National Aeronautics and Space Administration

Stardust Sample Investigator's Guidebook

Astromaterials Research and Exploration Science Directorate
Astromaterials Acquisition and Curation Office

NASA Johnson Space Center
Houston, TX 77058

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1.0 Stardust sample return

In January 2006, the Stardust spacecraft returned the first *in situ* collection of samples from a comet, and the first samples of contemporary interstellar dust. Stardust is the first US sample return mission from a planetary body since Apollo, and the first ever from beyond the moon.

This handbook is a basic reference source for allocation procedures and policies for Stardust samples. These samples consist of particles and particle residues in aerogel collectors, in aluminum foil, and in spacecraft components. Contamination control samples and unflown collection media are also available for allocation.

2.0 Stardust sample summary

2.1 Introduction

During two periods, February-May 2000 and August-December 2002, the Stardust spacecraft collected interplanetary and interstellar dust in the interstellar collector. Interstellar and interplanetary dust particles were collected in aerogel tiles, aluminum foils and in exposed surfaces of the sample tray and arm. The collection speed for interstellar dust was not measured, but is expected to have been ~20 km sec^{-1}. Also, some parts of the Stardust sample return capsule (SRC) were exposed to interplanetary and interstellar dust and may contain impact residues, and will be available for allocation.

In January 2004, the Stardust spacecraft collected cometary dust during a close encounter with the Jupiter-family comet Wild2. The relative speed of the spacecraft with respect to the comet was 6.1 km sec^{-1}. Cometary dust particles were collected in aerogel tiles, aluminum foils and in exposed surfaces of the sample tray and arm. The cometary dust collectors also contain interplanetary dust impacts, because they were exposed to interplanetary space during the interstellar dust collection periods.

In addition to collection media, there are spacecraft contamination control materials (one each sapphire and aluminum disk, and one aerogel block), which are available for allocation under extraordinary conditions. Other components of the SRC that are not expected to contain residues of extraterrestrial impacts are available for allocation under a different program. Contact the Stardust Curator for further information.

In addition, the Curator has many examples of unflown aerogel available for allocation for techniques development, contamination studies, etc.

In summary, the Stardust sample inventory consists of

- Aerogel tiles containing cometary and interplanetary dust impacts

- Aluminum foils containing cometary and interplanetary dust impacts
- Cometary tray and arm containing cometary and interplanetary dust impacts
- Aerogel tiles containing interstellar and interplanetary dust impacts
- Aluminum foils containing interstellar and interplanetary dust impacts
- Interstellar tray and SRC components containing interstellar and interplanetary dust impacts
- Two contamination control disks (one sapphire, one aluminum)
- One contamination control aerogel block
- Unflown aerogel tiles

2.2 Cometary sample collection media

The inventory of collecting media from the cometary side of the Stardust collector is:

- 124 aerogel tiles measuring approximately 4cm length by 2cm length by 3cm depth.
- 2 irregular aerogel tiles
- ~120 aluminum foils, each measuring ~1.7mm by 35mm.
- ~120 aluminum foils, each measuring ~1.7mm by 15mm.
- Exposed surfaces of the cometary tray and collector arm
- Contamination witness materials

2.3 Interstellar and interplanetary dust collection media

The inventory of collecting media from the interstellar side of the Stardust collector is:

- 124 rectangular aerogel tiles measuring approximately 4cm length by 2cm length by 1cm depth.
- 2 irregular aerogel tiles
- ~120 aluminum foils, each measuring ~1.7mm by 35mm.
- ~120 aluminum foils, each measuring ~1.7mm by 15mm.
- Approximately 4 cm^2 of exposed surface of the interstellar tray and collector arm
- A diverse variety of surfaces within the SRC capsule that have been exposed to interplanetary and interstellar dust

3.0 Stardust sample preparation

The Curatorial Facility at JSC is responsible for the preparation of Stardust samples, within the capabilities of the Curatorial operation.

3.1 Particles and particle residues in aerogel collectors

Analytical preparation of particles and particles residues in aerogel collectors is time-consuming, is not always successful, must be tailored to the specific needs of the Investigator, and is highly dependent on the physical state of the sample. Investigators are strongly encouraged to consult closely with the JSC curatorial staff regarding sample preparation before making a sample request. The Curator may in turn refer the Investigator to others in the community with expertise in specific areas of sample preparation.

A comprehensive description of the wide variety of sample preparation techniques is beyond the scope of these guidelines. The types of samples available are all described in the Stardust Catalog. These include naked grains, microtomed slices and potted butts prepared from grains, grains or grain tracks enclosed within small bits of aerogel (keystones and quickstones), and in exceptional circumstances, entire aerogel blocks.

3.2 Particles and particle residues in aluminum foils

Analytical preparation of particles and particles residues in foil collectors has a longer history and is much better established in comparison with sample preparation from aerogel collectors. Nevertheless, Investigators are encouraged to consult with the curator regarding sample preparation before making a sample request. The Curator may in turn refer the Investigator to others in the community with expertise in specific areas of sample preparation.

3.3 Spacecraft components containing particle residues

Analytical preparation of particles and particles residues in spacecraft components is highly dependent on the specific component under consideration. Investigators are strongly encouraged to consult closely with the Curator regarding sample preparation before making a sample request.

4.0 Stardust sample allocation

Stardust samples are the property of the United States Government, are considered irreplaceable, and are therefore made available to Investigators only under a carefully controlled and monitored program.

The Stardust Sample Curator (SSC) is responsible for the preservation of the Stardust sample collection and for provision of appropriate samples to Investigators.

The Curator will allocate Stardust samples to Investigators on the advice of the Stardust Sample Allocation Subcommittee (SSAS) of the Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM). Allocation plans will be approved by the Associate Administrator, Science Mission Directorate or designee.

Requests for samples from the cometary collector will be accepted at any time, in accordance with information posted on the JSC Curation website http://curator.jsc.nasa.gov Requests will be considered at periodic meetings of the SSAS, with no priority given to order of receipt.

