U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of the Chief Counsel

**800 Independence Ave., S.W.
Washington, D.C. 20591**

SEP 26 2013

Pamela L. Meredith, Esq.
Zuckert Scoutt & Rasenberger, LLP
Attorneys at Law
888 17th Street, NW
Washington, DC 20006-3309

Dear Ms. Meredith:

This responds to your correspondence of February 22, 2013 (Paragon Request), on behalf of Paragon Space Development Corporation (Paragon), and to the supplemental information you provided on May 9, 2013 (Paragon Supplemental). You requested an interpretation of the FAA's aviation and space statutes to determine which law applies to Paragon's proposed World View commercial space tourism vehicle. Paragon seeks a finding that World View's operations fall under the jurisdiction of 51 U.S.C. ch. 509 (Chapter 509).

Paragon seeks Chapter 509 jurisdiction on the grounds that its vehicle will reach outer space or, alternatively, that its vehicle is built to operate in outer space. As discussed below, the FAA is able to find that the vehicle satisfies the second test—that the manned capsule is built to operate in outer space—because of the duration of its mission and the "shirt-sleeves" environment Paragon offers. Based on this finding, the FAA determines that Paragon's operations fall under Chapter 509. The FAA will not address the more difficult question of whether Paragon's proposed altitude of 30 kilometers constitutes outer space.

Background

The FAA bases its interpretation on Paragon's following description of its plans and system. Paragon plans the flight of a capsule that can carry eight people to over 30 kilometers (98,425 feet) by means of a helium balloon. Flight would start at Spaceport America in New Mexico. Paragon states persons on board will:

> . . . experience the space environment, including a period of weightlessness and the iconic space view: A curved Earth with its thin blue atmosphere against the blackness of space. They will do so from . . . the pressurized, space qualified World View Spaceflight Capsule, designed to operate in, and protect the human body from, the near-vacuum, radiation, micrometeoroid, and extreme thermal environment of outer space.

Paragon Request at 1. The capsule functions as a gondola beneath the balloon. At World View's peak operating altitude, water and blood boil. Decompression would be fatal

quickly. The ascent will take 1.5 to 2 hours. The capsule will spend between two and six hours at the intended altitude of 30 kilometers. Paragon will fully pressurize the interior of the capsule at a near constant pressure and provide a breathable atmosphere. A thermal control system will maintain the temperature of the avionics and other subsystems and supply coolant fluid to the environmental control and life support system (ECLSS). The avionics suite consists of redundant space qualified, radiation-hardened avionics to control ascent, descent, and landing.

The propulsion system is a helium balloon connected to the capsule in a flight train of suspension cables. The envelope is 396,436 m^3 and is made of high-performance polyethylene film with multiple layers of caps added to the top dome to maintain structural integrity during flight. During ascent, the envelope expands, and helium density decreases until the envelope is fully inflated. When all excess helium has been vented, the system will have reached its target altitude. The envelope has a structural safety factor of 1.4. This is the safety factor NASA has used for human rated rockets.

The capsule will return and land in the space of 20 to 40 minutes, and the return will include a period of free-fall followed by aerodynamic deceleration as a deployed parafoil becomes progressively more effective. The trajectories will not extend more than 482 km east or west from the launch site and will not overfly foreign territory. The capsule is designed to land intact. It has a paraglider design with landing skids and a steerable parafoil to provide cross range capability and directional control. The steerable parafoil also serves as an emergency abort system during ascent in the event the envelope fails.

Paragon itself has, over the last two decades, designed, built, and tested environmental control, life support, and thermal control systems for manned space missions, including, among others, the International Space Station.

To distinguish its system from aircraft capable of high-altitude zoom climbs, Paragon supplemented its original request with additional information regarding the design and testing of its system, specifically the capsule. In order to sustain missions which last for several hours at the altitude Paragon proposes, Paragon will design, test, and build the capsule to operate in the environment of low-Earth orbit (LEO). The structural design derives from the modules used on the International Space Station. The capsule will feature a "shirt-sleeves" environment without need for pressure suits. As for testing, Paragon states:

> The space capsule will undergo space qualification testing at the component, subsystem and system levels. Each component will be over-stressed to determine its maximum tolerance. In addition, for acceptance testing, each component, subsystem and system will [be] exposed to the limits (temperature, pressure, vibration, and radiation) of the launch and LEO environments, plus a margin of safety to accommodate unknown factors. The space capsule will undergo pressure, thermal and vacuum chamber testing in spacecraft manufacturing facilities.

Paragon Supplement at 2.

