University of Leicester; The Sample Linear Inlet Investigation Device, SLIID

Executive Summary

The Sample Linear Inlet Investigation Device, SLIID, is a novel approach to sample containment in a hostile environment. Specifically with Mars Sample Return (MSR) in mind, the programme developed with CEOI-ST funding has enable refinement of a sealing technology; however, there are a number of terrestrial extreme environment applications where this technique could be used (eg. sub-glacial lake sampling). Knowledge exchange is key to space technology and collaboration with a genetics expert, Dr Turi King, to explore sampling compatibility with the proposed material is essential for ongoing development. The aim of the project has been to demonstrate a new sample sealing chamber approach that has not been used in a space application before and translate this to a TRL3 status.

Remote sample sealing is difficult to achieve where there is high value assigned to the sample and stringent aseptic, cross contamination and planetary protection requirements are imposed. SLIID is able to address these issues and is based on a relatively simple but reliable mechanism, which lends itself to applications where there is a strong incentive to use a mass and volume efficient solution. The engineering objectives that have driven this development are to reduce leak rates and mitigate both mechanical and contamination risk by utilising a simple mechanism (ie. no motors). The technology used in SLIID is based on a high output paraffin (HOP) actuator with redundant electrical interface; a linear force device (300 to 500N) used in high reliability (particularly space) mechanisms. The translation of the HOP is used in SLIID to open a sterile, semi-dynamic dry sealed sample chamber, such that a liquid or solid sample can be deposited, and then passively closed, securing sample integrity.

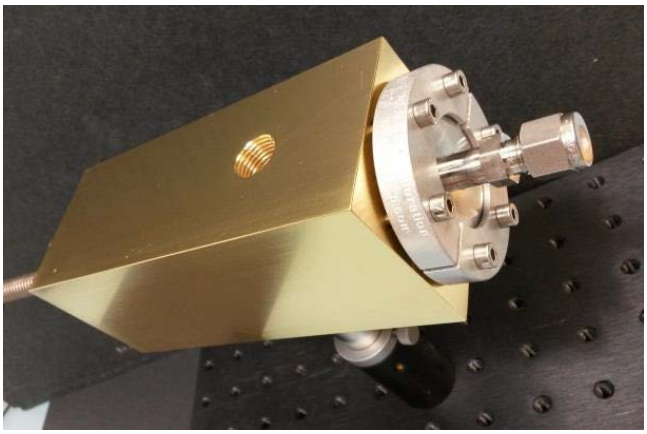

Fig 1 SLIID Prototype 1

Fig 1 shows a manufactured prototype of the SLIID sealing device used for testing.

NB: it is important to note that the size and mass of the prototype here is not representative of a small, low mass flight type device.