4.1 General Proposal Guidelines

The Stardust samples are extremely precious. No more than several hundred particles larger than 10 microns were collected. The next cometary sample return is not expected for at least two decades. Investigators should therefore anticipate that the supply of samples will not satisfy the strong demand. Investigators are strongly encouraged to form consortia in order to maximize the science yield from each sample. Coordinated analyses are considered to be especially important for those studies that will result in destruction of the samples. Preference will be given to Investigators or consortia that have a demonstrated capability of analyzing particles or particle residues captured in aerogel. Stardust analogs are available from the Curator, and may be requested through a Stardust sample request.

The Curator does not have resources for extensive characterization of samples before allocation. Investigators should therefore anticipate that most samples will not have been extensively characterized before allocation. Investigators should be prepared to do pre-analysis characterization of samples allocated to them, and should be prepared for the strong possibility that the allocated samples may not match their expectations. Preference will be given to Investigators who commit to reporting pre-analysis characterization to the Curator.

Investigators are also encouraged to make the minimum request that meets the requirements of the proposed measurement. It is expected that most sample allocations will consist of extracted particles or tracks, and that allocations of whole tiles or substantial fractions of tiles will be rare.

Samples lost during shipping may have to be re-requested in a completely new request, at the discretion of the Curator.

4.2 Proposal Submission

Guidelines and requirements for Stardust Allocation proposals are described in Appendix A of this document.

Proposals should be submitted electronically in pdf format to the Stardust Sample Curator, michael.e.zolensky@nasa.gov.

4.3 Proposal review

Proposals are reviewed by a subcommittee of CAPTEM, the Stardust Sample Allocation Subcommittee (SSAS). In considering allocation requests, SSAS will assess the scientific content of the proposal, capability of the proposers, availability of requested samples, and the realism of the investigation. SSAS will also weigh the overall merit of the proposal with the required amount of sample and any possible collateral damage to the remainder of the collector. The subcommittee will consist of approximately five scientists from diverse fields, and will be appointed by the Chair of CAPTEM. The membership term on SSAS will be approximately two years, with systematic rotation of members to provide new points of view while maintaining a continuity of oversight over the Stardust Allocation process.

4.4 Sample Preparation Priority

Some types of sample preparation are time-consuming and risky, while others are relatively straightforward. Allocations may not, therefore, be made in the order in which proposals are received. While the SSAS may make recommendations for ordering of sample requests, the decisions for prioritization of sample preparation in order to maximize the number of allocations that will be made solely by the Curator. All proposals accepted by the SSAS will be regarded to have equal scientific merit for the purpose of prioritization of allocations.

4.5 Alteration of samples

Any procedure that is likely to result in a major change in the final state of allocated samples (e.g., subdivision, complete destruction, substantial radiation damage, substantial heating) as compared with that described in the initial sample request must be approved by the SSAS. Such requests should be made in writing through the Stardust Sample Curator.

4.6 Other Use of Samples

Samples are provided to Investigators for research purposes only. Requests for samples for display or educational purposes will be considered in the future, but are not currently considered.

4.7 Preliminary Examination Samples

Samples which were utilized during the 7 month preliminary examination period, and which are still being held by participants at the close of the preliminary examination, must be returned immediately to the Curator, unless a new sample request is submitted. Samples which are not re-requested promptly will be recalled by the Curator.

5.0 Stardust Sample Security and Accountability

The Stardust samples are the property of the United States Government. It is NASA's policy that samples are used only for authorized purposes.

5.1 Stardust Investigators

Investigators who wish to analyze Stardust samples or spacecraft components must become Stardust Investigators before receipt of any Stardust samples, either from the Curator or from any Investigator. To become a Stardust Investigator, an Investigator must make a written commitment to abide by a certain set of rules, procedures and restrictions, as outlined below. Investigators make this commitment by signing and returning to the Curator the Stardust Sample Loan Agreement. A sample Loan Agreement is shown in Appendices B and C, and can be downloaded from the web at http://curator.jsc.nasa.gov/stardust/forms/index.cfm.
The form must be signed and returned by fax or mail to the Stardust Curator (Fax: 281-483-5347 Mailing Address: Stardust Sample Curator, Mail Code KT, Johnson Space Center, Houston, TX 77058.

5.2 Sample Receipt

A Sample Documentation form will accompany each sample distributed by the Curator. ***The sample documentation form must be signed and returned by mail upon receipt of the samples.*** A blank copy of this form is included in Appendix C.

5.3 Sample Transfer between Investigators

Samples may be transferred between Stardust Investigators without permission of the Curator. ***Both the transmitting and receiving Investigators must complete and return transfer forms by e-mail or fax to the Curator***. Blank transfer forms may be

downloaded from the web at: http://curator.jsc.nasa.gov/stardust/forms/index.cfm After receipt of the transferred sample, care for the sample becomes the responsibility of the receiving Investigator.

5.4 Sample Security

Stardust Investigators who are allocated Stardust samples are responsible for the security of the samples, and will be held accountable in the event that samples are lost, stolen or misused. When analyses require facilities outside of the laboratory of the Investigator, the samples should be maintained under the supervision by the Investigator or the Investigator's research team. The Investigator should prevent unsupervised access to the samples by anyone not on the research team. However, the Investigator should exercise reasonable judgment in the handling and security of these samples in order to maximize the scientific yield of sample analysis.

5.5 Sample Storage

Samples should be stored in clean and secure conditions, commensurate with the preciousness of these samples. They should be carefully stored and handled so as to prevent cross-contamination with other extraterrestrial samples.

5.6 Lost Samples

In the event that a sample cannot be accounted for, the Investigator must report the loss to the Stardust Curator immediately, by completing and faxing or mailing a Sample Loss or Consumption form. This form can be downloaded from the web at: http://curator.jsc.nasa.gov/stardust/forms/index.cfm.

5.7 Sample Accountability

Each Stardust Investigator is required to maintain records of the use of allocated samples. Samples become the Investigator's responsibility when the Investigator accepts delivery of the samples from NASA. That responsibility ends only when the samples have been returned to NASA or transferred to another Stardust Investigator in a manner described in this handbook, and all sample material has been accounted for.

