

# **HAYABUSA Sample Investigator's Guidebook:**

## **For the 1<sup>st</sup> International A/O**

January 24, 2012

### **Summary**

HAYABUSA encountered asteroid Itokawa in November 2005. During the touch-and-go operations that were tried twice, sample collection from the surface of the asteroid was attempted. The re-entry capsule that carried the sample container was returned to Earth in June 2010.

Although the sampling mechanism did not work as had been planned, HAYABUSA managed to capture thousands of tiny particles (mostly 10-100 micrometers in size) from Itokawa's surface and kept them safely in the container until they were curated at ISAS, JAXA. The HAYABUSA samples, unlike meteoritic samples, have neither been exposed to 1 atm of the earth air nor have experienced shock and high-temperatures during entry into the earth's atmosphere. The HAYABUSA samples are pristine asteroid regolith materials that uniquely retain information of the surface environment of the asteroid.

It is a time-consuming process to retrieve the tiny particles from the HAYABUSA sample catcher. Approximately 60 particles have been submitted to the Initial Analysis activity (HASPET) and a part of the initial results have been published in *Science* magazine in August 2011 (Vol. 333). The 1<sup>st</sup> delivery of HAYABUSA samples to NASA was completed in December 2011. For the 1<sup>st</sup> International Announcement of Opportunity for HAYABUSA Sample Investigation, in addition to the particles that have been through the Initial Analysis, we plan to allocate 50~100 newly retrieved Itokawa particles.

The particles that have been subject to the Initial Analysis will remain available for further detailed investigation. The past history of each of these particles, however, may

constrain the scope of their future analysis. The newly-retrieved particles that are to be allocated have been through SEM/EDX analysis only. Both types of particles to be allocated have been identified to consist mainly of silicate minerals by the Curator. The particle sizes are mostly in the range of 20~50 micrometers. A web-based Catalog describing the general properties of the particles is made public upon the release of the HAYABUSA A/O. A data sheet is attached to each particle returned from the Initial Analysis to document the analyses that were performed on it. There will be no additional preparatory work on these particles by the Curator before allocation.

The Implementation Committee for the 1<sup>st</sup> International A/O will handle the peer-review process in which HAYABUSA sample investigation proposals will be selected. This guideline is intended to help researchers who plan to submit proposals in response to the A/O.

The key milestones for the 1<sup>st</sup> International HAYABUSA A/O is as follows:

Announcement of Opportunity	24 January, 2012
Due date for proposals	7 March, 2012 (1500UT)
Completion of review	mid May, 2012

### **HAYABUSA curation activity**

HAYABUSA curation work is performed at the ISAS Curation Facility. The Facility is built to serve the community related to astromaterial science via an inter-university/institute collaboration scheme that is widely used in Japanese academic communities. The Curator (Dr. Masanao Abe, ISAS, JAXA) is in charge of sample retrieval, preliminary characterization, storage and transfer of HAYABUSA samples.

The Hayabusa sample container was opened inside a clean chamber in the ISAS Curation Facility, under a vacuum. Following this activity, the sample container was moved into a high-purity nitrogen (ppb levels of trace gases) cabinet, where all subsequent sample removal activities are performed. Thus the HAYABUSA samples have been returned to Earth without experiencing shock and high-temperature conditions during atmospheric entry, and since the HAYABUSA capsule was never completely filled with terrestrial atmosphere, the recovered samples are more pristine than any other available astromaterial, excepting the Apollo and Luna samples. These samples

retain unaltered information regarding the surface environment of asteroid Itokawa.

HAYABUSA samples are in the form of tiny particles. Their sizes are ~100 micrometers at most. The particles have been retrieved by three methods so far: (1) Scratching the surface of the sample catcher using a teflon spatula. Particles in the size range of 1-10 micrometers are recovered by this method. (2) Direct pick-up from the surface of the sample catcher by a quartz glass probe. The particle size range is 10-100 micrometers. (3) Dropping the particles onto a quartz disk by turning the sample catcher upside-down, and picking them up using a manipulator. The particle size range is 10-100 micrometers.

