Multi-Payload Adapters (MPAs) provide space access for satellites by using excess spacelift capacity, allowing ridesharing of multiple payloads on a single launch. Moog CSA designed, built, and qualified the EELV Secondary Payload Adapter (ESPA), and this development has evolved into a Moog product line of MPAs for small satellites of various sizes.

MPAs have demonstrated the rideshare concept on two recent DoD Space Test Program missions: the ESPA flew on the Atlas V STP-1 Mission in March 2007, and a flat plate adapter carrying four co-manifested ESPA-class spacecraft flew on the Minotaur IV STP-S26 Mission in November 2010.

CASPAR, the Composite Adapter for Shared Payload Rides, is an MPA for Minotaur IV and Athena II; it can accommodate two 1500-lb spacecraft, or, when fitted with two flat plate adapters, four ESPA-class (400-lb) satellites. Moog CSA has also developed a dual-spacecraft adapter for Delta II that has applicability to other launch vehicles.

Currently, Moog CSA is teamed with LoadPath LLC on the CubeStack “Wafer” adapter, which uses the NanoSat Launch Adapter System (NLAS) adapter as a baseline. The NLAS was developed by NASA/Ames Research Center (ARC) to accommodate multiple CubeSats along with a primary spacecraft. Moog CSA supported ARC in this MPA development and performed fabrication and testing of the NLAS adapter.
**ESPA**
The standard ring with 15-inch ports allows up to six 400-pound satellites to be launched together with a large satellite on Atlas V, Delta IV, Falcon 9 or Taurus 2. The ESPA Grande 5-Port has a height of 32 inches, with 24-inch ports that accommodate secondary payload masses up to 660 lbs. The Small Launch ESPA is a reduced-diameter ring for small launch vehicles with a 38.8 inch diameter primary interface and a choice of 8 or 15 inch diameter ports. Each ESPA ring can also serve as a satellite bus structure.

**ESPA 6U Mount (ESPA SUM)**
When ESPA Ring interior volume is available, ESPA SUM provides an additional capacity for CubeSats or other nanosats behind a 15-inch port, including a pair of 3U packages or a single 6U satellite.

**CubeStack**
Accommodates eight 3U dispensers, four 6U dispensers, or other combinations of 3U and 6U dispensers. Compatible with Minotaur, Athena, Taurus, Pegasus and Falcon. The wafer configuration is 10-inch height at primary spacecraft with a 38.81 inch launch vehicle interface and 38.81 inch and 24 inch diameter primary spacecraft interfaces.

**Flat-Plate Adapter**
Flat-Plate Adapter, or FPA, is compatible with ESPA or CASPAR, and it mounts two ESPA-class satellites side by side. FPA is available with SoftRide vibration isolation and it can be scaled up or down for larger or smaller spacecraft.

**CASPAR**
CASPAR, the Composite Adapter for Shared Payload Rides, is a Multi-Payload Adapter (MPA) developed by Moog CSA with whole-spacecraft vibration isolation for the Minotaur IV Launch Vehicle. CASPAR accommodates two 1500-lb satellites, or up to four ESPA-class satellites when used with one or two Flat-Plate Adapters.

**Sequencer**
Our sequencer is compatible with all our multi-payload adapters. It receives commands and drives up to eight small satellite or cubesat payload release and separation mechanisms per device specifications on load, current, timing and duration.

Moog CSA can tailor an MPA for existing and new launch vehicles per the mission and integrate other components with an adapter. Each of our MPAs offers the flight-proven SoftRide interface for individual payloads or for all payloads carried by the adapter. SoftRide reduces vibration and shock transmitted to the payload during launch and separation events.