A dedicated laboratory notebook, in addition to any other laboratory notebooks used by the Investigator, should be used to maintain records of the receipt, transmittal, and treatment of samples, including any intentional or accidental damage, contamination or destruction.

Investigators are required to maintain complete inventory of samples. Investigators are required to complete, sign and return an inventory to the Curator annually. Investigators are reminded that their records and inventory may be audited by the US Government at any time. Such audits have occurred under the Apollo Lunar Sample Program.

5.8 Destruction during analysis

Many types of analysis are highly destructive to extraterrestrial dust samples. ***If, in the course of analysis or handling, samples are destroyed, whether intentionally or unintentionally, a Sample Loss or Consumption form indicating this fact should be completed and returned by fax or mail to the Curator.*** Blank forms may be downloaded from the web at: http://curator.jsc.nasa.gov/stardust/forms/index.cfm . No form is needed in the event of intentional or accidental damage or contamination, but details should be documented in the Investigator's Stardust sample notebook.

5.9 Division of samples

In the event that Investigators subdivide samples, the Curator will assign new identification numbers. The Curator should be contacted for new assignments as soon as possible after the subdivision. Subdivisions should be documented by faxing or mailing a Request for New Sample Numbers form. Blank forms may be downloaded from http://curator.jsc.nasa.gov/stardust/forms/index.cfm

5.10 Sample transfer methods

These guidelines apply to transfers from the Curator to Stardust Investigators, from Stardust Investigators to the Curator, and to transfers between Stardust Investigators.

Samples can be sent by an overnight package delivery service that allows packages to be tracked online (e.g., FedEx, DHL). ***Before shipment, the sender and the recipient must agree on a date on which the recipient or the recipient's designee can receive the allocation.***

The value of the shipment must be recorded on the shipping form as "zero". To preclude inadvertent opening by mailroom employees, place inside the box a prominent message "MAIL ROOM EMPLOYEES: THIS PACKAGE CONTAINS MATERIALS TO BE OPENED ONLY IN A CLEAN ENVIRONMENT". Samples should be sealed in at least two layers of packaging so that exterior packaging can be removed prior to clean environment entry.

Samples may also be carried by hand from and to JSC. If samples are hand-carried by air, an accompanying letter from NASA should be carried with the samples indicating the value of the samples and cautioning airport security personnel against opening or touching the samples. ***The samples should not be put in checked luggage.***

Appendix A: Proposal Guidelines

Proposals should be as long as necessary to clearly meet the proposal requirements as defined below. Investigators are encouraged to be concise. If necessary, the Allocation Subcommittee may set up a teleconference with the applicant to discuss requests.

At a minimum, proposals should include

- A clear statement of research objectives
- A clear description of the measurements to be made
- A summary of relevant previous experience, if any, of the Investigator in analysis of similarly prepared samples or analogs
- Relevant recent publications, for those new to the field
- A discussion of the analytical issues arising from the capture medium (aerogel, foil or other surface)
- A detailed description of the sample requirements, including a description of the selection criterion for the sample, and a detailed sample preparation plan
- A sample transfer plan (for example, shipping requirements)

Appendix B: Domestic Sample Loan Agreement

Agreement Between
The National Aeronautics and Space Administration
and
[INSTITUTION NAME]
For the Loan of Stardust Samples

AUTHORITY AND PARTIES

In accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113), this Loan Agreement is entered into by the National Aeronautics and Space Administration Johnson Space Center, located at Houston, Texas (hereinafter referred to as "NASA" or "JSC") and [INSTITUTION NAME] in [INSTITUTION LOCATION] (hereinafter referred to as "the Institution"). NASA and the Institution may be individually referred to as a "Party" and collectively referred to as the "Parties."

PURPOSE

Stardust samples distributed by NASA, a U.S. federal agency, are property of the U.S. Government and are under the custody and curatorial control of JSC.

NASA desires to make certain Stardust samples available to the Institution by entering into this Loan Agreement. The Institution proposes to use these Stardust samples to undertake scientific investigations led by its Principal Investigator (the person who performs the investigations, hereinafter referred to as "PI"). These investigations are described in one or more sample requests submitted by the PI to the Stardust Sample Curator at JSC and approved by the Stardust Sample Curator. Once approved, these sample requests are an integral part of this Loan Agreement. JSC approval of the sample request (the award letter) is a prerequisite to the initiation of this Loan Agreement and

subsequent loan of the Stardust samples. The approved samples will not be provided to the PI, through the Institution, until after conclusion of this Loan Agreement.

The use of the Stardust samples will permit beneficial contact among representatives of JSC and the Institution, including through the PI; will provide opportunities for discovery and dissemination of information to the broader scientific community and to the general public; will promote the maximum utilization of Stardust samples by JSC; and will provide opportunities for the dissemination of information concerning the activities of NASA.

RELATIONSHIP BETWEEN THE INSTITUTION AND PI

The Institution hereby designates [PI NAME] as the PI for the purposes of this Loan Agreement. The Institution will enter into a separate legally binding agreement with the PI for purposes of carrying out certain responsibilities of the Institution, as appropriate, that are set forth in this Loan Agreement. The Institution will be responsible for ensuring the PI's and his/her designee(s)' adherence to this separate agreement which is attached to this Loan Agreement as Annex 1 and is an integral part of this Loan Agreement.

RESPONSIBILITIES:

The Parties agree to the following:

1. The Stardust samples made subject to this Loan Agreement shall be identified and assigned to the Institution by the JSC Stardust Sample Curator via Stardust sample assignment forms signed by the Stardust Sample Curator and the PI.
2. The Stardust samples are irreplaceable and are therefore made available through institutions to PIs only under a carefully controlled and monitored program. It is therefore essential that rigorous security and accountability procedures be followed by all persons who have access to the Stardust samples. The Institution shall designate the PI to be responsible for the receipt, use (including security during use), and accountability of the Stardust samples, through the attached agreement.