The samples recovered by method (3) have been subjected to SEM/EDX analysis for preliminary characterization. They are preserved on quartz disks and these samples are ready for further detailed analysis including this 1<sup>st</sup> International A/O. All the processes prior to preservation have been performed under a high purity Nitrogen atmosphere.

HAYABUSA curation activity has five categories: (A) Initial Analysis, (B) delivery to NASA, (C) international A/O, (D) short-term storage at ISAS/JAXA's, and (E) long-term storage and availability for future opportunities. The international A/O is open to researchers all over the world who are capable of performing useful analyses on such small samples. JAXA is ready to issue the 1<sup>st</sup> International A/O because the Initial Analysis (HASPET) by the pre-selected teams has come to its conclusion. The 1<sup>st</sup> delivery to NASA was also completed in December 2011.

### **HAYABUSA samples for the 1<sup>st</sup> International A/O**

The particles available for the 1<sup>st</sup> International A/O are mostly in the size range of 20~50 micrometers. All the particles have been identified as silicate type via SEM/EDX analysis by the Curator, that is, these particular particles are all dominated by silicate minerals. These are typical particles found in the sample catcher. Samples of different properties will be available for proposers selected in a future international A/O.

There will be two types of samples allocated in the 1<sup>st</sup> International A/O: Samples returned from Initial Analysis and newly retrieved samples.

Approximately 50 particles (out of ~60 analyzed) will be returned from the Initial Analysis and therefore be available for allocations and further detailed analysis. A detailed data sheet constructed in the course of the Initial Analysis will be attached to each of these samples. The past history of some of these previously analyzed particles may constrain future analysis, for example some particles have been irradiated, or analyzed by ion probe. The first part of the Initial Analysis results have been published in *Science* magazine in August 2011 (Vol. 333), and a second collection of papers are being submitted for publication in *Meteoritics and Planetary Science*.

For newly-retrieved particles, only general properties of each particle will be described in the Sample Catalog published upon release of A/O. Only SEM/EDX analysis has been performed on these new particles. The number of newly retrieved particles to be allocated will be 50~100.

For the 1<sup>st</sup> A/O, particles of both types will not be subjected to any additional preparatory work before allocation. In other words the Curator will not prepare microtomed samples, etc.

All the particles to be allocated in the 1<sup>st</sup> A/O have been through SEM analysis at least. In a future opportunity, truly pristine samples that have not been through any analysis may be available for investigators that are ready to take the risk of receiving contaminant particles. This is being considered because we realize that even low-voltage SEM/EDX analyses may compromise some analyses.

### **General notes on HAYABUSA samples**

As a reference for a future opportunity, a summary of the sample retrieval activity is given here. It includes information on samples that are not available for the 1<sup>st</sup> International A/O but which may be available in future opportunities.

The sample catcher is composed of two rooms, Room A and Room B. For Room A, three types of retrieval method were employed: (Method (1): scratching by a teflon spatula, Method (2): direct pick-up by a probe, Method (3): free-fall onto a quartz disk. See above for details.). For Room B, only method (3) has been performed.

By method (1) from Room A, out of ~3,300 particles that were recovered, ~1,500 were confirmed to be of silicate type. These very tiny particles (mostly less than 10 micrometers) are attached to a teflon spatula and we have not yet tried to remove them.

By method (2) from Room A, ~50 particles have been picked up. This method is by far more time consuming than the other two.

By method (3), it is estimated that ~1,000 particles from Room A and ~500 particles from Room B were deposited onto quartz disks. Approximately half of these are considered to be contaminant particles (mostly Al debris from the catcher surface). Room A particles are in the size range of 10~300 micrometers while Room B particles are distributed in the 10~200 micrometer range. ~200 and ~40 particles, respectively, have been picked up from the quartz disks. Among them, ~150 (from Room A) and ~40 (from Room B) have been through SEM/EDX analysis by the Curator. Out of these, ~60 particles have been submitted to Initial Analysis.

