SAMPLE CONTAINMENT TECHNOLOGY FOR MARS SAMPLE RETURN. Bob Gershman, JPL, 4800 Oak Grove Drive, M.S. 321-520, Pasadena, CA 91109. robert.gershman@jpl.nasa.gov.

The U.S. National Research Council and its European counterpart have considered the possible risks to the Earth's biosphere represented by potential Mars sample return (MSR). They recommended that "Samples returned from Mars by spacecraft should be *contained* and treated as though potentially hazardous until proven otherwise." NASA procedural requirements (NPR 8020.12) specify that the mission and the spacecraft design shall provide a method to "break the chain of contact" with Mars. All Mars material delivered to Earth must be inside a robustly sealed container, and no uncontained hardware that contacted Mars may be returned to Earth unless sterilized. The NASA Planetary Protection Officer has provided a draft "containment assurance" requirement for the first conceptual MSR mission: $<10^{-6}$ probability of inadvertent release of a single unsterilized Mars particle to the Earth's biosphere.

This talk will describe technology NASA is developing to meet the likely containment assurance requirement for the potential robotic MSR campaign. This includes methods for sealing the sample container with extremely low probability of external contamination, either on the Mars surface or in Mars orbit, and methods for sterilizing any residual contamination. Sealing modalities being investigated include brazing, explosive welding, bagging, and conventional o-rings. Sterilization modalities include heat, pyrotechnic paint, plasma, and hydrogen peroxide; but it should be noted that NASA has not yet considered which of these – if any – could be certified for sterilizing Mars material. Also, technology is needed to assure (with an unprecedented degree of confidence) that the Earth entry vehicle would withstand the thermal and structural rigors of Earth atmosphere entry and that the sample container and its seals would survive Earth entry, descent, and landing. Concepts for a new Earth entry vehicle that could satisfy the stringent MSR reliability requirements have been under study for several years, including some preliminary technology development activities.