3. Title to the Stardust samples shall remain with the U.S. Government and shall not be affected by the incorporation, attachment, or mixture thereof to or with property not owned by NASA.

4. As determined by NASA, the Stardust samples shall be either hand-carried, at the expense of the Institution, by an authorized official of the Institution, or mailed at JSC's expense, to the Institution via registered mail or a shipping service approved by JSC. JSC reserves the right, at the expense of the Institution, to direct the mode of transportation for the return of the Stardust sample.

5. Only the PI or the PI's designee(s), may receive and open the registered package. The PI or the PI's designee(s) shall record all of the Stardust samples promptly upon receipt, and a record of receipt shall be maintained while the Stardust samples are in the custody, possession or control of the PI and the Institution.

6. During the use for research purposes, the Stardust samples must be under the constant control of the PI or the PI's designee(s). At no time may the Stardust samples be left unattended. At the end of each use of the Stardust samples, an inventory shall be made to insure the accountability of the Stardust samples. Such inventories shall be maintained as a permanent record and shall be made accessible to NASA at all times.

7. When not being actively investigated, the Stardust samples must be maintained in a secure nitrogen cabinet behind a door with a combination padlock or equivalent. The combination to the locked door be under the exclusive control of the PI and, if appropriate, the Institution's security organization. If a controlled environment is required for scientific purposes, samples not being actively investigated must be stored in a locked laboratory.

8. In no case may Stardust samples on loan from NASA be stored with money, precious stones or minerals, classified material or any other item that is considered to be of high theft value. Stardust samples may be stored with other astromaterials (e.g., meteorites).

9. To ensure that appropriate security arrangements are followed, the Institution holding the Stardust samples shall be subject to inspection by NASA representatives upon request at all times.

10. The Institution and the PI shall report immediately the loss or damage of the Stardust samples to the Stardust Sample Curator.

11. The Institution security organization must be informed of the presence and location of the Stardust samples by the PI.

12. The Institution, or, if and when the Institution determines appropriate, the PI, is responsible for returning the Stardust samples upon expiration or termination of this Loan Agreement. However, the Institution retains the ultimate responsibility for the return of Stardust samples.

13. The PI shall be responsible for accurate accounting of all Stardust samples by sample name, number and location. The Institution shall perform an inventory of the Stardust samples on an annual basis beginning no later than approximately one year from the effective date of this Agreement, using the sample inventory form provided by the Stardust Sample Curator, and submit this form to the Stardust Sample Curator within two months of receipt. This inventory includes any samples consumed or destroyed in the course of the research. This inventory shall be signed by the PI and certified by an official or security representative of the Institution.

14. The Institution, acting through the PI, may only use the Stardust samples at the Institution, or may permit the PI to use the sample at other locations consistent with the approved sample request. Any uses not expressly addressed in the approved sample request will require the advance written approval of the Stardust Sample Curator. If the approved sample request entails collaborative work at another institution, the Stardust samples shall be either hand-carried, at the expense of the Institution, by an authorized official of the Institution, or mailed at the Institution's expense, via registered mail or by a shipping service approved by JSC. The Institution, acting through the PI shall keep a record of all such transfers, inform the Stardust Sample Curator when such transfers occur, and note them in the annual inventory. When the samples are in use by a collaborator, the original Institution is

responsible for extending the security requirements set forth in this agreement and shall retain responsibility for the Stardust samples.

15. This Loan Agreement is not transferable to another institution or investigator. If the PI relocates to another institution and wishes to continue research on the Stardust samples, a new Loan Agreement must be completed between the new Institution and NASA before Stardust samples can be transferred. If the PI is finished with a sample, but another investigator at the Institution is interested in studying this sample, a new sample request must be submitted to the Stardust Sample Curator, and if approved, a new Loan Agreement must be completed by the new Institution.

16. Return of Stardust samples to JSC may arise from several circumstances. If the PI completes or terminates research on the Stardust samples, or if the PI relocates to a new institution without executing a new loan agreement with NASA, the samples must be returned to the Stardust Sample Curator at JSC. Upon the circumstances of death or incapacitation of the PI, the Institution will likewise be responsible for returning the Stardust samples to the Stardust Sample Curator at JSC. Finally, if this agreement expires without a new loan agreement being entered into by the Parties, or is terminated by either Party, the Stardust samples must be returned to the Stardust Sample Curator at JSC. In all cases described above, the Stardust samples shall be returned with a full accounting of the Stardust samples, using the sample return forms provided by the Stardust Sample Curator.

17. The use of Stardust samples shall be solely for the purposes set forth in the approved sample request. This Loan Agreement allows the Institution to use destructive analytical procedures only as specified in the approved sample request. The Institution, acting through the PI, may request from the Stardust Sample Curator an amendment to the sample request in order to perform additional research on the samples.

18. When requested by NASA, the Institution, acting through the PI, shall provide the Stardust Sample Curator at JSC a copy of any publication(s) resulting from the Institution's research and confer any scientific knowledge acquired as a result of

such use, provided that no proprietary knowledge shall be disclosed involuntarily in the discharge of this obligation.

19. NASA or the Institution, in part acting through the PI, may, consistent with Federal law and this Loan Agreement, release general information regarding its participation in this Loan Agreement as desired.

LIABILITY AND RISK OF LOSS

1. The Institution shall be responsible for any loss or damage to the Stardust samples.

2. The Institution recognizes that the United States Government may take any action available under US law against the Institution with respect to such loss or damage.

3. Loss or damage to the Stardust samples caused by failure to follow proper safeguarding standards as set forth in this Loan Agreement, or by any willful act or omission, lack of good faith, or negligence of the Institution may result in the recall of all Stardust samples in the Institution's possession and will be considered in selecting future recipients, both PIs and Institutions, for Stardust sample loans.

4. NASA, its officers, and employees shall not be liable for any loss, damage, expense, or liability of whatsoever nature or kind arising out of, or as a result of, or in connection with the possession or use of the samples during the term of the loan or any extension thereof.

