Statement of Work
Extra-Vehicular Manned Unit (EMU) Quick Disconnect Coupling

As part of the national Vision for Space Exploration, NASA plans to return to the Moon in the 2018 - 2020 time range. This phase of lunar exploration will be characterized by longer surface stays and greater range of exploration, including extensive extravehicular activity. Development of a next generation extravehicular mobility unit is also included in these plans, and is expected to be introduced into the program during the low Earth orbit phase using the Crew Excursion Vehicle around 2014. There exist several technology challenges associated with the development of the next generation EMU, including making the systems tolerant of the abrasive lunar dust.

The contractor shall develop advanced quick disconnect (QD) fluid couplings that are suitable for use on the next generation EMU suit Portable Life Support System. Such QD's supply water for liquid cooled garments and external heat rejection, high pressure gaseous oxygen for astronaut breathing, and possibly liquid oxygen. A major focus is the incorporation of features that make these QD's "dust proof" or "dust tolerant". Damage from dust includes, seal wear and failure, dust intrusion into the flow stream, and mechanism failure. Potential ideas include, but are not limited to, advanced surface coatings that are impervious to dust and eliminate dust adhesion, geometry changes to minimize trapped volumes, cracks, and crevices, seal locations that make replacement simpler, integrated wipers and brushes, dust covers for QD openings that are mechanically integrated into the QD, external dust covers, and other innovative but robust design solutions.

QD Requirements:

- Non-latching QD to be integrated into a gang connector on an EMU Display and Control Module
- 100 mate/demate cycles in lunar polar environment with less than 0.1 sccm leakage mated and demated. For details on lunar environment, including temperature, pressure, radiation, dust reference Lunar Sourcebook (Heiken, G. and Vaniman, D.; Cambridge University Press; 1991)
- Engagement, disengagement, and alignment of the QD shall be performed by means of the fixture or 'carrier plate'. Engagement and disengagement forces shall be as low as practicable.
- ½ inch liquid oxygen quick disconnect coupling
- Zero fluid loss during mate/demate
- Estimated flowrate 3 gpm at 1 psid
- Shall be dust proof or dust tolerant

Materials of construction:

- 304 or 316 Stainless Steel (where there are interfaces with the fluid)
- Softgoods for Oxygen use

Fluid Operating Temperature range:

- -320F to +100F (77K to 310K)

Fluid Pressure range:

- 0 to 250 psig (0 to 1724 kPa)

QD End Connections:

- ½ inch, flared fitting or straight thread

The period of performance is not to exceed (NTE) 12 months.

Deliverables:

- One (1) Quick Disconnect
- Bi-monthly status reports