particle and black sphere left
W7075	AT JSC	Backg. of clear and some black spheres.Pickable.Some Contam.
W7076	AT JSC	Some contamination. Good flag to pick/excellent cluster
W7077	AT JSC	Heavy background. Sim. nuclear blast flown thru 074—082
W7078	AT JSC	Heavy background. Sim. nuclear blast flown thru. Contaminat.
W7079	AT JSC	Light backg. See W7077. One ~30um sphere. Flag hard to pick
W7080	AT JSC	Heavy background. See W7077. Contaminated
W7081	AT JSC	Heavy background. See W7077. Contaminated
W7082	AT JSC	Heavy background. See W7077. Contaminated
W7083	AT JSC	Many hours. Lots of particles. Good flag to pick
W7084	AT JSC	Many hours. Lots of particles. Good flag to pick
W7085	AT JSC	Many hours. Lots of particles. Good flag to pick
W7086	AT JSC	Many hours. Lots of particles. Good flag to pick
W7087	AT JSC	Many hours. Lots of particles. Good flag to pick
W7088	AT JSC	Many hours. Lots of particles. Good flag to pick
W7089	AT JSC	Same as W7087, but much heavier. Possible contamination
W7090	AT JSC	Same as W7089. Could be picked if necessary
W7091	AT JSC	Contaminated. Ash. No aerosol. Some ash is ~20um
W7092	AT JSC	Contaminated. Ash. No aerosol. Ash is ~15um
W7093	AT JSC	Contaminated. Ash. No aerosol. Ash is ~15-20um
W7094	AT JSC	Contaminated. Ash. No aerosol. Ash ~15/20um
W7095	AT JSC	Contam. Ash. No aerosol. Ash ~15/20u. Flag possibly pickable
W7096	AT JSC	Contaminated. Ash. No aerosol. Ash is ~15-20um. Pickable
W7097	AT JSC	Contaminated. Ash. No aerosol. Ash ~15/20um. Pickable
W7098	AT JSC	Contaminated. Ash. No aerosol. Ash ~15-20um. Interesting
W7099	AT JSC	Light backg. of ash. No aerosol. Ash is 2um or less.Pickable
W7100	AT JSC	Light backg. of ash. No aerosol. Ash 2um of less. Pickable
W7101	FLYNN,G	
W7102	AT JSC	Contam. Ash. No aerosol. Ash ~2um. Possibly pickable
W7103	AT JSC	Light backg. of ash. No aerosol. Ash ~2um or less. Contam
W7104	AT JSC	Light ash background. No aerosol. Possibly other contamin.
W7105	AT JSC	Light ash background. No aerosol. Possibly other contamin.
W7106	AT JSC	Light background of ash. No aerosol. Flag is pickable
W7107	AT JSC	Very light background of ash. No aerosol. Pickable
W7108	AT JSC	Very light background of ash. Poss. other contam. Pickable
W7109	AT JSC	Slight amount of ash/aerosol. Good flag to pick
W7110	AT JSC	Fairly clean to the eye. No ash or aerosol. Pickable
W7111	AT JSC	Light aerosol/ash background. Lots of particles. Pickable

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W7112	AT JSC	Good flag. Lots of parts. Slight aerosol around the notch
W7113	AT JSC	Slight background of something. Flag is pickable
W7114	AT JSC	Slight background of something. Lots of particles. Pickable
W7115	AT JSC	Aerosol. Four hr. flight to Denver from Hou. Some oil miss.
W7116	AT JSC	Some oil missing. Some aerosol. Few parts. One good cluster
W7117	AT JSC	Few parts. Some oil missing. Some aerosol. Signs of pollen
W7118	AT JSC	Housings in bad shape from aerosol. Few particles. Pickable
W7119	AT JSC	See W7118. Few particles. Some aerosol. Pickable
W7120	AT JSC	See W7118. Coverage of aerosol. Oil thinning. Pickable
W7121	AT JSC	See 118. Some aerosol. Some oil miss. 1 good clust. Pickable
W7122	AT JSC	Aerosol droplets. Some oil missing. Few particles. Pickable
W7123	AT JSC	Some aerosol. No oil miss. Few parts. Poss. ash. Pickable
W7124	AT JSC	Some aerosol. No oil miss, Few parts. Poss. ash. Pickable
W7125	AT JSC	Aerosol droplets. Some oil missing. Few particles. Pickable

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Guidelines for Preparing a Sample Request

All sample requests should be made in writing to:

Curator/Cosmic Dust
Code SN2
Planetary Science Branch
NASA/Johnson Space Center
Houston, Texas 77058 USA

Information may be obtained by telephone via (713) 483-5128.

Each request should refer to specific samples by their official identification numbers and should contain enough information to permit evaluation of the proposed study and the adequacy of the requestor's facilities. All necessary information should probably be condensable into a one- or two-page letter, although informative attachments (e.g., copies of pages from related proposals, reprints of publications, flow diagrams for analyses) are welcome. In addition, a brief statement regarding the desired method of mounting or containerizing the samples for shipment to the requestor should be included (see article on "Sample Containers for Shipment of Allocated Dust Particles" on pages 14-21 of Cosmic Dust Courier No. 4). Each sample request will be reviewed by the Cosmic Dust Committee (CDC), and the Lunar and Planetary Sample Team (LAPST), committees of scientists that advise NASA on matters related to the curation and allocation of extraterrestrial samples. The

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Renumbered Chondritic Interplanetary Dust Particles

OLD PARTICLE NUMBER	NEW PARTICLE CLUSTER NUMBER
U2011 A 2	U2011 *A 1
U2011 A 4	U2011 *A 2
U2011 A 5	U2011 *B 1
U2015 A 1	U2015 *A 1
U2015 A 2	U2015 *A 2
U2015 A 3	U2015 *A 3
U2015 A 8	U2015 *B 1
W7010 A 8	W7010 *A 1
W7010 C 1	W7010 *A 3
W7010 C 2	W7010 *A 4
W7010 C 4	W7010 *A 5
W7026 A 1	W7026 *A 1
W7028 A 4	W7028 *C 1
W7028 D 1	W7028 *C 2
W7029 B 13	W7029 *B 1
W7029 C 1	W7029 *A 1
W7029 K 1	W7029 *A 27
W7029 K 2	W7029 *B 8
W7031 A 1	W7031 *A 1
W7031 A 2	W7031 *B 1
W7031 A 5	W7031 *C 1
W7031 A 9	W7031 *D 1
W7031 E 1	W7031 *A 3
W7031 E 2	W7031 *C 2
W7031 E 3	W7031 *B 2
W7031 E 4	W7031 *B 3
W7066 A 1	W7066 *A 1
W7066 A 5	W7066 *A 2
W7066 B 1	W7066 *A 3
W7066 B 2	W7066 *A 4
W7069 A 1	W7069 *A 1
W7069 A 2	W7069 *B 2
W7069 B 1	W7069 *B 2
W7069 B 2	W7069 *A 2
W7069 B 3	W7069 *A 3
W7071 A 1	W7071 *A 2
W7071 A 2	W7071 *A 1

Itemized Listing of Available Samples

MOUNT #		PARTICLES AVAILABLE FOR ALLOCATION
L2001	A	8
L2005	A	1 6
L2005	B	9 13 15 16
L2005	C	2 3 16
L2005	D	1 2 21 24
L2005	E	1 3 30
L2005	F	1 2 4 32 34 36
L2005	G	1 2 3 38 42
L2005	H	1 43 44 45 48
L2005	I	4 7 13 19 24
L2005	J	2 4 6 7 8 9 10 12 15 16 17 18 19 21 23 25
L2005	K	1 4
L2005	L	1
L2005	N	1 2 4 6 7
L2005	O	2 5 6 7 10
L2005	P	4 8 10 11 15
L2005	Q	3
L2005	R	2 3 4
L2005	S	8
L2005	T	1 3 6 7 8 10 14 16
L2005	U	2 3 4 7 8 9 10 12 13 14 15 16 17
L2005	V	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18
L2005	W	1 2 3 4 5 6 7 8 9 10 11 12 14 15
L2005	X	1 2 3 4 5 6 7 8 9 10 12 13 14 16
L2005	Y	1 2 3 4 7 8 9 10 11 12 13 17 18
L2005	AB	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
L2005	AC	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
L2005	AD	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
L2005	AE	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
L2005	AF	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
L2005	AG	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
L2006	A	1 2 4 5 8 9 10 11 13 14 16 17
L2006	B	1 2 3 4 5 6 12 13 14 17 18
L2006	C	1 2 3 6 7 8 9 10 11 14 16 17
L2006	D	1 2 4 5 6 7 8 9 10 11 12 14 15
L2006	E	1 4 5 6 8 9 11 12 13 14
L2006	F	1 2 3 5 6 8 11 13 14
L2006	G	2 3 4 6 7 8 9 10 11 12 13
L2006	H	1 2 3 4 5 6 8 9 10 12 13 14 15 16 17 18
L2006	I	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
L2006	J	1 2 3 4 6 7 8 10 12 15
L2006	K	1 2 3 4 5 6 8 9 10 11
L2006	L	1 2 3 5 6 7 8 9 10 11 12 13 14 15 16 18
L2006	M	2 3 4 6 7 8 9 10 11 13 14 15 16
L2006	N	2 3 6 7 8 9 10 11 12 13 14 15 16
L2006	O	1 2 3 4 5 6 7 8 9 11 13 14 15
L2006	P	1 2 3