5. The Institution hereby waives any claims against NASA, its employees, its related entities, (including, but not limited to, contractors and subcontractors at any tier, grantees, investigators, customers, users, and their contractors and subcontractors, at any tier) and employees of NASA's related entities for any injury to, or death of, Institution employees or the employees of the Institution's related entities, or for damage to, or loss of, the Institution's property or the property of its related entities arising from or related to activities conducted under this Loan Agreement, whether such injury, death, damage, or loss arises through negligence or otherwise, except in

the case of willful misconduct. The Institution further agrees to extend this unilateral waiver to its related entities, including the PIs, by requiring them, by contract or otherwise, to waive all claims against NASA, its related entities, and employees of NASA and employees of NASA's related entities for injury, death, damage, or loss arising from or related to activities conducted under this Loan Agreement.

6. The Institution shall ensure that the PI is responsible to the United States Government to the same extent as the Institution as set forth in paragraphs 1 through 5 of this provision.

FINANCIAL OBLIGATIONS

There shall be no transfer of funds between the Parties under this Loan Agreement and each Party shall fund its own participation. All activities under or pursuant to this Loan Agreement are subject to the availability of funds, and no provision of this Loan Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, (31 U.S.C. § 1341).

PRIORITY OF USE

Any schedule or milestone in this Loan Agreement is estimated based upon the Parties' current understanding of the projected availability of NASA goods, services, facilities, or equipment. In the event that NASA's projected availability changes, the Institution shall be given reasonable notice of that change, so that the schedule and milestones may be adjusted accordingly. The Parties agree that NASA's use of the goods, services, facilities, or equipment shall have priority over the use planned in this Loan Agreement. Should a conflict arise, NASA in its sole discretion shall determine whether to exercise that priority. Likewise, should a conflict arise as between two or more non-NASA Parties, NASA, in its sole discretion, shall determine the priority as between those Parties. This Loan Agreement does not obligate NASA to seek alternative government property or services under the jurisdiction of NASA at other locations.

NONEXCLUSIVITY

This Loan Agreement is not exclusive; accordingly, NASA may enter into similar agreements for the same or similar purpose with other private or public entities.

USE OF NASA NAME, INITIALS, AND EMBLEM

The Institution or the PI shall not use "National Aeronautics and Space Administration" or "NASA" in a way that creates the impression that a product or service has the authorization, support, sponsorship, or endorsement of NASA, which does not, in fact, exist. The Institution or the PI must submit any proposed public use of the NASA name or initials (including press releases and all promotional and advertising use) to the NASA Assistant Administrator for the Office of Communication or designee ("NASA Communications") for review and approval. Approval by NASA Communications shall be based on applicable law and policy governing the use of the NASA name and initials.

Use of NASA emblems (*i.e.*, NASA Seal, NASA Insignia, NASA logotype, NASA Program Identifiers, and the NASA Flag) is governed by 14 C.F.R. Part 1221. The Institution or the PI must submit any proposed use of the emblems to NASA Communications for review and approval.

The Institution shall ensure that the PI carries out these obligations.

TERMS OF AGREEMENT -- DURATION, TERMINATION, AND MODIFICATION

This Loan Agreement becomes effective upon the date of the last signature below ("effective date") and shall remain in effect until the completion of all obligations of the Parties hereto, or five years from the effective date, whichever is sooner. This Loan Agreement may be amended at any time by written agreement of the Parties.

The Parties may unilaterally terminate this Loan Agreement by providing thirty (30) calendar days written notice to the other Parties. Upon termination the Institution, or if and when the Institution determines appropriate, the PI, is responsible for returning the

Stardust samples to the Stardust Sample Curator within thirty (30) days. However, if any provision of this Loan Agreement is violated, NASA may request the return of all the Stardust samples, and the Stardust samples shall be returned immediately. The Institution retains the ultimate responsibility for the return.

POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Loan Agreement:

Principal Investigator (PI)	Institution Official
Name	Name
Title	Title
Email	Email
Telephone	Telephone
Fax	Fax
Address	Address

NASA Stardust Sample Curator

Name:	Michael Zolensky
Email:	michael.e.zolensky@nasa.gov
Telephone:	(281) 438-5128
Fax:	(281) 483-5347
Address:	NASA – JSC, Mail Code KT 2101 NASA PKWY Houston TX 77058 USA

DISPUTE RESOLUTION

All disputes concerning questions of fact or law arising under this Loan Agreement shall be referred by the claimant in writing to the appropriate persons identified in this Loan Agreement as the "Points of Contact." The persons identified as the "Point of Contact" for NASA and the Institution shall consult and attempt to resolve all issues arising from the implementation of this Loan Agreement. If the Parties are unable to resolve the dispute, then the NASA signatory or that person's Designee, as applicable, shall issue a written decision that shall be the final agency decision for the purpose of judicial review. Nothing in this article limits or prevents any of the Parties from pursuing any other right or remedy available by law upon the issuance of the final NASA decision.

APPLICABLE LAW

U.S. Federal law governs this Loan Agreement for all purposes, including, but not limited to, determining the validity of the Loan Agreement, the meaning of its provisions, and the rights, obligations and remedies of the Parties.

SIGNATORY AUTHORITY

The signatories to this Loan Agreement covenant and warrant that they have authority to execute this Loan Agreement. By signing below, the undersigned agrees to the above terms and conditions:

Institution Official:

_____ _____
Signature Printed Name

_____
Date

NASA Stardust Sample Curator:

_____ _____
Signature Printed Name

_____
Date

Observer: Principal Investigator (PI):

_____ _____
Signature Printed Name

_____
Date

ANNEX 1

AGREEMENT BETWEEN [INSTITUTION NAME] AND [PI NAME]

1. [INSTITUTION NAME] designates [PI NAME] to be the Principal Investigator (hereinafter referred to as "PI.") for the Agreement between the National Aeronautics and Space Administration Johnson Space Center and [INSTITUTION NAME] of [INSTITUTION LOCATION] for the Loan of Stardust samples (hereinafter referred to as the "Loan Agreement"), to which this Agreement is affixed.
2. The PI agrees that s/he will be accountable for the responsibilities of the Institution and of the PI as set forth in the provisions of the Loan Agreement. These responsibilities are detailed in the following sections of the Loan Agreement:

   PURPOSE; RESPONSIBILITIES; LIABILITY AND RISK OF LOSS; PRIORITY OF USE; CUSTOMS CLEARANCE AND MOVEMENT OF PERSONS; USE OF NASA NAME, INITIALS, AND EMBLEM; TERMS OF AGREEMENT – DURATION, TERMINATION, AND MODIFICATION; POINTS OF CONTACT; and DISPUTE RESOLUTION.
3. This Agreement terminates or expires at such time as the Loan Agreement terminates or expires.

