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Paper Title:	<b>Extending Rideshare: Mission Case Studies Using Propulsive ESPA</b>

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Abstract:

Rideshare launches have become more available and frequent, but secondary payloads typically must accept a limited set of initial orbits based on constraints imposed by primary payloads. Subsequent operational orbits are then achieved through spacecraft maneuvers including those requiring substantial propulsion systems. A potential alternate architecture aggregates propulsion and delta v in a propulsive rideshare adapter, for example an adapter based on an ESPA ring. The LCROSS mission demonstrated the use of a propulsive ESPA to expand and enhance an existing lunar mission by utilizing the launch vehicles mass margin. Other propulsive ESPA architectures can provide Earth orbit flexibility and optimization. This paper summarizes multiple case studies that demonstrate the utility, value and flexibility of an Orbital Maneuvering Vehicle (OMV) as a mission enabling technology that augments standard launch services. Cases examined include:

- Accelerated deployment of a distributed smallsat constellation, which results in the optimal satellite placement in less than half the time of a traditional (passive) deployment;
- The deployment of multiple electro-optical/imaging CubeSats into a low altitude LEO constellation from a secondary launch opportunity;
- A scenario to ferry multiple small payloads to Low Lunar Orbit (LLO) from earth orbit;
- A scenario to ferry a small spacecraft to Earth-Sun L1 and then remain as a hosted payload platform;
- A scenario to utilize NASA Commercial Resupply Missions (CRS) for CubeSat and smallsat deployment

In each of the scenarios, the particular use of an OMV gives rise to a number of shared launch opportunities that would not have previously been considered and improves the overall access to space for rideshare passengers. Further extrapolating these results shows how a single launch vehicle could be used to deliver three disparate payloads to varying orbits without sacrificing any missions' objectives.

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