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Curator will arrange for all required CDC and LAPST reviews and will inform investigators of results as rapidly as possible. Prospective sample requestors may select samples from among those described in any issue of the Cosmic Dust Catalog or Cosmic Dust Courier series. However, reference should be made to the sample availability table of this newsletter to check the status of each sample before it is requested. In addition, we encourage investigators to contact us in advance of submitting their sample requests if further information is desired.

LDEF Reports Available from the Curator

Limited numbers of three reports dealing with the LDEF meteoroid and space debris impact record are available from the Curator, NASA JSC (see address below). These reports are:

See T, Allbrooks M, Atkinson D, Simon C and Zolensky M (1990) *Meteoroid and Debris Impact Features Documented on the Long Duration Exposure Facility*. JSC Publ. 24608, 586p.

Coombs C, Watts A, Wagner J and Atkinson D (1992) *LDEF Data: Comparisons with Existing Models*. NAS9-17900 Final Report 1. 42p.

Allbrooks M and Atkinson D (1992) *The Magnitude of Impact Damage on LDEF Materials*. NAS9-17900 Final Report 2. 82p.

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L2011	A	1 2 3 4
L2011	B	1 2 3 4
L2011	C	1 2 3 4 5 6 7
L2011	D	1 2 3 4 5 6
L2011	E	1 2 3 4 5 6 7
L2011	F	1 2 3
L2011	G	1 2 3 4 5 6 7 8 9 10 11 12
L2011	H	1 2 3 4 5 6 7 8 9 10 11 12 13
L2011	I	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
L2011	J	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
L2011	K	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
L2011	L	1 2 3 4 5 6 7 8 9 10 11
L2011	M	1 2 3 4 6 7 8 9 10 11 12 13 14 15
L2011	N	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
L2011	O	2 3 4 5 6
L2011	P	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
L2011	Q	1 2 3 4 5 6 7 8 9 10 11 12 13 14
L2011	R	1 2 4 5 6 7 8 9 10 11 12 13 14
L2011	S	1 2 3 4 5 6 7 8 9 10 11 12 13 14
L2011	T	1 2 3 4 5 6 7 8 9 10
U2001	A	1 2 4 6 10 11 13 14 15 16 18 19 20
U2001	B	7 12 16
U2001	C	2 3 5 9 12 13 14 17
U2001	D	1 2 3 5 6 9 10 13 14 18 19
U2001	E	1 4 6 7 11 12 13 14 15 17 18 19 20
U2011	A	1 3 6 7 8 9 10 11
U2011	C	1 6 8 9
U2011	*A	1 2
U2013	A	1 2
U2015	A	4 5 6 7
U2015	B	1 2 4 5 6 7 12 13 15 16 17
U2015	C	1 2 3 5 6 7 9 10 12 14 15 17 18 19 20 21 22 23
U2015	D	1 2 3 4 5 7 8 9 12 13 14 15 17 18 19 20 23 24 25
U2015	E	5 6 11 12 13 15
U2015	F	4 7 8 9 10 11 13 14 17 18 19 21 22
U2015	G	2 5 6 7
U2015	*A	1 2 3
U2017	A	3 6 7 12
U2018	A	1 2 3 4 5 6
U2022	A	1 2 4 5
U2022	B	3 6 7 8 9 11 20 22 23 24 25
U2022	C	3 4 5 6 10 11 12 15 16 21
U2022	D	5 10 13 16 17
U2022	E	8 10 13 14 18 20 21 22 23 27 28 29 30 31
U2022	F	1 2 7 8 12 14 15 16 19
U2022	G	4 5 6 11 12 15 16 21 22 24
U2034	A	1 4 5 6 7 8 9 10 11 12 13 14 15 16 18 19 20 21 22 23
U2034	B	3 4 7 8 9 10 11 12 13 14 15 16 17 19
U2034	C	3 4 7 8 9 10 11 14 15 16 18 19
U2034	D	5 6 8 9 10 11 12 14 15 16 17
U2034	E	1 4 6 7 10 11 12 13 15 18 19 20 21
U2034	F	5 7 9 11 12 14 15 16 19 20 22 23 25 28 29 30
W7010	C	3 5

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W7010	*A	3 4 5
W7013	A	4 5 6 9 12 13 16 17 18 19 20 21
W7013	B	2 3 4 8 12 16 18 19
W7013	C	1 3 4 5 7 8 9 11 13 17
W7013	D	3 5 6 10 14 15 16 17
W7013	E	1 2 5 6 7 12 18
W7013	F	1 2 3 7 10 14 15 16 17
W7013	G	4 5 7 12 13 14 15 16
W7013	H	3 6 7 8 9 10 12 13 15 19 20 21 22 23
W7017	B	15
W7017	C	1 3 4 6 7 8 9 10 11 12 16 17
W7017	D	3 5 7 8 11 12 14
W7017	F	1 2 6 7 8 9 11 12 13 14
W7017	G	2 5 7 9 11 16
W7026	A	2 3
W7026	B	1 2
W7027	A	2 3 6 7 14 18
W7027	B	11 16
W7027	C	6 8 9 11 13 15 16
W7027	D	1 3 5 6 9 11 12 13 14 15 16 17 18
W7027	E	1 2 3 4 5 13 14 15 16
W7027	F	1 2 4 5 6 7 8 9 10 13 14 15 16 18 19 20
W7027	G	1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
W7027	H	3 5 6 7 8 9 12 13 16 18
W7027	I	1 2 3 4 5 6 7 8 9 10 11 12 13 14
W7028	A	1 2 5 6 7 8 9 10 11 12 13
W7028	D	2 3 4 5 6 7
W7029	A	1 2 3 4 5 6 8 9 11 12 13 14 15 16 17 18 19
W7029	B	6 7 8 10 15 16 18
W7029	C	10
W7029	D	1 2 3 4 5 6 8 9 10 11 12 13 15 16
W7029	E	1 2 6 9 15
W7029	F	1 2 3 5 6 8 10 16
W7029	G	1 5 6 7 8 12 13 16
W7029	H	1 2 3 5 12 14 16 17 18
W7029	I	2 3 4 5 7 9 10 11 12 15 16 17 20
W7029	J	2 5 8 11 12 13 14 15 16 18 19 20
W7029	K	3
W7029	*A	3 4 5 6 7 9 10 11 14 18 19 20 21
W7029	*B	1 3 8
W7031	A	3 4 6 7 8 10 11 12 13 14
W7031	B	1
W7031	*A	1
W7031	*B	2 3
W7032	A	1 2 3 4 5 6 7
W7036	B	1 2 3 4 5 6
W7066	A	2 3 4
W7066	B	3 4
W7066	*A	1
W7068	A	1 2 3
W7069	*A	1 2 3
W7069	*B	2
W7071	B	1 2 3

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Highlights of the Meteoroid and Debris Sessions at the Second LDEF Post-retrieval Symposium, June 1-5, 1992

Meteoroid and debris investigators on the LDEF presented their latest results in 26 presentations at the symposium. It would be impossible to present a complete summary of the wealth of results presented in these papers; the interested reader is urged to consult the symposium abstract volume (NASA Conference Publication 10097, available from NASA Langley Research Center). Rather, we will discuss here a very few of the most interesting results in order to outline the current level of our understanding of LDEF results, and point out fruitful areas for further LDEF research. One could summarize the results by saying that with all we have learned about the particulate environment in low-Earth orbit (LEO) from the LDEF, a principal result is that we have a much better appreciation of the current limits of this understanding.