Institution Official	***Principal Investigator***
_____	_____
Printed Name	Printed Name
_____	_____
Signature	Signature
_____	_____
Date	Date

Appendix C: International Sample Loan Agreement

Agreement Between
The National Aeronautics and Space Administration
and
[INSTITUTION NAME]
For the Loan of Stardust Samples

AUTHORITY AND PARTIES

In accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113), this Loan Agreement is entered into by the National Aeronautics and Space Administration Johnson Space Center, located at Houston, Texas (hereinafter referred to as "NASA" or "JSC") and [INSTITUTION NAME] in [INSTITUTION LOCATION] (hereinafter referred to as "the Institution"). NASA and the Institution may be individually referred to as a "Party" and collectively referred to as the "Parties."

PURPOSE

Stardust samples distributed by NASA, a U.S. federal agency, are property of the U.S. Government and are under the custody and curatorial control of JSC.

NASA desires to make certain Stardust samples available to the Institution by entering into this Loan Agreement. The Institution proposes to use these Stardust samples to undertake scientific investigations led by its Principal Investigator (the person who performs the investigations, hereinafter referred to as "PI"). These investigations are described in one or more sample requests submitted by the PI to the Stardust Sample Curator at JSC and approved by the Stardust Sample Curator. Once approved, these sample requests are an integral part of this Loan Agreement. JSC approval of the sample request (the award letter) is a prerequisite to the initiation of this Loan Agreement and

subsequent loan of the Stardust samples. The approved samples will not be provided to the PI, through the Institution, until after conclusion of this Loan Agreement.

The use of the Stardust samples will permit beneficial contact among representatives of JSC and the Institution, including through the PI; will provide opportunities for discovery and dissemination of information to the broader scientific community and to the general public; will promote the maximum utilization of Stardust samples by JSC; and will provide opportunities for the dissemination of information concerning the activities of NASA.

RELATIONSHIP BETWEEN THE INSTITUTION AND PI

The Institution hereby designates [PI NAME] as the PI for the purposes of this Loan Agreement. The Institution will enter into a separate legally binding agreement with the PI for purposes of carrying out certain responsibilities of the Institution, as appropriate, that are set forth in this Loan Agreement. The Institution will be responsible for ensuring the PI's and his/her designee(s)' adherence to this separate agreement which is attached to this Loan Agreement as Annex 1 and is an integral part of this Loan Agreement.

RESPONSIBILITIES:

The Parties agree to the following:

20. The Stardust samples made subject to this Loan Agreement shall be identified and assigned to the Institution by the JSC Stardust Sample Curator via Stardust sample assignment forms signed by the Stardust Sample Curator and the PI.

21. The Stardust samples are irreplaceable and are therefore made available through institutions to PIs only under a carefully controlled and monitored program. It is therefore essential that rigorous security and accountability procedures be followed by all persons who have access to the Stardust samples. The Institution shall designate the PI to be responsible for the receipt, use (including security during use), and accountability of the Stardust samples, through the attached agreement.

22. Title to the Stardust samples shall remain with the U.S. Government and shall not be affected by the incorporation, attachment, or mixture thereof to or with property not owned by NASA.

23. As determined by NASA, the Stardust samples shall be either hand-carried, at the expense of the Institution, by an authorized official of the Institution, or mailed at JSC's expense, to the Institution via registered mail or a shipping service approved by JSC. JSC reserves the right, at the expense of the Institution, to direct the mode of transportation for the return of the Stardust sample.

24. Only the PI or the PI's designee(s), may receive and open the registered package. The PI or the PI's designee(s) shall record all of the Stardust samples promptly upon receipt, and a record of receipt shall be maintained while the Stardust samples are in the custody, possession or control of the PI and the Institution.

25. During the use for research purposes, the Stardust samples must be under the constant control of the PI or the PI's designee(s). At no time may the Stardust samples be left unattended. At the end of each use of the Stardust samples, an inventory shall be made to insure the accountability of the Stardust samples. Such inventories shall be maintained as a permanent record and shall be made accessible to NASA at all times.

26. When not being actively investigated, the Stardust samples must be locked in a secure nitrogen cabinet behind a door with a combination padlock or equivalent. The door combination shall be under the exclusive control of the PI and, if appropriate, the Institution's security organization. If a controlled environment is required for scientific purposes, samples not being actively investigated must be stored in a locked laboratory.

27. In no case may Stardust samples on loan from NASA be stored with money, precious stones or minerals, classified material or any other item that is considered to be of high theft value. Stardust samples may be stored with other astromaterials (e.g., meteorites).

28. To ensure that appropriate security arrangements are followed, the Institution holding the Stardust samples shall be subject to inspection by NASA representatives upon request at all times.

29. The Institution and the PI shall report immediately the loss or damage of the Stardust samples to the Stardust Sample Curator.

30. The Institution security organization must be informed of the presence and location of the Stardust samples by the PI.

31. The Institution, or, if and when the Institution determines appropriate, the PI, is responsible for returning the Stardust samples upon expiration or termination of this Loan Agreement. However, the Institution retains the ultimate responsibility for the return of Stardust samples.

32. The PI shall be responsible for accurate accounting of all Stardust samples by sample name, number and location. The Institution shall perform an inventory of the Stardust samples on an annual basis beginning no later than approximately one year from the effective date of this Agreement, using the sample inventory form provided by the Stardust Sample Curator, and submit this form to the Stardust Sample Curator within two months of receipt. This inventory includes any samples consumed or destroyed in the course of the research. This inventory shall be signed by the PI and certified by an official or security representative of the Institution.

