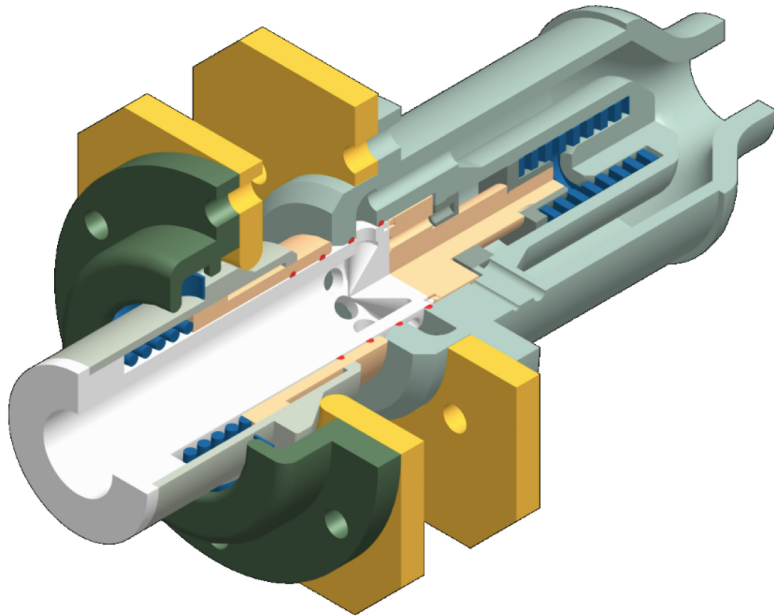




TECHNOLOGY SOLUTION

Mechanical and Fluid Systems



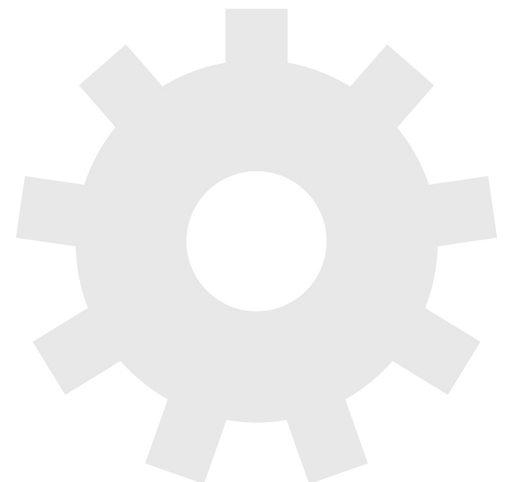
Low Separation Force Quick Disconnect Device

[A Self-Aligning, Self-Healing System for Pneumatics and Cryogenics](#)

Innovators at the NASA Kennedy Space Center (KSC) have developed the Low Separation Force Quick Disconnect device for transporting pneumatic and cryogenic fluids. Umbilical systems employ fluid connectors known as quick disconnects to transfer fluids into a vehicle. Traditional quick disconnect systems have a separation force directly proportional to the line pressure. For systems with a high line pressure, large separation forces are generated when disconnecting the flow line which requires the use of large, heavy support structures. KSC's Low Separation Force Quick Disconnect device eliminates this need for heavy support structures by ensuring low separation force regardless of line pressure, which is advantageous for systems requiring high line pressure. Applications include any mechanism in which fluid is being transferred from ground to a vehicle or another system, especially where a high line pressure is used. Any companies that deal with fluid connectors, particularly in the aerospace sector, may find value in the invention.

BENEFITS

- Offers reduced separation force: Conventional quick disconnect designs apply separation force proportional to pressure, requiring high strength, heavy support structures and locking devices. The Low Separation Force Quick Disconnect device reduces the force required for successful umbilical separations at high line pressures.
- Enables reduced support structure weight: Reduced separation forces allows for support structures like umbilical plates and locking devices to be lower weight and lower strength, reducing system mass.
- Supports decreased contamination: The self-healing and self-cleaning mechanisms prevent contamination from dirt, dust, and other undesirable particles.

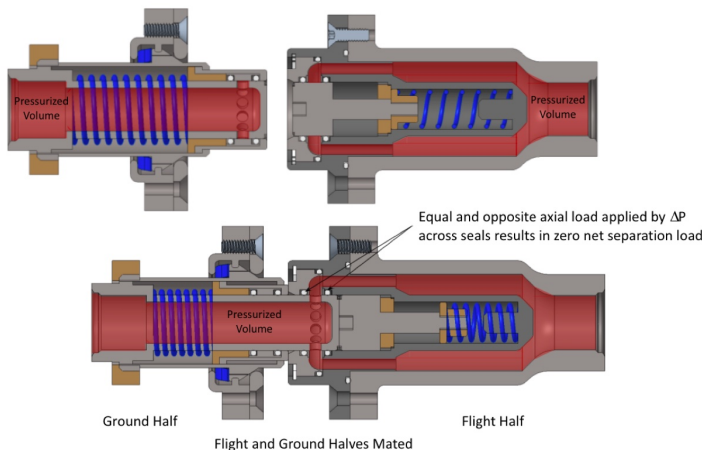


THE TECHNOLOGY

The Low Separation Force Quick Disconnect device uses an innovative seal arrangement and flow path to eliminate separation force from line pressure. A radial design ensures a low separation force regardless of line pressure. Ten holes around the internal seal cancel loads due to balanced pressure; thus, the central force exerted on the device is due to the springs fixed internally. The device also provides for additional optional characteristics including a self-aligning feature from a compliant mount and a self-sealing mechanism that keeps dust out of the device.

The Low Separation Force Quick Disconnect device is designed to transport pneumatics and cryogenic fluid. Due to the low separation force and overall design, the system requires less heavy and high-strength support structures than conventional designs; the design permits lighter retention systems and reduces deflection variations.

Aerospace specific uses of the invention include flight-to-ground, flight-to-flight and surface-system applications. Other uses of the invention include any mechanism in which fluid is being transferred from ground to a vehicle or another system, especially where a high line pressure is used.



This rendering illustrates how the Low Separation Force Quick Disconnect device enables easy line mating. The device re-routes fluid to flow into the connected line perpendicular to the typical flow path, and does so evenly around the circumference of the line for pressure balance. Thus, the disconnect pressure is no longer a function of line pressure (i.e., the only disconnect force is now supplied by the springs depicted in blue).

APPLICATIONS

The technology has several potential applications:

- Aerospace and Aviation
- Marine
- Oil and Gas
- Satellites
- Unmanned Vehicles

PUBLICATIONS

"Multi-User Spaceport Umbilical Low Force Disconnect," Tamasy, Gabor J. and Mueller, Robert P., January 12, 2021, <https://ntrs.nasa.gov/citations/20210010653>

technology.nasa.gov

More Information

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