At this stage, it is not clear how many more particles remain unrecovered inside the sample catcher.

Preliminary characterization by the Curator based on SEM/EDX analysis permits sorting of the recovered samples into four categories:

- Category 1: Particles showing only ferromagnesian silicate composition features
- Category 2: Particles showing ferromagnesian silicate plus other mineral features, such as metals, sulfides, oxides, etc.
- Category 3: Particles showing mainly carbon signatures
- Category 4: Particles that are likely to be contaminants, namely, debris from the parts within the sample catcher, showing composition features such as Al, quartz glass, stainless steel, etc.

Category 1 and 2 particles obtained by method (3) from Room A and Room B are those that will be allocated in the 1<sup>st</sup> International A/O.

Since the Curator is still optimizing the handling procedures for particles that are larger than 100 micrometers, these large particles are protected and are not available for the 1<sup>st</sup> International A/O. Also, the Curator has not yet devised an efficient method of handling particles that are smaller than 10 micrometers in diameter.

The nature of Category-3 particles is puzzling and is still under investigation by the Curator. Debris from operators' gloves during sample retrieval process is potential source. The Curator has not decided whether particles in this category should be provided to an open research opportunity.

### **Guidelines for Proposers**

The HAYABUSA samples are valuable and irreplaceable samples returned from an asteroid. Since they are in the form of tiny particles that require careful and dedicated treatment, proposers, first of all, need to demonstrate their capability of handling and successfully analyzing such tiny particles.

The time consuming nature of the sample retrieval process limits the total number of particles available for the initial A/O. In addition to ~50 samples returned from the Initial Analysis, 50~100 newly retrieved samples will be available for potential allocation. Since the total number of samples available for the investigators is not very large, a reasonable number of samples available for each individual investigator would not be large, and consortia of scientists proposing multiple analyses for individual samples are encouraged. In addition to describing the scientific goals and analysis plans for samples, sample request proposals must also detail the size, number, and specific features of the samples that are being requested. Sample requests must also detail all requirements regarding the sample transfer method.

Proposal selection will proceed on a peer-review basis handled by the International A/O Committee that consists of approximately ten scientists from diverse fields. A higher priority will be given to proposals that take the advantage of the unique attributes of the HAYABUSA samples, for example, non-exposure to the earth's air, pristine memory of the surface environment of the asteroid, the first regolith sample from an asteroid, and so on. Investigators must report the results any of their analysis results to the Curator in a timely manner, and this is particularly critical for samples that will have not received significant characterization by the Curator. As mentioned above, investigators are encouraged to form consortia to maximize the information to be obtained from each particle. Forming consortia to maximize scientific output is especially encouraged for studies that will result in damage or destruction of the samples.

Each particle has its own ID number indicated in the Sample Catalog so that a proposer can explicitly specify the particles that are being requested. Proposers must also state the required properties of particles that match their proposed investigations, in the event that more than one investigator requests the same particle. For this reason alternate sample requests are also strongly encouraged.

As mentioned above there will be two types of samples allocated in the 1<sup>st</sup> International A/O.

The first type of available particles is those returned from the Initial Analysis. In the Initial Analysis, the particles have been subject to, variously, X-ray CT scans, noble gas analysis, XRD/XRF analysis, SEM/TEM/EPMA analysis, SIMS analysis, search for organic material, and so on. The results of the Initial Analysis will be described in data sheets that will be made public upon release of the A/O. One data sheet is attached to each of the particles returned from the Initial Analysis. Proposals for further detailed analysis on top of the already obtained results are expected. The past analysis history of each particle is shown in the data sheets, since some analyses may constrain the scope of meaningful future analysis to be performed on some particles.

The second type of particles that will be available is composed of newly retrieved particles. Rather general properties known only from SEM and BSE imaging results and EDX spectrum information from a few points on each particle will be all the information that is available in the Sample Catalog for these particular particles.

