

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of)	
)	
The Boeing Company)	Call Sign: S2966
)	
Application for Authority to Launch)	File No. SAT-LOA-20160622-00058
And Operate a Non-Geostationary)	
Low Earth Orbit Satellite System)	
In the Fixed Satellite Service)	
)	

COMMENTS OF WORLDVU SATELLITES LIMITED

WorldVu Satellites Limited, d/b/a OneWeb (“OneWeb”), pursuant to Section 25.154(a) of the rules of the Federal Communications Commission (the “FCC” or “Commission”),¹ hereby comments on The Boeing Company’s (“Boeing”) Application for Authority to Launch and Operate a Non-Geostationary (“NGSO”), low Earth orbit (“LEO”) satellite system in the Fixed Satellite Service (“FSS”) using V-band frequencies.²

OneWeb has petitioned the FCC for U.S. market access for its own NGSO system using Ku- and Ka-band frequencies to bring competitively priced, high-speed Internet services to rural and other consumers worldwide.³ OneWeb submits these comments on Boeing’s Application to highlight the need to ensure safe operations and protect the viability of OneWeb’s critical high-

¹ 47 C.F.R. § 25.154(a).

² The Boeing Company, Application for Authority to Launch and Operate a Non-Geostationary Low Earth Orbit Satellite System in the Fixed Satellite Service, IBFS File No. SAT-LOA-20160622-00058 (filed Jun. 22, 2016) (“Boeing Application”). *See* Satellite Policy Branch Information, Boeing Application Accepted for Filing in Part, IBFS File No. SAT-LOA-20160622-00058, DA 16-1244 (rel. Nov. 1, 2016).

³ WorldVu Satellites Limited, Petition for a Declaratory Ruling Granting Access to the U.S. Market for the OneWeb System, IBFS File No. SAT-LOI-201604287-00041 (filed Apr. 28, 2016) (“OneWeb Petition”).

speed broadband services as later-filed NGSO systems like Boeing's seek to deploy LEO constellations which overlap or are in close proximity to the intended orbital altitude of OneWeb's constellation.

I. ONEWEB'S PLANS TO DEPLOY ITS NGSO CONSTELLATION AT A 1,200 KM ORBITAL ALTITUDE ARE WELL-ESTABLISHED WITH THE ITU AND THE COMMISSION

OneWeb began preparing to operate an NGSO constellation at the 1,200 km altitude more than two years ago. These operational parameters became publicly available in November 2014 when OneWeb's ITU filings referencing a planned orbital altitude of 1,200 km were published.⁴ OneWeb's April 2016 petition for U.S. market access also detailed its plans to operate an NGSO system at 1,200 km.⁵ OneWeb is far along on its system design and currently anticipates launching full capability production satellites into orbit at 1,200 km within the next 18 months.

OneWeb first became aware of Boeing's plans to operate its proposed constellation at 1,200 km based on its June 2016 Application.⁶ Boeing's ITU filings, which were submitted around the same time, do not indicate a 1,200 km orbital altitude.⁷ OneWeb specifically chose

⁴ See CR/C/3413 MOD-3, which was submitted to the ITU on June 27, 2014 and published in the ITU's IFIC 2782 on November 11, 2014. See also Peter B. de Selding, *WorldVu Seeks Builder for Smallsat Constellation, Wants To Co-own Production Facility*, SPACE NEWS, Nov. 11, 2014, <http://spacenews.com/42517worldvu-seeks-builder-for-smallsat-constellation-wants-to-co-own/>.

⁵ See *OneWeb Petition* at 7.

⁶ *Boeing Application* at 23.

⁷ The ITU filing referenced in footnote 1 on p. 5 of the Boeing Application, which was published on June 21, 2016, does not appear to include any orbital planes with an altitude of 1,200 km. There also do not appear to be any other ITU publications based on filings submitted by the United States for non-government NGSO satellite systems in the Q and V bands which include this 1,200 km orbit altitude. Therefore, there appears to be no underlying ITU filing upon which the Boeing V-band NGSO system can operate at an altitude of 1,200 km.

the 1,200 km orbital altitude in part to minimize the risk of potential physical collisions with other NGSO systems. Boeing's initial suggestion in its Application to launch nearly 3,000 satellites into the same orbital planes specified by OneWeb over two years ago raises significant concerns for OneWeb because it would increase the risk of collision events between the two constellations and unnecessarily jeopardize the ability of both systems to deliver services.