Results from many LDEF experiments indicate significant irregularities in the particulate flux in LEO; size-dependence and direction relationships for these grains are currently unexplained. Modeling indicates that these irregularities are probably due principally to man-made debris, although confirmation of this hypothesis must await better compositional data for impactor residues. The IDE (Interplanetary Dust Experiment, F. Singer, Univ. VA; D. Mulholland, Inst. Space Sci. & Tech.) instruments (active for the first 9 months of the LDEF mission) detected debris clouds, and a possible long-term time dependence of

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impactor flux. Discussion at the symposium indicated that the latter interpretation of the IDE data contradicts the interpretation of results from some other LDEF investigations. Hopefully, examination of other LDEF time-dependent experiments will serve to resolve this controversy.

Several LDEF investigators (F. Horz, NASA JSC; J.A.M. McDonnell, Univ. Kent) reported finding that a significant fraction (>15%) of impact features on the LDEF trailing side is due to man-made debris, where pre-flight modeling had indicated there should be essentially none. Don Kessler presented calculations that indicated that this result could best be explained by a population of man-made debris in highly elliptical orbits, with numbers 20-30 times greater than previously estimated. Material in these orbits probably result from orbital transfer stages, several of which are known to have exploded, producing debris.

LDEF investigators (D. Atkinson, POD Assoc., Inc.; M. Rose, Auburn Univ.) are now making the first attempts to model expected damage to spacecraft components due to meteoroid and debris impacts as a function of exposure time. Comprehensive models have awaited the most recent flux calculations available from LDEF data. This work is one of the most critical that remains for LDEF workers, and is of paramount importance to spacecraft designers.

Results of continuing analyses of crater and penetration feature morphologies on LDEF were reported by many LDEF investigators at the symposium (J-C. Mandeville, CERT-ONERA; T. See, Lockheed ESCO; M. Meshishnek, Aerospace Corp.; D.

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W7071	*A	1 2
W7073	A	1
W7074	A	1 2 3 4 8 9 10 11 12 13 15 16 18 20 21 24 25 27
W7074	B	2 3 6 7 8 9 12 15 16 17 18 19 20 21 22 23 24
W7074	C	1 4 6 10 11 12 14 16 18 19 20 21 22 23
W7074	D	2 6 8 9 12 14 19
W7074	E	1 3 4 8 9 10 18
W7074	F	1 2 3 4 5 7 8 10 11 14 15 16
W7074	G	1 2 4 5 6 8 9 11 13 14 15 16 17
W7074	H	2 5 6 7 11 12 13 14 15
W7074	I	1 2 3 4 7 12 13 14 16

Itemized Listing of Available LDEF Samples

The Surface Name, "Primary Surface Name", or Surface is a six-character designation for each LDEF experiment surface. The first three characters give the tray location (*e.g.,* A01 would be Bay A on Row 01). The fourth character is always a letter designation for the type of surface, called a "Component". The final two numbers in each Surface Name give the number of the specific surface. All of the experiment trays were composed of several to many separate surfaces, all of which were named separately. Thus, the Surface Name C01E01 would indicate experiment E surface number 01 from experiment Bay C on Row 01. For additional information concerning these available LDEF surfaces please consult *Meteoroid and Debris Impact Features Documented on the Long Duration Exposure Facility* (JSC Publication 24608), identified on page 10.

LDEF CORES AVAILABLE AT JSC

Surface Name	Feature Number	Layer Number	Brief Description of Impact Substrate	Core Number (Curatorial #)
A01E00,	4		GRAPHITE COMPOS	LD-114
A01E00,	5		GRAPHITE COMPOS	LD-113
A01E00,	8		GRAPHITE COMPOS	LD-115
A01E00,	9		GRAPHITE COMPOS	LD-116
A07E00,	8		GRAPHITE COMPOS	LD-117
A07E00,	14		GRAPHITE COMPOS	LD-118
A07E00,	17		GRAPHITE COMPOS	LD-119
A07F01,	2		TAPE LIFT	LD-65
A08F01,	2		TAPE LIFT	LD-57
A09F01,	7		TAPE LIFT	LD-81
A10F01,	2		TAPE LIFT	LD-76
A11F02,	2		TAPE LIFT	LD-75
A12F01,	2		TAPE LIFT	LD-46
A12F01,	3		TAPE LIFT	LD-47
B06F01,	3		TAPE LIFT	LD-61
B06F01,	3		TAPE LIFT	LD-84
B06F01,	3		TAPE LIFT	LD-85
B07F01,	3		TAPE LIFT	LD-56

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B07F01,	3		TAPE LIFT	LD-66
B11F01,	2		TAPE LIFT	LD-42
B11F02,	2		TAPE LIFT	LD-41
C05F01,	1		TAPE LIFT	LD-60
C09F01,	11		TAPE LIFT	LD-82
C10F01,	1		TAPE LIFT	LD-77
C10F01,	3		TAPE LIFT	LD-78
C11F01,	3		TAPE LIFT	LD-43
D05E00,	15		CU FOIL	LD-32
D05E01,	15		AL GROUND STRAP	LD-87
D06F02,	2		TAPE LIFT	LD-68
D08F02,	4		TAPE LIFT	LD-58
D08F02,	8		TAPE LIFT	LD-59
D10E01,	1		AL-MYLAR FOIL	LD-22
D10E01,	2		AL-MYLAR FOIL	LD-22
D10E01,	3	1	AL-MYLAR FOIL	LD-17
D10E01,	3	2	AL-MYLAR FOIL	LD-18
D12F01,	3		TAPE LIFT	LD-44
D12F01,	6		TAPE LIFT	LD-45
E01E00,	163	1	TEFLON	LD-163
E01E00,	182	1	TEFLON	LD-173
E05F01,	1		TAPE LIFT	LD-69
E05F02,	1		TAPE LIFT	LD-70
E06F01,	1		TAPE LIFT	LD-62
E08F01,	1		TAPE LIFT	LD-53
E08F01,	4		TAPE LIFT	LD-54
E08F01,	5		TAPE LIFT	LD-55
E08F02,	1		TAPE LIFT	LD-52
E09F02,	6		TAPE LIFT	LD-83
E10E00,	81	1	TEFLON	LD-192
E10E00,	85	1	TEFLON	LD-185
E10E00,	86	1	TEFLON	LD-214
E10E00,	88	1	TEFLON	LD-140
E10E00,	89	1	TEFLON	LD-212
E10E00,	91	1	TEFLON	LD-147
E10E00,	92	1	TEFLON	LD-155
E10E00,	93	1	TEFLON	LD-148
E10E00,	94	1	TEFLON	LD-204
E10E00,	95	1	TEFLON	LD-205
E10E00,	108	1	TEFLON	LD-171
E10E00,	109	1	TEFLON	LD-171
E10E00,	110	1	TEFLON	LD-169
E10E00,	113	1	TEFLON	LD-166
E10E00,	115	1	TEFLON	LD-157
E10E00,	117	1	TEFLON	LD-178
E10E00,	146	1	TEFLON	LD-158
E10E00,	149	1	TEFLON	LD-169
E10E00,	154	1	TEFLON	LD-159
E10E00,	156	1	TEFLON	LD-169
E10E00,	158	1	TEFLON	LD-168
E10E00,	164	1	TEFLON	LD-170
E10E00,	165	1	TEFLON	LD-166
E10E00,	168	1	TEFLON	LD-160
E10E00,	174	1	TEFLON	LD-167
E10E00,	175	1	TEFLON	LD-166
E10E00,	177	1	TEFLON	LD-172
E10E00,	178	1	TEFLON	LD-161
E10E00,	179	1	TEFLON	LD-161
E10E00,	180	1	TEFLON	LD-162
E10E00,	181	1	TEFLON	LD-176
E10E00,	183	1	TEFLON	LD-174

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Kinser, Vanderbilt Univ.; R. Tennyson, Univ. Toronto; M. Zolensky, NASA JSC; M. Mirtich, NASA LRC; R. Bernhard, Lockheed ESCO). These analyses are yielding a great advance in our understanding of particulate flux and trajectories. J.A.M. McDonnell reported that careful shape analyses of LDEF impact craters frequently reveals small, but measurable, asymmetries which can be used to decode particulate trajectories with greater resolution.