Here are some notes on the Sample Catalog. The main table shows basic properties of samples: sample ID, sample size, sample category (Category 1-4, see above), mineral phase, and, for those particles returned from Initial Analysis, a list of the analyses that the particle has been through. The gray-hatched particles are not available for the 1<sup>st</sup> International A/O for one reason or another (wrong category, too small or too large size, unreturned from Initial Analysis, and so on.). When a sample that matches a proposer's interest is found, the proposer should follow the links for further information (SEM images and EDX spectrum for newly retrieved particles, and a detailed data sheet for a particle returned from Initial Analysis) to complete the proposed research plan.

Since the Curator is prepared to package up samples for transfer to an investigator's

institution in a high-purity nitrogen (ppb levels of trace gases) atmosphere, samples can reach the investigator without exposure to the earth's air if necessary. However, such precautions may not be necessary for some proposed investigations. Thus sample request proposals must describe the exact environmental conditions for the sample transfer procedures to be made by the Curator.

An allocated sample must be returned to the Curator as soon as the proposed investigation is completed. If a proposed investigation will completely consume samples, this fact must be clearly stated in the proposal. An investigator cannot transfer samples to other investigators/institutions unless this action was described in the original approved sample request, or without explicit approval of the Hayabusa Curator. .

Additional instructions to proposers that list all the necessary items to be included in a proposal will be provided upon release of the A/O. All the sample request proposals sent to the International A/O Committee will have referees assigned. By referring to the referee reports, the A/O Committee will assess the scientific merit of each proposal. The proposer's demonstrated capability of handling and analyzing tiny particles and access to the required analytical facilities, the availability of the requested samples, and the realism of the proposed investigation will also be assessed. Furthermore, the Committee will weigh the overall scientific merit of the proposal with the required number of particles and possible degradation that the samples may suffer. The Committee will make the final selection of the successful proposals.

The 1<sup>st</sup> delivery of HAYABUSA samples to NASA occurred in December 2011 and there will be a research opportunity provided by NASA in parallel to this JAXA's International A/O. This Committee for JAXA's A/O will communicate with the NASA's allocation committee to maximize the scientific output from HAYABUSA Sample Investigation as a whole. Part of this cooperation will be to ensure that investigators do not request HAYABUSA samples from both agencies for the same scientific investigation. .

### **Investigator's Responsibility**

HAYABUSA Sample Investigators are responsible for the security of the samples



allocated to them and will be held personally accountable in the event of sample loss. Investigators must make every effort to avoid unnecessary contamination of the samples. Investigators must return allocated samples to the Curator immediately upon completion of the approved investigation. The Curator assumes one year as the standard sample allocation period but this can be modified according to the actual progress rate of an investigation, at the discretion of the Curator.

Investigators are required to report the results of all sample analyses to the Curator very soon after completion of their investigations, even if these results are not ultimately published. The Sample Information Sheet, which would be filled with minimum information that an Investigator should report to the Curator, will be posted upon release of the A/O. While the Investigators have complete control over publications, they are requested to notify the Curator of any publications that result from analysis of the HAYABUSA samples in a timely fashion. When it is judged to be useful for a future allocation, unpublished results may be added to a sample analysis report to the Curator. The Curator is interested in constructing a knowledge warehouse that stores all information related HAYABUSA Sample Investigation, to aid future sample investigations. The Sample Catalog, which a proposer should carefully inspect before drafting a proposal, will be enhanced by the input from the Investigators and better serve future research opportunity where more sophisticated study plans can be proposed.

HAYABUSA Sample Investigators are responsible for arranging for the transfer of samples from ISAS to their institutions. While the Curator will prepare JAXA-standard containers for the transfer, investigators can also consult the Curator in case they prefer to use containers prepared by themselves. Various methods of transfer may be considered, such as hand carrying and FedEx. It is noted, however, that some sample transport routes have the risk of unintentional opening by various persons. While JAXA is willing to lend some help, investigators are responsible for going through all customs formalities. Basically, investigators are requested to cover all transfer fees.

