HAYABUSA RECOVERY, CURATION AND PRELIMINARY SAMPLE ANALYSIS: LESSONS LEARNED FROM RECENT SAMPLE RETURN MISSIONS. M.E. Zolensky, ARES, NASA Johnson Space Center, Houston, TX 77058, USA (michael.e.zolensky@nasa.gov)

Introduction**:** I describe lessons learned from my participation on the Hayabusa Mission, which returned regolith grains from asteroid Itokawa in 2010 [1], comparing this with the recently returned Stardust Spacecraft, which sampled the Jupiter Family comet Wild 2.

Spacecraft Recovery Operations**:** The mission Science and Curation teams must actively participate in planning, testing and implementing spacecraft recovery operations. The crash of the Genesis spacecraft underscored the importance of thinking through multiple contingency scenarios and practicing field recovery for these potential circumstances. Having the contingency supplies on-hand was critical, and at least one full year of planning for Stardust and Hayabusa recovery operations was necessary. Care must be taken to coordinate recovery operations with local organizations and inform relevant government bodies well in advance. Recovery plans for both Stardust and Hayabusa had to be adjusted for unexpectedly wet landing site conditions. Documentation of every step of spacecraft recovery and deintegration was necessary, and collection and analysis of launch and landing site soils was critical. We found the operation of the Woomera Text Range (South Australia) to be excellent in the case of Hayabusa, and in many respects this site is superior to the Utah Test and Training Range (used for Stardust) in the USA. Recovery operations for all recovered spacecraft suffered from the lack of a hermetic seal for the samples. Mission engineers should be pushed to provide hermetic seals for returned samples.

Sample Curation Issues: More than two full years were required to prepare curation facilities for Stardust and Hayabusa. Despite this seemingly adequate lead time, major changes to curation procedures were required once the actual state of the returned samples became apparent. Sample databases must be fully implemented before sample return – for Stardust we did not adequately think through *all* of the possible sub sampling and analytical activities before settling on a database design - Hayabusa has done a better job of this. Also, analysis teams must not be permitted to devise their own sample naming schemes. The sample handling and storage facilities for Hayabusa are the finest that exist, and we are now modifying Stardust curation to take advantage of the Hayabusa facilities. Remote storage of a sample subset is desirable.

Preliminary Examination (PE) of Samples: There must be some determination of the state and quantity of the returned samples, to provide a necessary guide to persons requesting samples and oversight committees tasked with sample curation oversight. Hayabusa's sample PE, which is called HASPET, was designed so that late additions to the analysis protocols were possible, as new analytical techniques became available. A small but representative number of recovered grains are being subjected to in-depth characterization. The bulk of the recovered samples are being left untouched, to limit contamination. The HASPET plan takes maximum advantage of the unique strengths of sample return missions.

References: *42nd Lunar and Planetary Science Conference* (2011) abstracts.