LDEF investigators agreed on the woeful shortage of compositional analyses of impactor residues in craters (as a guide to elucidation of the nature of the impactor: meteoroid vs. debris). Results of many such analyses were presented at the symposium (R. Bernhard; E. Zinner, Washington Univ.; T. Bunch, NASA ARC; F. Radicati di Brozolo, Charles Evans & Assoc.; C. Simon, Inst. Space Sci. & Tech.) but most participants agreed that greater emphasis should be placed on this work in the immediate future.

Although the discrimination between meteoroids and debris can best be made on the basis of impactor residue chemistry, some particulate dynamic modeling can be performed now. Based upon crater densities in selected LDEF facing directions and orbital considerations, H. Zook (NASA JSC) reported confirmation of the existence of B-meteoroids. Zook also presented an analysis that concluded that approximately 90% of the meteoroid impacts on the LDEF should have resulted from comets (as opposed to asteroids). This is a far higher percentage than previous results have indicated, and a controversial calculation.

This summary of the meteoroid and debris presentations is intended to present only the flavor of the events. Fortunately, all of these

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papers will be more widely available in the upcoming Proceedings volumes. To receive these proceedings publications contact: LDEF Data Analysis Office, Code 404, NASA Langley Research Center, Hampton, VA 23665.

LDEF Meteoroid and Debris Impact Sample Curation

A principal goal of the LDEF Meteoroid and Debris Special Investigation Group (M&D SIG) is to further detailed research into the nature of particulates in low-Earth orbit, and the effects of their impact onto spacecraft materials. Towards this goal, we have carefully selected a large variety of space-exposed materials from LDEF containing impact features, and returned them to the Curatorial Facility at the Johnson Space Center (JSC). LDEF surfaces thereby join lunar samples, Antarctic meteorites, interplanetary dust, and surfaces from the Solar Maximum and Palapa spacecraft as an additional source of extraterrestrial and space debris materials for scientific study. In addition, investigators wishing to characterize the type and amount of spacecraft debris will find materials of interest that can be utilized to address these goals.

All selected LDEF samples have been stored in the Facility for the Optical Inspection of Large Surfaces (FOILS Lab). The FOILS Lab is a dedicated facility for the storage and preliminary examination of space-exposed surfaces, and occupies class 10,000 clean room. The cleanliness of this facility thus exceeds that

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E10E00,	184	1	TEFLON	LD-175
E10E00,	185	1	TEFLON	LD-177
E10E00,	186	1	TEFLON	LD-182
E10E00,	187	1	TEFLON	LD-181
E10E00,	188	1	TEFLON	LD-183
E10E00,	189	1	TEFLON	LD-184
E10E00,	190	1	TEFLON	LD-179
E10E00,	191	1	TEFLON	LD-180
E10E00,	192	1	TEFLON	LD-180
E10E00,	194	1	TEFLON	LD-209
E10E00,	195	1	TEFLON	LD-184
E10E00,	198	1	TEFLON	LD-210
E10E00,	199	1	TEFLON	LD-208
E10E00,	200	1	TEFLON	LD-211
E10E00,	203	1	TEFLON	LD-208
E10E00,	204	1	TEFLON	LD-208
E10E00,	208	1	TEFLON	LD-213
E10E00,	209	1	TEFLON	LD-213
E10E00,	210	1	TEFLON	LD-215
E10E00,	214	1	TEFLON	LD-193
E10E00,	215	1	TEFLON	LD-202
E10E00,	217	1	TEFLON	LD-207
E10E00,	218	1	TEFLON	LD-207
E10E00,	219	1	TEFLON	LD-207
E10E00,	222	1	TEFLON	LD-202
E10E00,	224	1	TEFLON	LD-195
E10E00,	225	1	TEFLON	LD-195
E10E00,	227	1	TEFLON	LD-194
E10E00,	228	1	TEFLON	LD-195
E10E00,	229	1	TEFLON	LD-195
E10E00,	230	1	TEFLON	LD-196
E10E00,	231	1	TEFLON	LD-201
E10E00,	232	1	TEFLON	LD-201
E10E00,	233	1	TEFLON	LD-201
E10E00,	234	1	TEFLON	LD-190
E10E00,	236	1	TEFLON	LD-197
E10E00,	238	1	TEFLON	LD-203
E10E00,	239	1	TEFLON	LD-206
E10E00,	240	1	TEFLON	LD-203
E10E00,	241	1	TEFLON	LD-203
E10E00,	242	1	TEFLON	LD-191
E10E00,	246	1	TEFLON	LD-198
E10E00,	249	1	TEFLON	LD-199
E10E00,	250	1	TEFLON	LD-200
E10E00,	252	1	TEFLON	LD-189
E10E00,	254	1	TEFLON	LD-199
E10E00,	256	1	TEFLON	LD-204
E10E00,	265	1	TEFLON	LD-186
E10E00,	266	1	TEFLON	LD-186
E10E00,	267	1	TEFLON	LD-188
E10E00,	269	1	TEFLON	LD-187
E10E00,	270	1	TEFLON	LD-187
E10E00,	271	1	TEFLON	LD-186
E10E00,	272	1	TEFLON	LD-127
E10E00,	274	1	TEFLON	LD-127
E10E00,	274	1	TEFLON	LD-128
E10E00,	276	1	TEFLON	LD-142
E10E00,	277	1	TEFLON	LD-130
E10E00,	280	1	TEFLON	LD-128
E10E00,	281	1	TEFLON	LD-129
E10E00,	283	1	TEFLON	LD-143

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E10E00,	284	1	TEFLON	LD-131
E10E00,	285	1	TEFLON	LD-143
E10E00,	286	1	TEFLON	LD-144
E10E00,	288	1	TEFLON	LD-156
E10E00,	289	1	TEFLON	LD-132
E10E00,	290	1	TEFLON	LD-145
E10E00,	294	1	TEFLON	LD-141
E10E00,	295	1	TEFLON	LD-141
E10E00,	296	1	TEFLON	LD-149
E10E00,	297	1	TEFLON	LD-141
E10E00,	298	1	TEFLON	LD-139
E10E00,	299	1	TEFLON	LD-133
E10E00,	300	1	TEFLON	LD-150
E10E00,	301	1	TEFLON	LD-153
E10E00,	303	1	TEFLON	LD-138
E10E00,	305	1	TEFLON	LD-134
E10E00,	306	1	TEFLON	LD-152
E10E00,	307	1	TEFLON	LD-150
E10E00,	308	1	TEFLON	LD-151
E10E00,	309	1	TEFLON	LD-154
E10E00,	311	1	TEFLON	LD-140
E10E00,	312	1	TEFLON	LD-138
E10E00,	313	1	TEFLON	LD-134
E10E00,	316	1	TEFLON	LD-146
E10E00,	318	1	TEFLON	LD-135
E10E00,	319	1	TEFLON	LD-135
E10E00,	320	1	TEFLON	LD-146
E10E00,	321	1	TEFLON	LD-137
E10E00,	322	1	TEFLON	LD-136
E10E00,	323	1	TEFLON	LD-135
E10F01,	4		TAPE LIFT	LD-73
E10F02,	2		TAPE LIFT	LD-72
E10F02,	8		TAPE LIFT	LD-79
E12E00,	4		WHITE-PAINTD AL	LD-5
E12E00,	5		WHITE-PAINTD AL	LD-6
E12E00,	6		WHITE-PAINTD AL	LD-7
E12E00,	7		BLK ANODIZED AL	LD-8
E12E00,	8		WHITE-PAINTD AL	LD-4
E12E00,	16		WHITE-PAINTD AL	LD-3
E12F01,	2		TAPE LIFT	LD-51
E12S01,	8		SCREW	LD-2
F01F01,	2		TAPE LIFT	LD-64
F02E00,	49	1	TEFLON BLANKET	LD-126
F05F01,	4		TAPE LIFT	LD-71
F07F02,	2		TAPE LIFT	LD-63
F07F03,	2		TAPE LIFT	LD-67
F08F03,	5		TAPE LIFT	LD-80
F09E00,	31		AL TAPE	LD-33
F09E00,	31		STEEL BOLT	LD-35
F09E01,	7		AL-MYLAR FOIL	LD-27
F09E01,	16	1	AL-MYLAR FOIL	LD-28
F09E01,	16	2	AL-MYLAR FOIL	LD-29
F09E01,	16	3	AL-MYLAR FOIL	LD-30
F09E05,	19		MULTI-BLANKET	LD-31
F09E08,	1		MULTI-BLANKET	LD-36
F09E08,	2		MULTI-BLANKET	LD-37
F09E08,	14		MULTI-BLANKET	LD-38
F09E08,	24		MULTI-BLANKET	LD-39
F09E08,	25		MULTI-BLANKET	LD-86
F09E08,	27		MULTI-BLANKET	LD-39

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provided by the class 100,000 clean room used to house the LDEF during integration and deintegration activities.