All the terms and conditions of the HAYABUSA Sample A/O are described in the following.

## **Terms and Conditions on the 1<sup>st</sup> International Announcement of Opportunity for Hayabusa Sample Investigation**

This agreement is made between the Japan Aerospace Exploration Agency (hereinafter referred to as "JAXA"), established under the provisions of the Japan Aerospace Exploration Agency Law of December 13, 2002, represented by its President and having its principal office at 7-44-1 Higashimachi, Jindaiji, Choufu-shi, Tokyo, Japan and the Research Organization (hereinafter referred to as the "Research Organization") that submitted the application form for this agreement to JAXA, hereinafter collectively referred to as "the Parties".

Recognizing that the Muses-C (hereinafter referred to as "Hayabusa") was launched by JAXA from Japan on May, 2003 and returned to the earth on June 2010,

Recognizing that JAXA shall provide the sample of the asteroid Itokawa which brought back by Hayabusa,

Recognizing that JAXA issued the Announcement of Opportunity (hereinafter referred to as "AO") in January 2012, Research Organization, submitted a proposal in response to the AO;

And recognizing that JAXA has selected, based on the proposal,

The Parties hereto agree as follows,

### **1. Definitions**

As used in this agreement, the following terms shall have the meanings indicated.

"Hayabusa" consists of the asteroid explorer plus all the instruments on board.

"Hayabusa sample" means the particles of the asteroid Itokawa brought back by Hayabusa.

A "PI" is the person who has been selected to perform these AO activities and who belongs to the Research Organization, and whose name is shown on the "Work Plan";

The "Co-Investigator" (CI) is the person who supports the PI in performing the research defined in this agreement with approval by the Research Organization and notification to JAXA.

"Research" is defined in the AO and further detail is described in the "Work Plan."

“Research Results” means the results derived from the implementation of this AO.

## **2. Purpose and Scope**

The purpose of this agreement is to establish the terms and conditions under which the Research Organization shall conduct the AO activities. The Research is described in the Work Plan.

## **3. Period of Performance**

This agreement shall come into force upon issuance of a confirmation sheet prescribed by JAXA and shall continue in effect until March 31, 2013, unless terminated as described in article 22. In spite of the previous paragraph, articles 9, 10, 11, 12, 18, 19, 20, 24, and 25 shall remain in force after the expiration of this agreement.

## **4. Affiliation**

1. In the event that the Research Organization intends to add CIs, the Research Organization shall first obtain the consent of JAXA for such personnel. The Research Organization shall submit to JAXA the list of such candidates of CIs in order to obtain JAXA's consent. If JAXA does not agree to the proposed list of candidates of CIs, then JAXA will send notification to the Research Organization within 7 days upon receipt of the list of candidates of CIs.
2. The Research Organization shall supervise the PI's and CI's engaging in the Research Projects and shall ensure all PI's and/or CI's engaging in the Research Projects in accordance with the terms and conditions of the Agreement. For avoidance of doubt, with regard to this Agreement, the PIs and CIs shall not be deemed to be a third party.
3. In the event that the PI dies, retires from the Research Organization, takes a leave absent from work, or come to be no longer engaged in the Research Projects, the Research Organization shall immediately notify to JAXA as such and JAXA and the Research Organization may terminate this Agreement; provided however, if the Research Organization designates a researcher who belongs to the Research Organization as the PI's successor, the Research Organization can continue AO activities by sending notification to JAXA with the succeeding researcher being a new PI. If JAXA does not agree to the proposed new PI, then JAXA will send notification to the Research Organization within 14 days upon receipt of the notification proposing new PI.

## **5. Responsibilities of JAXA**

JAXA shall make reasonable efforts to .

- a) Prepare the list of Hayabusa sample and open it on the website.
- b) Loan the PI with Hayabusa sample which PI requested .