Since filing its Application, however, Boeing has clarified that it "does not intend to operate its satellite system using an overlapping orbital altitude with the WorldVu system."⁸ OneWeb appreciates Boeing's willingness to avoid operationally overlapping the OneWeb constellation as it considers potential configurations for its constellation. OneWeb is prepared to share ephemeris data and work together with Boeing, especially for the crucial insertion and deployment phases, to ensure a safe operational environment.

OneWeb has spent years developing a safe constellation and operation plan for the 1,200 km altitude. Many non-overlapping altitudes are available to operate other constellations while maintaining safe separation between NGSO systems. It is OneWeb's position that even with the best intentions for cooperation, the operation of a constellation of Boeing's planned size near the OneWeb constellation will present challenging physical coordination issues. Going forward, OneWeb believes that a few fundamental principles must serve as the framework for these inter-coordination and altitude selection discussions.

⁸ See Letter from Bruce A. Olcott, Counsel to the Boeing Company, Jones Day, to Jose P. Albuquerque, Chief, Satellite Division, IBFS File No. SAT-LOA-20160622-00058, at 7 (Sept. 16, 2016) ("September 2016 Letter to IB").

II. BOEING MUST WORK TOGETHER WITH ONEWEB TO SUCCESSFULLY COORDINATE ITS NGSO SYSTEM

Consistent with the relative stages of development of their respective constellations, as well as certain regulatory and operational realities, OneWeb believes that four principles must form the basis for discussions between Boeing and OneWeb.

First, OneWeb is at an advanced stage of development – testing of pre-production hardware is ongoing and a ramp-up to manufacturing is underway. OneWeb and its broad base of suppliers have invested significantly to get to this point, and any meaningful system changes would have far-reaching impacts. Since submitting its Petition last April, OneWeb completed its satellite design and signed procurement contracts for virtually all of its satellite components. OneWeb, through its joint venture with Airbus Group, is also building an \$85 million, advanced, high-volume aerospace manufacturing facility in Florida next year.⁹ This facility will construct hundreds of low-cost, high-performance satellites, which will be ready for deployment starting in early 2018. OneWeb suppliers are also co-locating their own factories nearby for efficient delivery.¹⁰ Gateway planning of OneWeb’s ground systems, supported by OneWeb partners Qualcomm Incorporated, Hughes Network Systems, and Intelsat, are also well underway. OneWeb’s 3G- and 4G-compatible chipsets are near completion, as are its dual-feed GEO/LEO antennas. OneWeb is poised to offer affordable broadband to consumers as early as 2019.

Unlike OneWeb, Boeing’s system is in an early stage of development and has significantly more design flexibility to adjust its planned orbital altitude, as its ITU filing

⁹ Creating 250 high-tech manufacturing and engineering jobs, this facility will be the industry’s first satellite factory designed to mass-produce space stations using automated assembly and test capabilities similar to those used in aircraft production facilities.

¹⁰ Susan Lundine, *RUAG Space USA to build facility, add high-wage jobs in C.Fla.*, ORLANDO BUSINESS JOURNAL, Nov. 29, 2016, <http://www.bizjournals.com/orlando/news/2016/11/29/ruag-space-usa-to-build-facility-add-high-wage.html>.

suggests.¹¹ Boeing’s Application states that its Initial Deployment configuration will be achieved “within six years of license grant.”¹² As noted in a supplemental letter, Boeing “intends to work with WorldVu to identify orbital altitudes for each system that do not overlap and include sufficient margin to prevent collision events.”¹³ Recognizing the significantly different stages of development between the OneWeb and Boeing systems, Boeing’s identification process should specifically include consideration of alternative orbital altitudes. Establishing greater than 100 km separation between the nominal orbital heights of large constellations is prudent to ensure safe operating margins. There is sufficient physical space to maintain a safe altitude gap and still support multiple constellations. Going forward, OneWeb looks forward to working with Boeing as it evaluates these operational issues prior to its preliminary design review. OneWeb remains committed to ensuring that both NGSO constellations can safely coexist and deliver affordable broadband connectivity to U.S. consumers.