The accompanying tables list LDEF hardware received at JSC for curation by August, 1990, and which are still available for allocation and examination. A detailed listing of all M&D SIG is given within the M&D SIG Preliminary Report (JSC Publication #24608, available from the Curator). Most of these materials were obtained directly from the Principle Investigators (PIs) and the LDEF Project Office during LDEF deintegration at KSC. A few additional samples have arrived since that time, having been donated or loaned by the original experiment PI. We expect that more materials will be added to the curated materials list as time progresses.

Investigators Who Have Received LDEF Samples

- Dale Atkinson
  POD Associates, Inc.
  Albuquerque, NM
- Donald E. Brownlee
  Dept. of Astronomy
  University of Washington
  Seattle, WA
- Christian Durin
  CNES
  Toulouse, FRANCE
- Harry Dursch
  Boeing Defense & Space Group
  Seattle, WA
- David Felbeck
  Mechanical Engineering Dept.
  University of Michigan
  Ann Arbor, MI
- John Gregory
  Department of Chemistry
  University of Alabama
  Huntsville, AL
- William H. Kinard
  NASA/Langley Research Center
  Hampton, VA
- J. A. M. McDonnell
  Physics Laboratory
  Unit for Space Sciences
  University of Kent
  United Kingdom
- Lawrence Murr
  Department of Metallurgical and Materials Engineering
  University of Texas
  El Paso, TX
- Seth Shepherd
  Arnold Air Force Base, TN
- Patrick Tevlin
  Ontario Science Centre
  Don Mills, Ontario, Canada

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F10F01,	3		TAPE LIFT	LD-74
F12E01,	15		AL-MYLAR FOIL	LD-19
F12E01,	17		AL-MYLAR FOIL	LD-20
F12E02,	1	1	AL FOIL	LD-15
F12E02,	2	1	AL-MYLAR FOIL	LD-25
F12E02,	3	1	AL-MYLAR FOIL	LD-26
F12E02,	4		AL-MYLAR FOIL	LD-24
F12E02,	5		AL-MYLAR FOIL	LD-23
F12E03,	1		AL TAPE	LD-16
F12E03,	2		AL TAPE	LD-16
G25F01,	1		TAPE LIFT	LD-48
H03E00,	13	2	LEXAN SHEET	LD-98
H03E00,	13	3	LEXAN SHEET	LD-99
H03E00,	13	4	LEXAN SHEET	LD-100
H03E00,	13	5	LEXAN SHEET	LD-101
H03E00,	14	2	LEXAN SHEET	LD-95
H03E00,	14	3	LEXAN SHEET	LD-96
H03E00,	14	4	LEXAN SHEET	LD-97
H03E00,	15	2	LEXAN SHEET	LD-88
H03E00,	15	3	LEXAN SHEET	LD-89
H03E00,	15	4	LEXAN SHEET	LD-90
H03E00,	15	5	LEXAN SHEET	LD-91
H03E00,	15	6	LEXAN SHEET	LD-92
H03E00,	15	7	LEXAN SHEET	LD-93
H03E00,	15	8	LEXAN SHEET	LD-94
H05F02,	2		TAPE LIFT	LD-50
H07F03,	1		TAPE LIFT	LD-49
H09E00,	3		WHITE-PAINTD AL	LD-10
H09E00,	7		WHITE-PAINTD AL	LD-11
H09E00,	8		WHITE-PAINTD AL	LD-12
H09E00,	9		WHITE-PAINTD AL	LD-13
H09E00,	A		WHITE PAINTD AL	LD-14
H09E00,	10		WHITE-PAINTD AL	LD-9
H12E00,	1	2	LEXAN SHEET	LD-102
H12E00,	1	3	LEXAN SHEET	LD-103
H12E00,	1	4	LEXAN SHEET	LD-104
H12E00,	1	5	LEXAN SHEET	LD-105
H12E00,	1	6	LEXAN SHEET	LD-106
H12E00,	1	7	LEXAN SHEET	LD-107
H12E00,	1	8	LEXAN SHEET	LD-108
H12E00,	1	9	LEXAN SHEET	LD-109
H12E00,	1	10	LEXAN SHEET	LD-110
H12E00,	1	11	LEXAN SHEET	LD-111
H12E00,	1	12	LEXAN SHEET	LD-112
H12E00,	8		AL OVER SCREW	LD-21

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LDEF PRIMARY SURFACES AVAILABLE AT JSC

Surface	Component	Material
A01C01	CLAMP	ALUMINUM
A01C04	CLAMP	ALUMINUM
A01E00A	EXPERIMENT TRAY	ALUMINUM
A01E00B	EXPERIMENT TRAY	ALUMINUM
A01E00C	EXPERIMENT TRAY	ALUMINUM
A01E00D	EXPERIMENT TRAY	ALUMINUM
A01E00E	EXPERIMENT TRAY	ALUMINUM
A01E00F	EXPERIMENT TRAY	ALUMINUM
A01E00G	EXPERIMENT TRAY	ALUMINUM
A01E00H	EXPERIMENT TRAY	ALUMINUM
A01E00I	EXPERIMENT TRAY	ALUMINUM
A01E00J	EXPERIMENT TRAY	ALUMINUM
A01E00K	EXPERIMENT TRAY	ALUMINUM
A01E00L	EXPERIMENT TRAY	ALUMINUM
A01E00M	EXPERIMENT TRAY	ALUMINUM
A01E00N	EXPERIMENT TRAY	ALUMINUM
A01E00O	EXPERIMENT TRAY	ALUMINUM
A01E00P	EXPERIMENT TRAY	ALUMINUM
A01E00Q	EXPERIMENT TRAY	ALUMINUM
A01E00R	EXPERIMENT TRAY	ALUMINUM
A01E00S	EXPERIMENT TRAY	ALUMINUM
A01S01B	BOLT	STEEL
A01S01E	BOLT	STEEL
A01S01F	BOLT	STEEL
A01S01G	BOLT	STEEL
A01S01J	BOLT	STEEL
A01S01L	BOLT	STEEL
A01S01N	BOLT	STEEL
A01S01O	BOLT	STEEL
A01S01P	BOLT	STEEL
A01S01Q	BOLT	STEEL
A01S01R	BOLT	STEEL
A01S01S	BOLT	STEEL
A01S02E	BOLT	STEEL
A01S02F	BOLT	STEEL
A01S02G	BOLT	STEEL
A01S02I	BOLT	STEEL
A01S02J	BOLT	STEEL
A01S02L	BOLT	STEEL
A01S02N	BOLT	STEEL
A01S02O	BOLT	STEEL
A01S02P	BOLT	STEEL
A01S02Q	BOLT	STEEL
A01S02S	BOLT	STEEL
A01S03E	BOLT	STEEL
A01S03F	BOLT	STEEL
A01S03G	BOLT	STEEL
A01S03I	BOLT	STEEL
A01S03J	BOLT	STEEL
A01S03N	BOLT	STEEL
A01S03O	BOLT	STEEL
A01S03P	BOLT	STEEL
A01S03Q	BOLT	STEEL
A01S03S	BOLT	STEEL
A01S04E	BOLT	STEEL
A01S04F	BOLT	STEEL
A01S04G	BOLT	STEEL
A01S04Q	BOLT	STEEL
A02C01	CLAMP	ALUMINUM
A02C03	CLAMP	ALUMINUM
A02E00AA	EXPERIMENT TRAY	TEFLON
A02E00AB	EXPERIMENT TRAY	TEFLON
A02S07C	BOLT	STEEL
A02S08C	BOLT	STEEL
A03C01	CLAMP	ALUMINUM
A03E00	EXPERIMENT TRAY	AU

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- Kazuo Yamakoshi
  Institute for Cosmic Ray Research
  The University of Tokyo
  Tokyo, Japan
- Michael Zolensky
  NASA/Johnson Space Center
  Houston, TX

Guidelines for Preparing a Request for LDEF Samples

All of the LDEF surfaces obtained by the M&D SIG for curation described below are available for allocation to qualified investigators. Each of these samples remains the property of NASA and/or the original LDEF PI, and its study is conditional upon regulations embodied in various memoranda between the original LDEF PI and NASA. One universal requirement covering the study of any LDEF surface is that all data obtained will be published in the open literature and also provided to the M&D SIG for entry into the LDEF M&D SIG database. All sample allocations will be made for a period of up to two years, with the samples returning to the JSC Curatorial Facility at the end of that time.

