

## ESPA

### THE EELV SECONDARY PAYLOAD ADAPTER

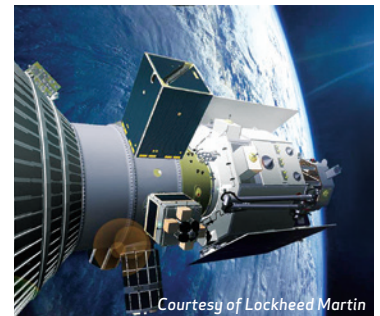


ESPA mounts to the standard EELV interface bolt pattern such as Atlas V, Falcon 9, Delta IV, Antares, and future EELV-class launch vehicles and is a drop-in component in the launch stack. Small payloads mount to ESPA ports featuring either a Ø15-inch bolt circle with 24 fasteners or a 4-point mount with pads at each corner of a 15-inch square; both of these interfaces have become small satellite standards. ESPA is qualified to carry 485 lbs (220 kg), and a

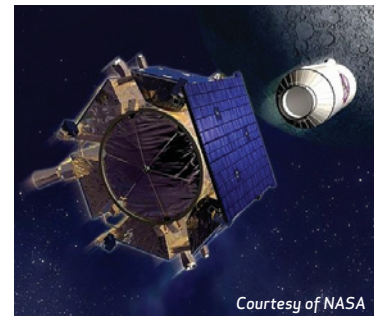
Heavy interface (with Ø5/16" fastener hardware) has been introduced with a capacity of 710 lbs (322 kg). All small satellite mass capabilities require the center of gravity (CG) to be within 20 inches (51 cm) of the ESPA port surface. Alternative configurations can be accommodated.

### ESPA GRANDE Ø24-INCH PORT

ESPA Grande is similar to ESPA but with Ø24-inch ports and taller. The Ø24-inch port has been qualified by test to carry small satellites up to 1026 lb (465 kg) using heritage load factors. The ESPA Mass Acceleration Curve (MAC), using design load factors based on satellite mass and CG, increases the Ø24-inch port capability to 1543 lb (700 kg).



Courtesy of Lockheed Martin



Courtesy of NASA



Courtesy of ORBCOMM & Sierra Nevada Corp.

# ESPA

## ESPA IS ADAPTABLE TO UNIQUE MISSION REQUIREMENTS

- The Air Force's STP-1 mission delivered multiple small satellites on an Atlas V.
  - NASA's Lunar Crater Observation and Sensing Satellite (LCROSS) where ESPA was the spacecraft hub for the LCROSS shepherding satellite.
  - ORBCOMM Generation 2 (OG2) launched a stack of two and three ESPA Grandes on two different Falcon 9 missions and in total deployed 17 satellites.
  - AFRL's ESPA Augmented Geostationary Laboratory Experiment (EAGLE) with ESPA as the primary structure of a free flyer satellite and the basis for future Long Duration Propulsive ESPA (LDPE) programs.
  - AFRL's DSX mission will demonstrate ESPA's capability as the structural hub of a satellite that will launch on the Falcon Heavy.
  - ESPA uses thru holes on the ports but they can be tapped holes if required. ESPA minimum height is determined by the port size, e.g., 24-inch ports correspond to a 32-inch height minimum, but 42-inch is typical for ESPA Grande.
- ESPA and ESPA Grande can also serve as a satellite structural hub, free flyer, or launch vehicle insertion stage.

### SPECIFICATIONS

Name	ESPA P/N	# of Ports P/N	Ø of Ports	Height	Port Payload Capacity	ESPA Mass	Port Interface Bolt Size
Standard ESPA	6-15-24	6	15"	24"	220 kg	136 kg	1/4" Bolts
ESPA Heavy	6-15-24				322 kg		5/16" Bolts
ESPA Grande	4-24-42	4	24"	42"	465* kg	211 kg	1/4" Bolts**
Stretched ESPA	4-24-60		24"	60"	465* kg		1/4" Bolts**

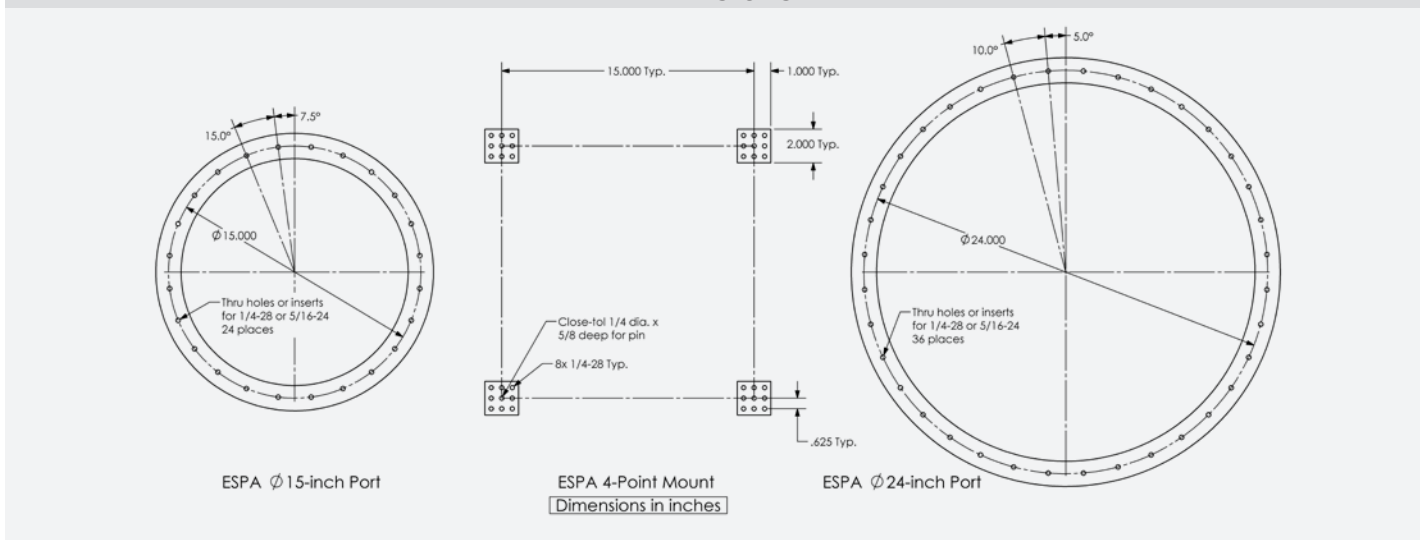
\* Increases to 700 kg if using the ESPA Mass Acceleration Curve load factors  
 \*\* ESPA Grande is qualified with 1/4" or 5/16" bolts, larger bolts are recommended (but not required) for payloads above 465 kg

### OTHER VARIANTS

ESPA is versatile and can be easily modified, in many cases with no impact to the qualification status. Port size and quantity can be "mixed and matched" to accommodate a variety of payloads. A common modification is five 24-inch ports on an ESPA Grande. Other port sizes such as 11.7-inch and 8-inch are possible. Examples include:

- Small Launch ESPA – Ø38.8 inch ring provides 8- or 15-inch ports for Minotaur IV and Minotaur-C vehicles. The SL-ESPA has a mass of 59 kg.
- ESPAStar™ – Custom ESPA for NGIS's ESPAStar™ product line. This ring has no circular ports but instead the ESPA 4-Point Mount (4PM) in six locations, and it has an ESPA mass of 113 kg (compared to 136 kg for the Standard).

### DIMENSIONS



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