## **6. Responsibilities of the Research Organization**

The Research Organization shall make reasonable efforts to

- a) Develop the work plan for AO activity provided that the Hayabusa sample shall be return to JAXA soon after AO activity completed.
- b) Conduct and complete the AO activities in accordance with the Work Plan.
- c) Establish an adequate security system for the Hayabusa sample
- d) Deliver the Research Results as a summary by the end of performance period as described in article 3.
- f) Explain the Hayabusa sample condition prior to return them to JAXA

## **7. Rights and Obligations concerning Hayabusa sample**

- a) The PI shall not use the Hayabusa sample for any other purposes than defined by the work plan.
- b) The PI shall pay attention to keep the condition of sample not to polluted as much as possible.

## **8. Transportation of Hayabusa sample**

- a) JAXA will use the commercial transportation for the Hayabusa sample and will accept the scientific risk like the X-ray inspection, open the container in the airport and its loss.
- b) In the event the PI cannot accept these risks, the PI is entitled to propose the different transportation. In this case, the PI shall propose it by work plan.

## **9. Transfer of Technical Data**

Except as otherwise provided in this article, each party under this agreement shall transfer all technical data, considered to be necessary to fulfill the receiving party's responsibilities under this agreement, to the extent feasible.

The parties will undertake to handle expeditiously any request for technical data presented by the other party for the purpose of this agreement. Neither party shall have any right to require the other party to transfer any data, the transfer of which would violate the laws or regulations of the country having jurisdiction of such transfer.

The furnishing party shall mark with a notice or otherwise clearly indicate the technical data that are to be protected for proprietary rights purposes or export control purposes. Such a notice shall indicate any specific conditions regarding how such technical data may be disclosed or used by the receiving party including, for export control (a) that such technical data shall be used or disclosed only for the purpose of fulfilling the receiving party's responsibilities under this agreement, and, for proprietary rights (b) that such technical data shall not be disclosed, duplicated or used by persons or entities other than the receiving party, or for any other purpose, without the prior consent of the furnishing party.

Each party shall observe any clearly indicated limitation on the handling of transferred technical data.

According to directives of the furnishing party, the receiving party shall return or otherwise dispose of Technical Data provided under the Agreement upon completion of the activities under the Agreement.

## **10. Intellectual Property Rights**

If the Research organization solely generates Potential Intellectual Property Rights in the course of the Research Projects ("Solely-Owned Intellectual Property Rights") the party shall notify such fact to the other party without delay. In this case, the Research organization may take steps to apply for the registration of the resulting Intellectual Property Rights as solely-owned ones at its own expense, provided that it shall obtain prior confirmation of the other party. For the avoidance of doubt, only if Potential Intellectual Property Rights are generated or created by the Research Organization's sole work and sole funding shall such Potential Intellectual Property Rights be deemed to be solely generated or created by the Research Organization.

## **11. Usage of Research Results**

The Research Organization solely owns Results of Research and utilize it exclusively. However, if JAXA wishes to utilize the Result of the Research, JAXA shall obtain the written permission from the Research Organization in advance.

## **12. Publication of Research Results**

1. The results obtained through the performance of these AO activities by the Research Organization will be made available to the general public in a timely manner. If the Research organization intends to publish the Research Results, they the Research Organization shall inform JAXA prior to submission.

2. The Research Organization shall add a statement to the publication that indicates, as appropriate that the research results have been obtained through the cooperation between the research organization and JAXA

### **13. Language**

All communications between the Research Organization and JAXA under this agreement shall be in English.

### **14. Force Majeure**

Neither party is liable for failure, delay or suspension to perform its part of this agreement when such failure is due to the reason including, but not limited to, fire, war, inevitable accident, act/policy of government, legal restrictions beyond the control of the party.

### **15. Taxes and Customs**

If any customs fees and/or taxes of any kind are levied on the transactions necessary for the implementation of this agreement, such customs fees and/or taxes shall be borne by the party of the country levying the fees and/or taxes.

### **16. Funding**

There will be no exchange of funds under this agreement. Each party shall bear necessary costs to fulfill its own responsibilities under this agreement.

