

SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Part 1 (3A)

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CONCEPTUAL STUDY AND KEY TECHNOLOGY DEVELOPMENT FOR MARS AEROFLYBY
SAMPLE COLLECTION**Abstract**

Conceptual study of Mars aeroflyby sample collection (MASC) is made as a part of Mars Exploration with Landers and Orbiters (MELOS) mission, which is currently under investigation in Japan Aerospace Exploration Agency. In a mission scenario, an atmospheric entry vehicle of aero-maneuver ability is flown into the Martian atmosphere, collects the Martian dust particles and atmospheric gases during the hypersonic atmospheric flight, exits the Martian atmosphere, and is inserted into a parking orbit from which a return system departs for the earth. In order to accomplish controlled flight and successful orbit insertion, aeroassist orbit transfer technologies are introduced into the vehicle guidance and control system. The system analysis has been made to examine system feasibility and to make a conceptual design, finding that the MASC system is feasible at the minimum system mass of 500 kg approximately. The aerogel, which is one of the candidates for dust sample collector, has been tested by arcjet heating to examine its behavior when exposed to high-temperature gases, as well as by particle shooting to examine its dust capturing capacity.