Second, on the regulatory front, unlike the Boeing V-band system which does not appear to have underlying ITU filings designating the 1,200 km orbital altitude,¹⁴ any change to the orbital altitude of the OneWeb system may not be possible without OneWeb altering its ITU filings (which do specify the 1,200 km orbital altitude) and thus risking its current date prioritization status. In contrast, Boeing’s proposed system, even if it did have underlying ITU filings for the 1,200 km orbit altitude, would still have no priority over any other NGSO system

¹¹ *See supra* note 7.

¹² *Boeing Application* at 22, n.3.

¹³ *September 2016 Letter to IB* at 7.

¹⁴ *See supra* note 7.

because there is no such priority regime in the ITU for the frequency bands proposed by Boeing.¹⁵ Therefore, Boeing could modify its ITU-filed orbital altitude without any impact on its ITU priority status. The Commission ought not to require NGSO applicants who have an established ITU priority status, such as OneWeb, to risk jeopardizing that priority in situations like this because it could create a perverse incentive for later-filed NGSO systems to choose an overlapping orbital altitude precisely in order to threaten the ITU priority status of previously filed systems.

Third, establishing safe NGSO operations requires operators to recognize that some altitude fluctuation for each individual spacecraft is to be expected. As Boeing recognizes, such altitude variability is typically “in the range of 20 to 25 kilometers.”¹⁶ In addition, operating each orbital plane at a slightly different altitude is helpful to overall constellation management and safety, as orbital planes inevitably cross. OneWeb expects that both the Boeing and OneWeb constellations will be deployed in a manner that minimizes the possibilities for intra- (as well as inter-) constellation collisions and accounts for the range of orbit altitude required by each system.

Fourth, large constellations are not static. Operators will continuously launch and deorbit satellites, which may present unique physical coordination challenges. Boeing proposes, in its

¹⁵ The V-band frequencies proposed by Boeing are not, according to the ITU Radio Regulations, “subject to coordination” with respect to other NGSO systems, unlike the Ku and Ka frequency bands where such a coordination regime does exist. This is evidenced by the fact that an NGSO system in the Ku and Ka-band requires an ITU Coordination Request (CR) filing, whereas in the V-band there is no such Coordination Request, and the only filing is an Advance Publication Information (API). In the absence of this NGSO coordination requirement for V-band NGSO systems, there is no priority regime between NGSO systems, so modifying a V-band NGSO filing does not impact its priority status.

¹⁶ *Reply Comments of The Boeing Company, WorldVu Satellites Limited, Petition for a Declaratory Ruling Granting Access to the U.S. Market for the OneWeb System*, IBFS File No. SAT-LOI-20160428-00041, at 2 (filed Sept. 1, 2016).

initial deployment, to launch 1,396 LEO satellites at the 1,200 km altitude, operating across 35 circular-orbit planes at a 45 degree inclination and 6 circular-orbit planes at a 55 degree inclination.¹⁷ Boeing’s final deployment would “increase the number of satellites to 2,956, adding 12 more 55 degree inclination planes operating at an altitude of 1,200 kilometers and adding 21 orbit planes including a near-polar orbit of 88-degree inclination operating at a lower altitude of 1,000 kilometers.”¹⁸ Substantial physical coordination challenges exist not only in the initial deployment of Boeing’s NGSO system, but also in replenishing the constellation over the lifetime of the system.¹⁹ OneWeb is prepared to work closely with Boeing to ensure that frequent constellation replenishment is performed in a safe and efficient manner.

¹⁷ *Boeing Application* at 23.

¹⁸ *Id.*

¹⁹ OneWeb’s initial system will consist of approximately 720 satellites using 18 orbital planes.

III. CONCLUSION

In a potentially crowded LEO environment, Boeing and OneWeb must work together to ensure there is a safe altitude margin between constellations. To that end, OneWeb will engage in inter-operator discussions with Boeing conducted in line with the operational parameters and practical considerations discussed herein. In the event that these discussions do not successfully resolve such orbital altitude issues, the Commission should refrain from taking any action that undermines the substantial development of OneWeb's constellation as it considers the later-filed Boeing Application.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I, Kim Riddick, hereby certify that on this 1st day of December 2016, a copy of the foregoing Comments is being sent via first class, U.S. Mail, postage paid, to the following:

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