Scientists desiring to perform detailed research on LDEF samples curated by the M&D SIG should apply in writing to:

Curator LDEF Surfaces
Code SN2
NASA/Johnson Space Center
Houston, Texas 77058
U.S.A.
(713) 483-5128

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Sample requests should refer to specific sample-identification numbers and should describe the research being proposed as well as the qualifications and facilities of the investigator making the request. All requests are reviewed by a sub-committee of the M&D SIG, and are subject to its approval. Approval of a sample request does not imply or include funding for the proposed research. Foreign scientists are welcome to request samples.

Additional Teflon Thermal Blanket Samples

In addition to the one-third sections of each A0178 Teflon blanket curated at the Johnson Space Center, the remaining two thirds of each of these blankets is being maintained in Europe by ESTEC. Individuals wishing information concerning the possible analysis of portions of these blankets should contact Prof. J.A.M. McDonnell, and send a copy of all communications to Dr. K.-P. Wenzel (see addresses below).

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A03E00A	EXPERIMENT TRAY	ALUMINUM
A03E00B	EXPERIMENT TRAY	ALUMINUM
A03E00C	EXPERIMENT TRAY	ALUMINUM
A03E00D	EXPERIMENT TRAY	ALUMINUM
A03E00E	EXPERIMENT TRAY	GOLD
A03E00F	EXPERIMENT TRAY	GOLD
A03E00G	EXPERIMENT TRAY	GOLD
A03E00H	EXPERIMENT TRAY	GOLD
A03E00I	EXPERIMENT TRAY	GOLD
A03E00J	EXPERIMENT TRAY	GOLD
A03E00K	EXPERIMENT TRAY	GOLD
A03E00L	EXPERIMENT TRAY	ALUMINUM
A03E00M	EXPERIMENT TRAY	ALUMINUM
A03E00N	EXPERIMENT TRAY	ALUMINUM
A03E00O	EXPERIMENT TRAY	ALUMINUM
A03E00P	EXPERIMENT TRAY	ALUMINUM
A03E00Q	EXPERIMENT TRAY	ALUMINUM
A03E00R	EXPERIMENT TRAY	ALUMINUM
A03E00S	EXPERIMENT TRAY	ALUMINUM
A03E00T	EXPERIMENT TRAY	ALUMINUM
A03E00U	EXPERIMENT TRAY	STEEL
A03E00V	EXPERIMENT TRAY	STEEL
A03E00W	EXPERIMENT TRAY	STEEL
A03E00X	EXPERIMENT TRAY	STEEL
A03E00Y	EXPERIMENT TRAY	ALUMINUM
A03E00Z	EXPERIMENT TRAY	ALUMINUM
A03E00ZA	EXPERIMENT TRAY	ALUMINUM
A03E00ZB	EXPERIMENT TRAY	ALUMINUM
A03E00ZC	EXPERIMENT TRAY	ALUMINUM
A03E00ZD	EXPERIMENT TRAY	ALUMINUM
A03E00ZE	EXPERIMENT TRAY	ALUMINUM
A03E00ZF	EXPERIMENT TRAY	ALUMINUM
A03E00ZG	EXPERIMENT TRAY	ALUMINUM
A03E00ZH	EXPERIMENT TRAY	ALUMINUM
A03E00ZI	EXPERIMENT TRAY	ALUMINUM
A03E00ZJ	EXPERIMENT TRAY	ALUMINUM
A03E00ZK	EXPERIMENT TRAY	ALUMINUM
A03E00ZL	EXPERIMENT TRAY	ALUMINUM
A03E00ZM	EXPERIMENT TRAY	ALUMINUM
A03E00ZN	EXPERIMENT TRAY	ALUMINUM
A03E00ZO	EXPERIMENT TRAY	ALUMINUM
A03E00ZP	EXPERIMENT TRAY	ALUMINUM
A03E00ZQ	EXPERIMENT TRAY	ALUMINUM
A03S03B	BOLT	STEEL
A03S07B	BOLT	STEEL
A03S07C	BOLT	STEEL
A04C05	CLAMP	ALUMINUM
A04C06	CLAMP	ALUMINUM
A04E00AA	EXPERIMENT TRAY	TEFLON
A04E00AB	EXPERIMENT TRAY	TEFLON
A05C03	CLAMP	ALUMINUM
A05C08	CLAMP	ALUMINUM
A06C04	CLAMP	ALUMINUM
A06C05	CLAMP	ALUMINUM
A06C06	CLAMP	ALUMINUM
A07E00	EXPERIMENT TRAY	ALUMINUM
A09C02	CLAMP	ALUMINUM
A09C05	CLAMP	ALUMINUM
A10C02	CLAMP	ALUMINUM
A10C06	CLAMP	ALUMINUM
A10C08	CLAMP	ALUMINUM
A10E00AA	EXPERIMENT TRAY	TEFLON
A10E00AB	EXPERIMENT TRAY	TEFLON
A10H06	SHIM	ALUMINUM
A10S05B	BOLT	STEEL
A11C01	CLAMP	ALUMINUM
A11C05	CLAMP	ALUMINUM
A11C07	CLAMP	ALUMINUM

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A11C08	CLAMP	ALUMINUM
A11E00A	EXPERIMENT TRAY	ALUMINUM
A11E00B	EXPERIMENT TRAY	ALUMINUM
A11E00C	EXPERIMENT TRAY	ALUMINUM
A11E00D	EXPERIMENT TRAY	ALUMINUM
A11E00E	EXPERIMENT TRAY	AL
A11E00F	EXPERIMENT TRAY	AL
A11E00G	EXPERIMENT TRAY	AL
A11E00H	EXPERIMENT TRAY	AL
A11E03	EXPERIMENT TRAY	ALUMINUM
A11E04	EXPERIMENT TRAY	ALUMINUM
A11E05	EXPERIMENT TRAY	ALUMINUM
A11E06	EXPERIMENT TRAY	ALUMINUM
A11S01A	BOLT	STEEL
A11S02A	BOLT	STEEL
A12C02	CLAMP	ALUMINUM
B01C06	CLAMP	ALUMINUM
B01F02	FRAME	ALUMINUM
B01S05A	BOLT	STEEL
B01S08C	BOLT	STEEL
B02F02	FRAME	ALUMINUM
B04F02	FRAME	ALUMINUM
B05E00AA	EXPERIMENT TRAY	TEFLON
B05E00AB	EXPERIMENT TRAY	TEFLON
B06F02	FRAME	ALUMINUM
B06H07	SHIM	ALUMINUM
B06S07A	BOLT	STEEL
B07E00AA	EXPERIMENT TRAY	TEFLON
B07E00AB	EXPERIMENT TRAY	TEFLON
B08E00A	EXPERIMENT TRAY	WHITE-PAINTD AL
B08H04	SHIM	ALUMINUM
B08S01	BOLT	STEEL
B08S02	BOLT	STEEL
B08S03	BOLT	STEEL
B08S04	BOLT	STEEL
B08S05	BOLT	STEEL
B08S06	BOLT	STEEL
B08S07	BOLT	STEEL
B08S08	BOLT	STEEL
B08S09	BOLT	STEEL
B09H08	SHIM	ALUMINUM
B09S01C	BOLT	STEEL
B09S03A	BOLT	STEEL
B09S04C	BOLT	STEEL
B10F02	FRAME	ALUMINUM
B10S03C	BOLT	STEEL
B10S04A	BOLT	STEEL
B10S04C	BOLT	STEEL
B10S06B	BOLT	STEEL
B10S08B	BOLT	STEEL
B11F02	FRAME	ALUMINUM
B11S01A	BOLT	STEEL
B11S07A	BOLT	STEEL
B12C01	CLAMP	ALUMINUM
B12S03B	BOLT	STEEL
C01C03	CLAMP	ALUMINUM
C01C06	CLAMP	ALUMINUM
C01C08	CLAMP	ALUMINUM
C01E00A	EXPERIMENT TRAY	TEFLON/NYLON
C01E00B	EXPERIMENT TRAY	ALUMINUM
C02C03	CLAMP	ALUMINUM
C02C04	CLAMP	ALUMINUM
C02C05	CLAMP	ALUMINUM
C03C01	CLAMP	ALUMINUM
C03C05	CLAMP	ALUMINUM
C03F02	FRAME	ALUMINUM
C04C06	CLAMP	ALUMINUM
C05C03	CLAMP	ALUMINUM

