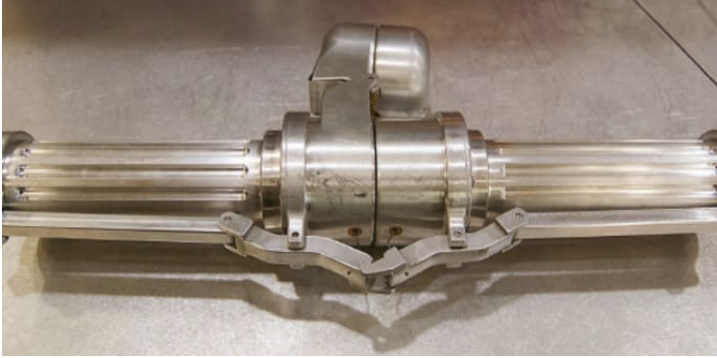


# Help NASA improve Dust Tolerant Connectors for the Moon



**Name of Technology:** Moon Dust Tolerant Connectors

**Participating NASA Centers:** Kennedy Space Center (KSC)

**Technological Taxonomy Area:** TX12 – Materials, Structures, Mechanical Systems and Manufacturing; TX13 – Ground, Test, and Surface Systems

**Vision for the Technology:** NASA seeks to land the first woman and the next man at the South Pole of the Moon by 2024 and establish a sustained human presence by 2028. Surface systems, such as landers, rovers and other equipment, will require servicing. Servicing activities may include deploying electrical cables and pressurized gas and fuel lines to refill cryogenic tanks among other equipment. Lunar dust has been identified as a significant challenge in future exploration. Lunar regolith is composed of very rough, jagged and irregular electrostatically charged particles that range in size of medium sand to fine silt. These particles can contaminate umbilicals and surface equipment. The need to prevent dust intrusion into connectors is required.

**Challenges:** Improve an electrical or fluid connector that prevents intrusion of dust, sand, dirt, and moisture during field use under lunar conditions.

**Overview of Student Project:** NASA seeks

structural and mechanical innovations, not photovoltaics, electrical, or energy storage Innovations.

## **Innovative Areas Student Projects Can Address (It is recommended to focus on one area):**

- Novel design, functionality, retraction, and modular concepts.
- Lightweight, compact components and mechanisms.
- Mechanisms with exceptionally high resistance to lunar dust.
- Load-limiting devices to avoid damage during mating and de-mating.
- Optimized use of advanced lightweight materials (but not materials development).
- Modular and adaptable concepts for multiple uses.
- Completely new concepts

## **Ultimately, NASA Seeks to Dust Tolerant Connectors that Meet the Following Specs**

- Protection – Shields connectors from dust, dirt, and moisture
- Rugged – Withstands harsh environments and rough handling (e.g., being dropped, stepped on, or rolled over by a light vehicle)
  - If the de-mated connectors are dropped or placed on the ground, a method to shield them from damage or contaminants.
- Cryogenics fluid transfer – Housing can be purged to avoid icing when de-mated (e.g., liquified natural gas)
- Scalable – Can be sized up or down for different-size connectors
- Ergonomic – Designed to be easily held in one hand; requires minimal pressure to open and close with EVA gloves
- Modular – Any COTS connector can be installed and swapped in a modular, universal housing
- When mated, the seal between the housings and shielding (when closed) should keep contaminants out.
- When mated, the shielding should be designed so it cannot be unintentionally opened.
- Design Lifetime: >15 years.

## Research Funded by NASA on this Topic:

Category: Mechanical and Fluid Systems  
Reference Number: KSC-TOPS-11  
Patent(s): [9,431,778](#) [9,653,838](#)  
[Harsh Environment Protective Housings](#)

## References:

[“Merits of a Lunar Pole Base Location,” in Lunar Bases and Space Activities of the 21st Century](#)

[Dust Tolerant Connectors](#)

[Lunar Dust-Tolerant Electrical Connector](#)

[Lunar Regolith Simulant](#)