### **17. Limitations on Liabilities**

JAXA and the Research Organization agree to waive any claim against the other with respect to any injury or death of its employees or the employees of its related entities, with respect to damage of any kind, or any loss of its own property or property of its related entities arising out of activities under this agreement (hereinafter referred to as "Damages"), except such Damages which arise through willful misconduct and gross negligence and except intellectual property rights.

### **18. Invention and Patent**

Nothing in this agreement shall be construed as granting or implying any right to, or interest in, patents owned or inventions that are independently developed by the parties or their contractors or subcontractors.

## **19. Confidentiality**

1. In this Agreement, "Confidential Information" means any information that a party discloses or presents in writing or by other media, to the other party in the course of these Research Projects, provided however, Confidential Information does not include the following:

- a) Information that is already known to the public when disclosed by the disclosing party;
- b) Information that becomes known to the public after the disclosure by the disclosing party without intentional misconduct or negligence of the receiving party;
- c) Information that the receiving party already had before the disclosure by the disclosing party;
- d) Information that the receiving party acquires from a duly authorized third party not subject to confidentiality obligations;
- e) Information that the receiving party independently develops without utilizing information obtained from the disclosing party;
- f) Information with a prior written consent of the disclosing party for the disclosure and the publication; or
- g) Information that is required to be disclosed by applicable laws, judgment or order of a competent court. In this case, the receiving party shall promptly notify the disclosing party of the necessity of disclosure.

2. The receiving party shall keep the Confidential Information secret, and shall not disclose or divulge any Confidential Information to a third party without prior written consent of the disclosing party.

3. The confidentiality obligation under this Article shall remain effective for a period of five (5) years after the termination of the Agreement. However this period of keeping confidentiality may be extended or shortened by mutual agreement.

## **20. Government Approvals**

Each party shall obtain such permits, licenses, and other government authorizations as are required for it to perform its responsibilities under this agreement, and shall comply with all respective laws and regulations.

## **21. Suspension**

When the Research Organization fails to meet the purposes of this agreement or to comply with the terms of this agreement, JAXA may suspend execution of this agreement, in whole or in part, pending corrective action by the Research Organization

or a decision by JAXA to revoke this agreement.

## **22. Termination**

1. Either party may terminate the Agreement:
  - a) When the other party commits a dishonest and/or inequitable act that irreparably harms the mutual trust between the Parties; provided, that breaching party fails to offer any effective and satisfactory remedial measures within seven (7) days after getting demands for corrective action from the harmed party;
  - b) When the other party violates any of the terms and conditions of this Agreement provided that the breaching party fails to offer any effective and/or satisfactory remedial measures within seven (7) days after getting demands for corrective action from the harmed party; and
  - c) When the Parties consent to terminate
2. Upon the termination of the Agreement, the Research Organization shall promptly deliver to JAXA all work including, but not limited to, all works in progress and all work that is completed and otherwise ready for delivery.
3. The preceding paragraph shall apply to termination upon the occurrence of the events contemplated in Article 4 Paragraph 3.

## **23. Special Agreement**

Any supplement, modification or amendment of this Agreement shall only be binding if made upon the Parties' mutual written agreement which makes specific reference to this Agreement.

## **24. Dispute Resolution**

The parties agree to make their best efforts to solve amicably any dispute, controversy, or difference arising out of, in connection with, or resulting from this agreement.

## **25. Arbitration**

All disputes that cannot be amicably settled by the method defined in the previous paragraph hereof will be settled by arbitration in Tokyo in accordance with the Commercial Arbitration Rules of the Japan Commercial Arbitration Association.



## STATEMENT OF AGREEMENT

I, the undersigned, have read and fully understood the above “Terms and conditions on the 1st International Announcement of Opportunity for Hayabusa Sample Investigation” and agreed to abide by the rules contained therein.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (Signature)  
\_\_\_\_\_  
\_\_\_\_\_ (Full Name in Block Letters)  
\_\_\_\_\_ (Full Name of Organnaization )

\_\_\_\_\_, 2012  
MONTH DAY