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C05C07	CLAMP	ALUMINUM
C05C08	CLAMP	ALUMINUM
C05E00AA	EXPERIMENT TRAY	TEFLON
C05E00AB	EXPERIMENT TRAY	TEFLON
C05F02	FRAME	ALUMINUM
C05H07	SHIM	ALUMINUM
C06C04	CLAMP	ALUMINUM
C06C07	CLAMP	ALUMINUM
C06E00AA	EXPERIMENT TRAY	TEFLON
C06E00AB	EXPERIMENT TRAY	TEFLON
C06F02	FRAME	ALUMINUM
C07C03	CLAMP	ALUMINUM
C07C05	CLAMP	ALUMINUM
C07F02	FRAME	ALUMINUM
C08C02	CLAMP	ALUMINUM
C08C03	CLAMP	ALUMINUM
C08C04	CLAMP	ALUMINUM
C08C06	CLAMP	ALUMINUM
C08E00AA	EXPERIMENT TRAY	TEFLON
C08E00AB	EXPERIMENT TRAY	TEFLON
C08F02	FRAME	ALUMINUM
C08S01A	BOLT	STEEL
C08S03B	BOLT	STEEL
C09C05	CLAMP	ALUMINUM
C09H03	SHIM	ALUMINUM
C09S06A	BOLT	STEEL
C09S07B	BOLT	STEEL
C09S07C	BOLT	STEEL
C10C02	CLAMP	ALUMINUM
C10C05	CLAMP	ALUMINUM
C10C06	CLAMP	ALUMINUM
C10E00A	EXPERIMENT TRAY	TEFLON/NYLON
C10E00B	EXPERIMENT TRAY	ALUMINUM
C10E00C	EXPERIMENT TRAY	
C10E00CA	EXPERIMENT TRAY	LENS
C10E00CF	EXPERIMENT TRAY	LENS
C11C01	CLAMP	ALUMINUM
C11C02	CLAMP	ALUMINUM
C11C04	CLAMP	ALUMINUM
C11C08	CLAMP	ALUMINUM
C11E00AA	EXPERIMENT TRAY	TEFLON
C11E00AB	EXPERIMENT TRAY	TEFLON
C12C02	CLAMP	ALUMINUM
C12E00A	EXPERIMENT TRAY	PAINTED AL
C12F02	FRAME	ALUMINUM
C12S02A	BOLT	STEEL
D01C05	CLAMP	ALUMINUM
D01C06	CLAMP	ALUMINUM
D01E00AA	EXPERIMENT TRAY	TEFLON
D01E00AB	EXPERIMENT TRAY	TEFLON
D02C02	CLAMP	ALUMINUM
D03C04	CLAMP	ALUMINUM
D04C03	CLAMP	ALUMINUM
D04C05	CLAMP	ALUMINUM
D04C07	CLAMP	ALUMINUM
D05C08	CLAMP	ALUMINUM
D05E00AB	EXPERIMENT TRAY	TEFLON
D05E00AC	EXPERIMENT TRAY	TEFLON
D05S06B	BOLT	STEEL
D06C03	CLAMP	ALUMINUM
D06S04A	BOLT	STEEL
D06S04C	BOLT	STEEL
D06S06A	BOLT	STEEL
D07C03	CLAMP	ALUMINUM
D07C04	CLAMP	ALUMINUM
D07E00AB	EXPERIMENT TRAY	TEFLON
D07E00AC	EXPERIMENT TRAY	TEFLON
D07H06	SHIM	ALUMINUM
D08C01	CLAMP	ALUMINUM

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D08C08	CLAMP	ALUMINUM
D08S06A	BOLT	STEEL
D09C03	CLAMP	ALUMINUM
D09S04A	BOLT	STEEL
D10C02	CLAMP	ALUMINUM
D10S03C	BOLT	STEEL
D10S05B	BOLT	STEEL
D11C02	CLAMP	ALUMINUM
D11C05	CLAMP	ALUMINUM
D11E00AA	EXPERIMENT TRAY	TEFLON
D11S01A	BOLT	STEEL
D12C01	CLAMP	ALUMINUM
D12C05	CLAMP	ALUMINUM
E01C01	CLAMP	ALUMINUM
E01C02	CLAMP	ALUMINUM
E01C06	CLAMP	ALUMINUM
E01F02	FRAME	ALUMINUM
E01H01	SHIM	ALUMINUM
E01S01C	BOLT	STEEL
E02C01	CLAMP	ALUMINUM
E02C02	CLAMP	ALUMINUM
E02E00AA	EXPERIMENT TRAY	TEFLON
E02E00AB	EXPERIMENT TRAY	TEFLON
E02E00AC	EXPERIMENT TRAY	TEFLON
E03E01	EXPERIMENT TRAY	
E03F02	FRAME	ALUMINUM
E04C03	CLAMP	ALUMINUM
E05C03	CLAMP	ALUMINUM
E05C05	CLAMP	ALUMINUM
E05C07	CLAMP	ALUMINUM
E05E01	EXPERIMENT TRAY	SUNSCREEN
E05E02	EXPERIMENT TRAY	AL SUNSCREEN
E05F02	FRAME	ALUMINUM
E06C05	CLAMP	ALUMINUM
E06E00A	EXPERIMENT TRAY	AL-MYLAR BLANKT
E06S08B	BOLT	STEEL
E07C02	CLAMP	ALUMINUM
E07C03	CLAMP	ALUMINUM
E07C05	CLAMP	ALUMINUM
E07C07	CLAMP	ALUMINUM
E07S04B	BOLT	STEEL
E08C02	CLAMP	ALUMINUM
E08C05	CLAMP	ALUMINUM
E08C07	CLAMP	ALUMINUM
E08S04A	BOLT	STEEL
E09C01	CLAMP	ALUMINUM
E09C07	CLAMP	ALUMINUM
E09E00A	EXPERIMENT TRAY	PAINTED Al
E09E00D	EXPERIMENT TRAY	PAINTED Al
E09F02	FRAME	ALUMINUM
E09S05C	BOLT	STEEL
E09S07C	BOLT	STEEL
E10C05	CLAMP	ALUMINUM
E10C07	CLAMP	ALUMINUM
E10E00A	EXPERIMENT TRAY	TEFLON BLANKET
E10E00AA	EXPERIMENT TRAY	TEFLON
E10E01	EXPERIMENT TRAY	AL GROUND STRAP
E10F02	FRAME	ALUMINUM
E10S05C	BOLT	STEEL
E11C01	CLAMP	ALUMINUM
E11C02	CLAMP	ALUMINUM
E11C05	CLAMP	ALUMINUM
E11F02	FRAME	ALUMINUM
E11S02C	BOLT	STEEL
E12C01	CLAMP	ALUMINUM
E12C03	CLAMP	ALUMINUM
F01C01	CLAMP	ALUMINUM
F01C02	CLAMP	ALUMINUM
F01C04	CLAMP	ALUMINUM

