Hybrid rockets are comprised of a solid fuel and liquid oxidizer. Classical hybrids suffered from low regression (burning) rates, which led to the necessity for complex motor geometries and associated disadvantages that hindered their development. They have generally been overlooked for in-space applications in favor of propulsion systems with flight heritage. The discovery of a class of fuels with a high regression rate has negated the disadvantages associated with classical hybrids and is encouraging a revival in hybrid rocket research and development. These fuels form a liquid layer at the surface during combustion. When vaporized oxidizer is passed over the melt layer, the shear force between them causes roll waves in the liquid and forces droplets to entrain in the oxidizer flow. This greatly increases the mass transfer and allows for simple, single port motor geometries. The performance of paraffin-based hybrids is greater than solids and is more closely comparable with that of liquids. Paraffin based hybrid rockets are promising candidates for in-space motors because of their throttling capability, ability to stop and restart and their tolerance to low temperatures. Two applications for which they are especially well suited will be presented, including a Mars Ascent Vehicle as part of a Mars Sample Return Campaign and an orbit insertion system for Mars or Europa. Additionally, an experiment to visualize the mechanism responsible for the high regression rate (and accompanying benefits) of paraffin-based fuels will be presented.