33. The Institution, acting through the PI, may only use the Stardust samples at the Institution, or may permit the PI to use the sample at other locations consistent with the approved sample request. Any uses not expressly addressed in the approved sample request will require the advance written approval of the Stardust Sample Curator. If the approved sample request entails collaborative work at another institution, the Stardust samples shall be either hand-carried, at the expense of the Institution, by an authorized official of the Institution, or mailed at the Institution's expense, via registered mail or by a shipping service approved by JSC. The Institution, acting through the PI shall keep a record of all such transfers, inform the Stardust Sample Curator when such transfers occur, and note them in the annual inventory. When the samples are in use by a collaborator, the original Institution is

responsible for extending the security requirements set forth in this agreement and shall retain responsibility for the Stardust samples.

34. This Loan Agreement is not transferable to another institution or investigator. If the PI relocates to another institution and wishes to continue research on the Stardust samples, a new Loan Agreement must be completed between the new Institution and NASA before Stardust samples can be transferred. If the PI is finished with a sample, but another investigator at the Institution is interested in studying this sample, a new sample request must be submitted to the Stardust Sample Curator, and if approved, a new Loan Agreement must be completed by the new Institution.

35. Return of Stardust samples to JSC may arise from several circumstances. If the PI completes or terminates research on the Stardust samples, or if the PI relocates to a new institution without executing a new loan agreement with NASA, the samples must be returned to the Stardust Sample Curator at JSC. Upon the circumstances of death or incapacitation of the PI, the Institution will likewise be responsible for returning the Stardust samples to the Stardust Sample Curator at JSC. Finally, if this agreement expires without a new loan agreement being entered into by the Parties, or is terminated by either Party, the Stardust samples must be returned to the Stardust Sample Curator at JSC. In all cases described above, the Stardust samples shall be returned with a full accounting of the Stardust samples, using the sample return forms provided by the Stardust Sample Curator.

36. The use of Stardust samples shall be solely for the purposes set forth in the approved sample request. This Loan Agreement allows the Institution to use destructive analytical procedures only as specified in the approved sample request. The Institution, acting through the PI, may request from the Stardust Sample Curator an amendment to the sample request in order to perform additional research on the samples.

37. When requested by NASA, the Institution, acting through the PI, shall provide the Stardust Sample Curator at JSC a copy of any publication(s) resulting from the Institution's research and confer any scientific knowledge acquired as a result of

such use, provided that no proprietary knowledge shall be disclosed involuntarily in the discharge of this obligation.

38. NASA or the Institution, in part acting through the PI, may, consistent with Federal law and this Loan Agreement, release general information regarding its participation in this Loan Agreement as desired.

LIABILITY AND RISK OF LOSS

7. The Institution shall be responsible for any loss or damage to the Stardust samples.

8. The Institution recognizes that the United States Government may take any action available under US law against the Institution with respect to such loss or damage.

9. Loss or damage to the Stardust samples caused by failure to follow proper safeguarding standards as set forth in this Loan Agreement, or by any willful act or omission, lack of good faith, or negligence of the Institution may result in the recall of all Stardust samples in the Institution's possession and will be considered in selecting future recipients, both PIs and Institutions, for Stardust sample loans.

10. NASA, its officers, and employees shall not be liable for any loss, damage, expense, or liability of whatsoever nature or kind arising out of, or as a result of, or in connection with the possession or use of the samples during the term of the loan or any extension thereof.

11. The Institution hereby waives any claims against NASA, its employees, its related entities, (including, but not limited to, contractors and subcontractors at any tier, grantees, investigators, customers, users, and their contractors and subcontractors, at any tier) and employees of NASA's related entities for any injury to, or death of, Institution employees or the employees of the Institution's related entities, or for damage to, or loss of, the Institution's property or the property of its related entities arising from or related to activities conducted under this Loan Agreement, whether such injury, death, damage, or loss arises through negligence or otherwise, except in the case of willful misconduct. The Institution further agrees to extend this

unilateral waiver to its related entities, including the PIs, by requiring them, by contract or otherwise, to waive all claims against NASA, its related entities, and employees of NASA and employees of NASA's related entities for injury, death, damage, or loss arising from or related to activities conducted under this Loan Agreement.

12. The Institution shall ensure that the PI is responsible to the United States Government to the same extent as the Institution as set forth in paragraphs 1 through 5 of this provision.

FINANCIAL OBLIGATIONS

There shall be no transfer of funds between the Parties under this Loan Agreement and each Party shall fund its own participation. All activities under or pursuant to this Loan Agreement are subject to the availability of funds, and no provision of this Loan Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, (31 U.S.C. § 1341).

PRIORITY OF USE

Any schedule or milestone in this Loan Agreement is estimated based upon the Parties' current understanding of the projected availability of NASA goods, services, facilities, or equipment. In the event that NASA's projected availability changes, the Institution shall be given reasonable notice of that change, so that the schedule and milestones may be adjusted accordingly. The Parties agree that NASA's use of the goods, services, facilities, or equipment shall have priority over the use planned in this Loan Agreement. Should a conflict arise, NASA in its sole discretion shall determine whether to exercise that priority. Likewise, should a conflict arise as between two or more non-NASA Parties, NASA, in its sole discretion, shall determine the priority as between those Parties. This Loan Agreement does not obligate NASA to seek alternative government property or services under the jurisdiction of NASA at other locations.

CUSTOMS CLEARANCE AND MOVEMENT OF PERSONS

In accordance with its laws and regulations, each Party will facilitate free customs clearance and waiver of all applicable customs duties and taxes for goods necessary for the implementation of this Loan Agreement. In the event that any customs duties or taxes of any kind are nonetheless levied on such equipment and related goods, such customs duties or taxes will be borne by the Party of the country levying such customs duties or taxes.

In accordance with its laws and regulations, each of the Parties will also facilitate the movement of goods into and out of its territory as necessary to comply with this Loan Agreement.