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F01C05	CLAMP	ALUMINUM
F02C02	CLAMP	ALUMINUM
F02C03	CLAMP	ALUMINUM
F02C04	CLAMP	ALUMINUM
F02E00AA	EXPERIMENT TRAY	TEFLON
F02E00AB	EXPERIMENT TRAY	TEFLON
F02E00AC	EXPERIMENT TRAY	TEFLON
F02E00BA	EXPERIMENT TRAY	TEFLON
F02E00BB	EXPERIMENT TRAY	TEFLON
F02E00CA	EXPERIMENT TRAY	TEFLON
F02E00CB	EXPERIMENT TRAY	TEFLON
F02F02	FRAME	ALUMINUM
F03C08	CLAMP	ALUMINUM
F04C04	CLAMP	ALUMINUM
F04C05	CLAMP	ALUMINUM
F04C08	CLAMP	ALUMINUM
F04E00AA	EXPERIMENT TRAY	TEFLON
F04E00AB	EXPERIMENT TRAY	TEFLON
F04F02	FRAME	ALUMINUM
F04H04	SHIM	ALUMINUM
F04H06	SHIM	ALUMINUM
F04S04B	BOLT	STEEL
F05C01	CLAMP	ALUMINUM
F05C05	CLAMP	ALUMINUM
F05C06	CLAMP	ALUMINUM
F05C07	CLAMP	ALUMINUM
F05H07	SHIM	ALUMINUM
F05S01B	BOLT	STEEL
F05S01C	BOLT	STEEL
F05S03A	BOLT	STEEL
F05S05A	BOLT	STEEL
F05S07B	BOLT	STEEL
F06C05	CLAMP	ALUMINUM
F06C07	CLAMP	ALUMINUM
F06C08	CLAMP	ALUMINUM
F06F02	FRAME	ALUMINUM
F07C01	CLAMP	ALUMINUM
F07C04	CLAMP	ALUMINUM
F07C06	CLAMP	ALUMINUM
F07C08	CLAMP	ALUMINUM
F07H01	SHIM	ALUMINUM
F08C01	CLAMP	ALUMINUM
F08C05	CLAMP	ALUMINUM
F08C07	CLAMP	ALUMINUM
F08C08	CLAMP	ALUMINUM
F08F02	FRAME	ALUMINUM
F08S04B	BOLT	STEEL
F09C02	CLAMP	ALUMINUM
F09E02	EXPERIMENT TRAY	AL-MYLAR BLANKT
F09E03	EXPERIMENT TRAY	AL-MYLAR BLANKT
F09E04	EXPERIMENT TRAY	AL-MYLAR BLANKT
F09E07	EXPERIMENT TRAY	AL-MYLAR BLANKT
F09F02	FRAME	ALUMINUM
F09S02A	BOLT	STEEL
F09S04C	BOLT	STEEL
F10C03	CLAMP	ALUMINUM
F10C05	CLAMP	ALUMINUM
F10C06	CLAMP	ALUMINUM
F10C08	CLAMP	ALUMINUM
F10S08A	BOLT	STEEL
F11C02	CLAMP	ALUMINUM
F11C04	CLAMP	ALUMINUM
F11C06	CLAMP	ALUMINUM
F11C07	CLAMP	ALUMINUM
F11F02	FRAME	ALUMINUM
F12C02	CLAMP	ALUMINUM
F12C04	CLAMP	ALUMINUM
F12C05	CLAMP	ALUMINUM
F12C07	CLAMP	ALUMINUM

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F12F02	FRAME	ALUMINUM
F12H01	SHIM	ALUMINUM
F12S07B	BOLT	STEEL
G02C02	CLAMP	ALUMINUM
G02C06	CLAMP	ALUMINUM
G02C07	CLAMP	ALUMINUM
G02C10	CLAMP	ALUMINUM
G02C11	CLAMP	ALUMINUM
G03S01	BOLT	STEEL
G04C04	CLAMP	ALUMINUM
G04C06	CLAMP	ALUMINUM
G04C07	CLAMP	ALUMINUM
G04C09	CLAMP	ALUMINUM
G04C12	CLAMP	ALUMINUM
G06C06	CLAMP	ALUMINUM
G06C07	CLAMP	ALUMINUM
G06C09	CLAMP	ALUMINUM
G06C11	CLAMP	ALUMINUM
G06C12	CLAMP	ALUMINUM
G06S04A	BOLT	STEEL
G08C03	CLAMP	ALUMINUM
G08C04	CLAMP	ALUMINUM
G08C10	CLAMP	ALUMINUM
G08C11	CLAMP	ALUMINUM
G08C12	CLAMP	ALUMINUM
G10C01	CLAMP	ALUMINUM
G10C04	CLAMP	ALUMINUM
G10C06	CLAMP	ALUMINUM
G10C08	CLAMP	ALUMINUM
G10C10	CLAMP	ALUMINUM
G10C12	CLAMP	ALUMINUM
G12C07	CLAMP	ALUMINUM
G12C09	CLAMP	ALUMINUM
G12C10	CLAMP	ALUMINUM
G12C11	CLAMP	ALUMINUM
G12C12	CLAMP	ALUMINUM
G13R01	REFLECTOR	ALUMINUM
G13S01K	BOLT	STEEL
G13S01L	BOLT	STEEL
G13S02O	BOLT	STEEL
G14S01O	BOLT	STEEL
G15R01	REFLECTOR	ALUMINUM
G15S01E	BOLT	STEEL
G16R01	REFLECTOR	ALUMINUM
G17R01	REFLECTOR	ALUMINUM
G19R01	REFLECTOR	ALUMINUM
G20S01F	BOLT	STEEL
G21R01	REFLECTOR	ALUMINUM
G21S01I	BOLT	STEEL
G22R01	REFLECTOR	ALUMINUM
G23R01	REFLECTOR	ALUMINUM
H01C05	CLAMP	ALUMINUM
H01C08	CLAMP	ALUMINUM
H01C09	CLAMP	ALUMINUM
H01C10	CLAMP	ALUMINUM
H01C12	CLAMP	ALUMINUM
H01H02	SHIM	ALUMINUM
H01S03C	BOLT	STEEL
H03C04	CLAMP	ALUMINUM
H03C06	CLAMP	ALUMINUM
H03C08	CLAMP	ALUMINUM
H03C09	CLAMP	ALUMINUM
H03E00A	EXPERIMENT TRAY	LEXAN SHEET
H03E00B	EXPERIMENT TRAY	LEXAN SHEET
H03F02	FRAME	AL Z-FRAME
H03R01	REFLECTOR	ALUMINUM
H05C03	CLAMP	ALUMINUM
H05C06	CLAMP	ALUMINUM
H05C11	CLAMP	ALUMINUM

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H05C12	CLAMP	ALUMINUM
H05S02B	BOLT	STEEL
H05S06C	BOLT	STEEL
H06C01	CLAMP	ALUMINUM
H06C03	CLAMP	ALUMINUM
H06C08	CLAMP	ALUMINUM
H06C10	CLAMP	ALUMINUM
H06C12	CLAMP	ALUMINUM
H06F01	FRAME	AL FRAME
H06F03	FRAME	AL FRAME
H06S02C	BOLT	STEEL
H06S04A	BOLT	STEEL
H07C01	CLAMP	ALUMINUM
H07C04	CLAMP	ALUMINUM
H07C05	CLAMP	ALUMINUM
H07C08	CLAMP	ALUMINUM
H07C10	CLAMP	ALUMINUM
H07C12	CLAMP	ALUMINUM
H09C07	CLAMP	ALUMINUM
H09C09	CLAMP	ALUMINUM
H09F03	FRAME	AL FRAME
H09R01	REFLECTOR	ALUMINUM
H09S02B	BOLT	STEEL
H11C02	CLAMP	ALUMINUM
H11C03	CLAMP	ALUMINUM
H11C05	CLAMP	ALUMINUM
H11C06	CLAMP	ALUMINUM
H11C12	CLAMP	ALUMINUM
H11H12	SHIM	ALUMINUM
H11S01C	BOLT	STEEL
H11S02B	BOLT	STEEL
H12C04	CLAMP	ALUMINUM
H12C09	CLAMP	ALUMINUM
H12C10	CLAMP	ALUMINUM
H12C11	CLAMP	ALUMINUM
H12C12	CLAMP	ALUMINUM
H12E00A	EXPERIMENT TRAY	LEXAN SHEET
H12E02	EXPERIMENT TRAY	MULTI BLANKET
H12E03	EXPERIMENT TRAY	MULTI-BLANKET
H12E05	EXPERIMENT TRAY	MULTI BLANKET
H12S01	BOLT	STEEL
H13R01	REFLECTOR	ALUMINUM
H15R01	REFLECTOR	ALUMINUM
H15S01J	BOLT	STEEL
H17R01	REFLECTOR	ALUMINUM
H19R01	REFLECTOR	ALUMINUM
H21R01	REFLECTOR	ALUMINUM
H23R01	REFLECTOR	ALUMINUM