

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of)	
)	
Streamlining Licensing Procedures for Small)	IB Docket No. 18-86
Satellites)	

**COMMENTS OF
PHASE FOUR, INC.**

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I. INTRODUCTION

Phase Four, Inc. (“Phase Four”) is pleased to respond to the Notice of Proposed Rulemaking (“*Smallsat NPRM*”) in the above-captioned docket.¹ Phase Four is building the next generation of plasma propulsion technologies to meet the growing demand for small satellite maneuverability. The Phase Four team is located in El Segundo, California and has grown rapidly since its inception in 2015. Phase Four completed a DARPA contract in January 2017 to create a flight-like propulsion system and to gather performance data. In 2018, Phase Four delivered its first propulsion system flight hardware for a manifested rideshare launch in late 2018. The company is backed by venture capital and has active customers in the commercial and government sectors.

Having applied for its own Part 5 experimental license for a technology demonstration mission, Phase Four has experience with the FCC licensing process and particularly the items related to propulsion. Below Phase Four provides comments to propulsion-related items in the

¹ See generally *Streamlining Licensing Procedures for Small Satellites*, IB Docket No. 18-86, Notice of Proposed Rulemaking, FCC 18-44 (rel. Apr. 17, 2018).

Commission's proposed streamlined process under Part 25 for small satellites (the "Streamlined Process").

II. COMMENTS

Small Satellite Propulsion Availability

In Section III.A.1.e., Phase Four agrees with the assessment that "new (propulsion) technologies are being developed that could provide a means for actively maneuvering," but we contend that some of these propulsion technologies are available now. Some technologies referred to in the NASA publication are in fact readily available and, in some cases, have flight heritage.² An archetype example is the NASA Mars mission (MarCO) wherein two CubeSats equipped with commercially available on-board propulsion systems are presently en route to Mars.³ In many cases, the propulsion systems that the Commission claims are being developed are readily available or imminently available across a variety of propulsion methods including cold gas, chemical, and electric propulsion. Beyond the NASA MarCO propulsion system, other small satellite propulsion options are presently being purchased and will soon be flown by commercial⁴ and government⁵ entities.

² NASA Small Spacecraft Technology Report, 37-56

³ JPL Marco Micro Propulsion System [<http://www.cubesat-propulsion.com/jpl-marco-micro-propulsion-system/>]

⁴ Phase Four Tapped by Astro Digital as Certified Propulsion Provider for Landmapper Constellation. [<https://www.prnewswire.com/news-releases/phase-four-tapped-by-astro-digital-as-certified-propulsion-provider-for-landmapper-constellation-and-the-corvus-satellite-product-line-will-act-as-reseller-for-phase-four-thrusters-300654096.html>]

⁵ Phase Four Signs Contract with NASA to Vet its Propulsion System for Upcoming Small Satellite Missions. [<https://www.prnewswire.com/news-releases/phase-four-signs-contract-with-nasa-to-vet-its-propulsion-system-for-upcoming-small-satellite-missions-300654094.html>]

Propulsion Requirement for Launches Above ISS Orbit

Phase Four encourages the Commission to rename this requirement from a “propulsion requirement” to a “mobility requirement.” Several subsystems need to work in concert to execute collision avoidance and de-orbit maneuvers, including propulsion, attitude control, power, and communication. Furthermore, propulsion systems are not the only types of systems that can change a satellite’s orbit.

While Phase Four agrees with the Commission that a mobility requirement might someday be required to limit space debris, a premature requirement would prevent most smallsat operators from using the Streamlined Process due to the lack of a mobility certification process. Phase Four urges the Commission to first work with the smallsat mobility manufacturers to identify certification guidelines, such as lifetime testing, startup and shutdown testing, and qualification test requirements. Once the smallsat mobility technologies mature to meet these certification guidelines, the Commission can levy a mobility requirement in a way that enables smallsat operators to take advantage of the Streamlined Process.