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History of the “Mars sample return”: orbiting quarantine facilities and shuttles.

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Mars sample return missions have been seriously considered since Viking’s days and at their beginning were simultaneous to the development of the NASA space shuttle, the ESA SPACELAB and early designs of the FREEDOM space stations. Parallel studies were made at the same time in the Soviet Union and it is known that one the rationale of the BURAN shuttle was to ensure the reentry of heavy loads of planetary samples.

An especially beneficial aspect of a “shuttle” like return vehicle is the containment and preservation of the samples, it represents also the advantage of not having to bring to Mars the thermal shields necessary for reentry in the earth atmosphere. The orbiting processing facilities were the object of the NASA ANTAEUS report in 1981; this processing facility was based on SPACELAB like equipment and was manned by a crew of five. At the time, an automated telescience concept had not been tested; it arose naturally later during the actual SPACELAB flights.

The concept was abandoned in 1999 when it was found after several Mars missions failure that the planetary protection advantage of these solutions was not sufficient to justify the investment planned. Further, the safety presented by the shuttle was more and more questioned especially after the COLUMBIA loss at reentry.

While planetary protection needs can be achieved for light sample loads using direct earth reentry, in the case of large quantities, orbital facilities and return vehicles might

again become attractive. An inventory of possibilities will be given in the post-shuttle era.