Statutory analysis

Under Chapter 509, a person must obtain a license to launch a launch vehicle from the United States. 51 U.S.C. § 50904. Paragon proposes to begin its ascent to 30 kilometers from New Mexico's Spaceport America. Section 50902(4) defines launch to mean, in relevant part, "to place or try to place a launch vehicle or reentry vehicle and any payload, crew, or space flight participant from Earth -- (A) in a suborbital trajectory; (B) in Earth orbit in outer space; or (C) otherwise in outer space . . .." Paragon proposes a suborbital trajectory for the ascent of its capsule. Section 50902(8) defines a launch vehicle to mean, "(A) a vehicle built to operate in, or place a payload or human beings in, outer space; and (B) a suborbital rocket." The World View capsule is not a rocket.

The FAA is able to find that Paragon's World View capsule will be a "vehicle built to operate in . . . outer space" under section 50902(8). Given the proposed shirt-sleeves environment, the duration of its mission and the physiological responses of a human body to the altitude at which Paragon intends its World View capsule to operate, the capsule needs to be built to operate in outer space. At Paragon's intended altitude of 30 kilometers (98,425 feet), water and blood boil, and an unprotected person would rapidly experience fatal decompression. Regardless of whether 30 kilometers constitutes outer space—and the FAA renders no opinion on that question—a person would experience the same physiological responses at 30 kilometers as if exposed to the environment of low-Earth orbit (LEO). Thus, Paragon's capsule will need to be space qualified, and Paragon intends it to be able to operate in the equivalent of low-Earth orbit. Occupants of the capsule will not need pressure suits and will experience a "shirt-sleeves" environment of several hours duration. To achieve this environment, Paragon will subject its capsule to qualification testing in which it will over-stress each component to determine maximum tolerance at the component, subsystem, and system levels. For acceptance testing Paragon will expose each component, subsystem, and system to the temperature, pressure, vibration, and radiation environments of the launch and LEO. The capsule will undergo pressure, thermal, and vacuum chamber testing in spacecraft manufacturing facilities.

The FAA bases this interpretation, in part, on the assumption that World View will make a rapid transit of and exit from controlled airspace and will not loiter. Just because a vehicle may be built to operate in outer space does not mean that any and all of its operations will be subject to Chapter 509. Were Paragon to operate its World View vehicle at altitudes where the majority of civil aircraft operate, it would not need to be built—that is, designed and tested— to operate in outer space. Although aircraft that fly at 35,000 feet require pressurization, they do not require environmental controls and life support systems on par with those of the International Space Station. Aircraft designed to operate at 35,000 feet do not undergo the same testing that vehicles designed to operate in outer space require. Were an airliner or even a TR-1 placed on orbit, it would not provide a "shirt-sleeves" environment that would last for hours. Accordingly, although the FAA is able to interpret Chapter 509's definition of a launch vehicle to encompass one that will operate at an altitude where it needs to be built to operate in outer space, it will not do so for one that does not need to be so built. Likewise, even for Paragon itself, this interpretation only applies to the

altitudes Paragon proposed in its request for an interpretation. When not operating as a launch vehicle, Paragon will operate under the appropriate aviation provisions of Title 49 of the United States Code and its accompanying regulations.

This approach is consistent with and analogous to the way Chapter 509 applies to the combination carrier aircraft, WhiteKnightTwo, and suborbital rocket, SpaceShipTwo, of Scaled Composites and Virgin Galactic. The combination launch system satisfies a different definition of a launch vehicle because it has a suborbital rocket as a component. Chapter 509 applies when the system operates as a launch vehicle from the flight of the carrier aircraft, through ignition of the rocket, to the return and landing of the carrier aircraft and the suborbital rocket. For a mission that does not entail ignition of the rocket, the FAA's aviation statute and regulations apply. Similarly, Paragon's operations would fall under 51 U.S.C. ch. 509 when operating at altitudes where the vehicle needed to be built to operate in outer space.

This approach is also consistent with the FAA continuing to regulate under the Federal Aviation Act aircraft that are able to reach altitudes even greater than Paragon proposes. Certain aircraft, usually of military origins, are able to briefly reach altitudes in excess of 30 kilometers but cannot sustain either the altitudes or aircraft controllability. They include F-104s and MiGs, among others. Those aircraft do not provide a shirt-sleeves environment that can last for hours and are not designed, tested, or built to operate in outer space for any period of time, let alone for the length of time that Paragon intends to operate its vehicle. Nor, for their normal operations, do they need to do so.

This interpretation has been coordinated with the Associate Administrator for Aviation Safety and with the Associate Administrator for Commercial Space Transportation. Please feel free to contact Laura Montgomery, Manager of the Space Law Branch, at (202) 267-3150, or me with any questions or concerns.

Sincerely,

Mark W. Bury
Assistant Chief Counsel for International Law,
Legislation and Regulations Division, AGC-200