NONEXCLUSIVITY

This Loan Agreement is not exclusive; accordingly, NASA may enter into similar agreements for the same or similar purpose with other private or public entities.

USE OF NASA NAME, INITIALS, AND EMBLEM

The Institution or the PI shall not use "National Aeronautics and Space Administration" or "NASA" in a way that creates the impression that a product or service has the authorization, support, sponsorship, or endorsement of NASA, which does not, in fact, exist. The Institution or the PI must submit any proposed public use of the NASA name or initials (including press releases and all promotional and advertising use) to the NASA Assistant Administrator for the Office of Communication or designee ("NASA Communications") for review and approval. Approval by NASA Communications shall be based on applicable law and policy governing the use of the NASA name and initials.

Use of NASA emblems (*i.e.*, NASA Seal, NASA Insignia, NASA logotype, NASA Program Identifiers, and the NASA Flag) is governed by 14 C.F.R. Part 1221. The Institution or the PI must submit any proposed use of the emblems to NASA Communications for review and approval.

The Institution shall ensure that the PI carries out these obligations.

TERMS OF AGREEMENT -- DURATION, TERMINATION, AND MODIFICATION

This Loan Agreement becomes effective upon the date of the last signature below ("effective date") and shall remain in effect until the completion of all obligations of the Parties hereto, or five years from the effective date, whichever is sooner. This Loan Agreement may be amended at any time by written agreement of the Parties.

The Parties may unilaterally terminate this Loan Agreement by providing thirty (30) calendar days written notice to the other Parties. Upon termination the Institution, or if and when the Institution determines appropriate, the PI, is responsible for returning the Stardust samples to the Stardust Sample Curator within thirty (30) days. However, if any provision of this Loan Agreement is violated, NASA may request the return of all the Stardust samples, and the Stardust samples shall be returned immediately. The Institution retains the ultimate responsibility for the return.

POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Loan Agreement:

Principal Investigator (PI)		Institution Official	
Name		Name	
Title		Title	
Email		Email	
Telephone		Telephone	
Fax		Fax	
Address		Address	

NASA Headquarters, Office of International and Interagency Relations		NASA Stardust Sample Curator	
Name	Sherry Copeland	Name:	Michael Zolensky
Email	Sherry.T.Copeland@nasa.gov	Email:	michael.e.zolensky@nasa.gov
Telephone	(202) 358-2283	Telephone:	(281) 483-5128
Fax	(202) 358-3030	Fax:	(281) 483-5347
Address	NASA Headquarters Mail Suite 2X54 300 E Street, SW Washington, DC 20546-0001 USA	Address:	NASA – JSC, Mail Code KT 2101 NASA PKWY Houston TX 77058 USA

DISPUTE RESOLUTION

All disputes concerning questions of fact or law arising under this Loan Agreement shall be referred by the claimant in writing to the appropriate persons identified in this Loan Agreement as the "Points of Contact." The persons identified as the "Point of Contact" for NASA and the Institution shall consult and attempt to resolve all issues arising from the implementation of this Loan Agreement. If the Parties are unable to resolve the dispute, then the NASA signatory or that person's Designee, as applicable, shall issue a written decision that shall be the final agency decision for the purpose of judicial review. Nothing in this article limits or prevents any of the Parties from pursuing any other right or remedy available by law upon the issuance of the final NASA decision.

APPLICABLE LAW

U.S. Federal law governs this Loan Agreement for all purposes, including, but not limited to, determining the validity of the Loan Agreement, the meaning of its provisions, and the rights, obligations and remedies of the Parties.

SIGNATORY AUTHORITY

The signatories to this Loan Agreement covenant and warrant that they have authority to execute this Loan Agreement. By signing below, the undersigned agrees to the above terms and conditions:

Institution Official:

_____ _____

Signature Printed Name

_____

Date

NASA Stardust Sample Curator:

_____ _____

Signature Printed Name

_____

Date

Director, Aeronautics and Cross-Agency
Support Division (ACD), NASA Headquarters
Office of International and Interagency Relations:

_____ _____

Signature Printed Name

_____

Date

Observer: Principal Investigator (PI):

_____ _____

Signature Printed Name

_____

Date

ANNEX 1

AGREEMENT BETWEEN [INSTITUTION NAME] AND [PI NAME]

4. [INSTITUTION NAME] designates [PI NAME] to be the Principal Investigator (hereinafter referred to as "PI.") for the Agreement between the National Aeronautics and Space Administration Johnson Space Center and [INSTITUTION NAME] of [INSTITUTION LOCATION] for the Loan of Stardust samples (hereinafter referred to as the "Loan Agreement"), to which this Agreement is affixed.

5. The PI agrees that s/he will be accountable for the responsibilities of the Institution and of the PI as set forth in the provisions of the Loan Agreement. These responsibilities are detailed in the following sections of the Loan Agreement:

   PURPOSE; RESPONSIBILITIES; LIABILITY AND RISK OF LOSS; PRIORITY OF USE; CUSTOMS CLEARANCE AND MOVEMENT OF PERSONS; USE OF NASA NAME, INITIALS, AND EMBLEM; TERMS OF AGREEMENT – DURATION, TERMINATION, AND MODIFICATION; POINTS OF CONTACT; and DISPUTE RESOLUTION.

6. This Agreement terminates or expires at such time as the Loan Agreement terminates or expires.

Institution Official	***Principal Investigator***
_____	_____
Printed Name	Printed Name
_____	_____
Signature	Signature
_____	_____
Date	Date

Appendix D: Sample Documentation Form

STARDUST SAMPLE DOCUMENTATION FORM

Date:
CO:

Event: __Transmittal __Receipt __Loss or Destruction __Subdivision

JSC Tracking Number:	**Stardust Sample Description**
Transfer from: _____ **Date:**	**Processor:**
Transfer to:	

JSC Stardust Form #100 January 4, 2006

PLEASE RETURN THIS FORM TO:

STARDUST SAMPLE CURATOR
MAIL CODE KT
JOHNSON SPACE CENTER
HOUSTON, TX 77058