GENESIS SOLAR WIND SCIENCE CANISTER COMPONENTS CURATED AS POTENTIAL SOLAR WIND COLLECTORS AND REFERENCE CONTAMINATION SOURCES. J. H. Allton[1], C. P. Gonzalez[2] and K. K. Allums[2], [1] NASA/Johnson Space Center, Mail Code XI2, 2101 NASA Parkway, Houston, TX 77058, Judith.h.allton@nasa.gov, [2] Jacobs Technology, Inc., Houston, TX.

Introduction: The Genesis mission collected solar wind for 27 months at Earth-Sun L1 on both passive and active collectors carried inside of a Science Canister, which was cleaned and assembled in an ISO Class 4 cleanroom prior to launch. The primary passive collectors, 271 individual hexagons and 30 half-hexagons of semiconductor materials, are described in [1]. Since the hard landing reduced the 301 passive collectors to many thousand smaller fragments, characterization and posting in the online catalog remains a work in progress, with about 19% of the total area characterized to date [2, 3, 4]. Other passive collectors, surfaces of opportunity, have been added to the online catalog [4, 5, 6, 7]. For species needing to be concentrated for precise measurement (e.g. oxygen and nitrogen isotopes) an energy-independent parabolic ion mirror focused ions onto a 6.2 cm diameter target [8]. The target materials, as recovered after landing, are described in [9, 10, 11, 12, 13, 14]. The online catalog of these solar wind collectors, a work in progress, can be found at:
http://curator.jsc.nasa.gov/gencatalog/index.cfm

This paper describes the next step, the cataloging of pieces of the Science Canister, which were surfaces exposed to the solar wind or component materials adjacent to solar wind collectors which may have contributed contamination.

The Science Canister prior to launch. The Science Canister, a "tuna can" shape about 75 cm in diameter and 40 cm tall, was cleaned, assembled and closed under nitrogen purge in an ISO Class 4 cleanroom at Johnson Space Center (Fig. 1). It was not opened until on station at Earth-Sun L1 for solar wind collection. Rigorous precautions were taken to assure cleanliness of the canister interior and solar wind collectors [15]. Functionality of the canister is described in [16] (Figs. 2 & 3). The primary passive collectors, the hexagons, were affixed to 5 arrays, each devoted to particular solar wind regimes: two arrays for bulk solar wind, 1 each for coronal mass ejection, high speed and interstream slow speed solar wind. Arrays for coronal mass ejection, high speed and low speed solar wind were shaded until appropriate solar wind regime was determined by on board instruments, then that specific array was deployed (unshaded). The three surfaces of opportunity (gold foil, polished aluminum alloy, metallic glass) and adjacent canister hardware were exposed to solar wind for the duration of collection. The Science Canister structure was aluminum 7075. The interior aluminum surface was bare aluminum – no anodizing or other surface finishing. The array frames were cut by electric discharge machining (EDM) from aluminum 6061 plate. The array frames were phosbrite dipped to remove the EDM dross contamination. Most smaller parts were made from aluminum 6061 with no surface finishing. Final cleaning was done with heated, megasonically energized ultrapure water (>18 MΩ). The structure for the concentrator, assembled at Los Alamos National Laboratory, was gold-coated aluminum with stainless steel grids. Use of lubricants and staking compounds in the canister were severely restricted, the array deployment mechanism was external to the canister interior, and the pressure equalization for re-entry was through a molecular sieve sorbant.

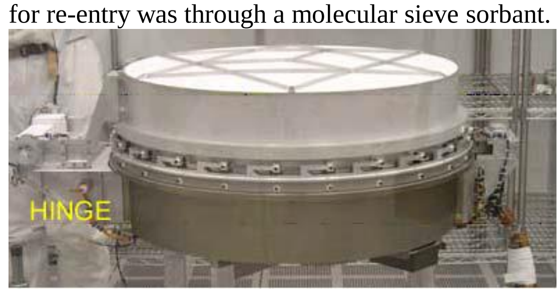

Fig. 1. Closed Science Canister, pre-launch.

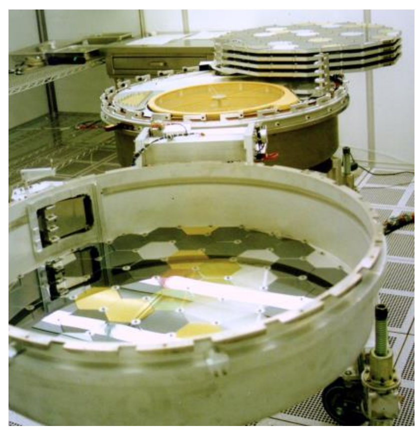
Fig. 2. Canister opened in solar wind collection configuration (except a regime array would also be unshaded from stack).

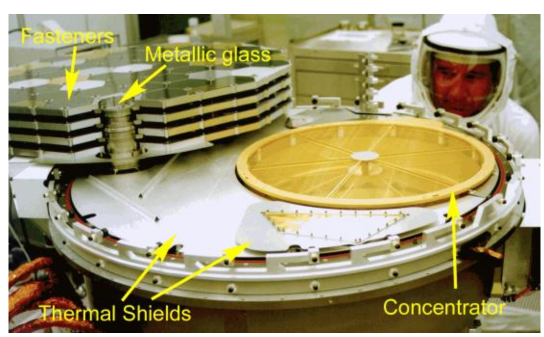

Fig. 3. Sunward facing surfaces.

Science Canister material recovered after the hard landing. About 100 pieces were preliminarily identified as being from the Science Canister at the Utah crash site. These are being examined and an updated inventory verified for the purpose of documenting these items more completely. The goal is to add solar wind exposed surfaces and potential contamination reference pieces to the online catalog of available specimens that can be subsampled for analysis. Preliminary inspection of larger Science Canister structural pieces is described in [17]. Surfaces exposed to the solar wind include the canister seal surface, aluminum thermal shields, hexagon fasteners, sun-facing surfaces of the concentrator structure and grids, canister side wall surfaces (Figs.4-8).

Fig. 4.Canister thermal shield prior to installation. Diameter is 75 cm.

Fig. 5. Canister thermal shield as returned after hard landing. Brown areas are where solar radiation darkened a molecular film.

Fig. 6. Close-up of canister thermal shield illustrating shading from direct solar radiation (see fig. 3).

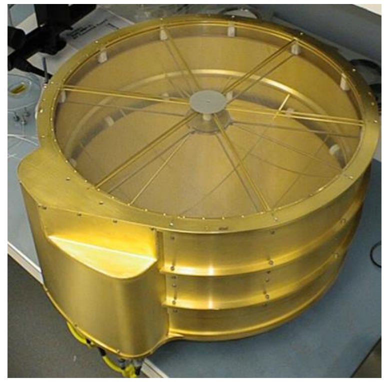

Fig. 7. Concentrator prior to installation. Diameter is about 45 cm.

Fig. 8. Concentrator as recovered in Utah. Interior portions of the structure experienced operational effects of focusing voltage. [18]

Potential contamination reference materials from the canister include white thermal paint from the cover, Braycote lubricant, staking compound, molecular sieve components, electrical and cabling materials, and array deployment mechanism materials. [Much of the contamination previously reported on the primary passive collectors was debris from the Sample Return Capsule (a more materially complex and less clean spacecraft component) and the Utah lakebed sediments.] Cataloging of Science Canister materials has just been initiated and significant progress is expected in 2016.

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