Sit on Umbilicals for Remote Fluid Servicing of Launch

Umbilicals are extensively used in the fields of aviation, space technology as well as automotives. Indian Space Research Organisation (ISRO) at its Liquid Propulsion Systems Centre has developed a compact and reliable sit on Umbilical which can be used for remote fluid servicing of Launch Vehicles.

Principle of operation

This innovation though is developed for a specified requirement (servicing the lower stage of launch vehicle) can be extended to various other applications. This system has a flight segment (part of vehicle) which sits over the ground segment (assembled to launch pedestal). The flight segment gets lifted off along with vehicle upward movement.

The system has got a pack of Belleville disc springs to take up longitudinal deflections and a twin spherical ball mechanism to transfer disc spring load to ground segment and also accommodate vehicle sway. Moreover, the system employs push open type check valves for fluid transfer in mated condition.

Specification

- Accommodate vehicle sway of +10mm
- Accommodate vehicle longitudinal deflection of 10mm in downward direction
- The ground segment & flight segment has to separate within 20mm of vehicle lift off.
    - Automatic sealing devices should automatically close after vehicle lift off ensuring leak tightness both in mated and separated condition.
- External leak of SOU in mated condition ≤ 1x10-3 sccm/sec of GN2 at Room

Temperature

- Envelope of SOU should be minimum.
- Flight segment to have minimum aerodynamic load during flight.

Advantages and salient features

- Minimum assembly and test time required at launch pad.
- Provides completed testability & serviceability at launch pad.
- Simple concept of self sealing connectors
- Easy fabrication and testing
- Compact design
- Design allows easy de-mating when flight segment gets lifted off along with vehicle upward movement. No complex locking and separating mechanism.

Applications

- Servicing of military and commercial aircrafts
- Remote fluid servicing of missiles
- Oil rigging operations
- Automobile industry
- Chemicals and fertilizer industry handling toxic chemicals
- Locomotives
- Commercial gas (LPG) filling center