

## EXHIBIT A

### Application for Ka band Aeronautical Antenna

By this application, Viasat, Inc. (“Viasat”) requests blanket authority to operate the G-12 transmit/receive earth station antenna model mounted on aircraft to provide service in the United States using the ViaSat-1, ViaSat-2, WildBlue-1, and ANIK-F2 satellites.

Grant of this application would promote the public interest by enabling the provision of expanded broadband service to passengers and crew on board commercial and private aircraft using the above satellites, which are currently in commercial operation and providing similar services today using the M40 and GM40 antennas.<sup>1</sup>

#### 1. Frequencies, Satellite Points of Communication, Geographic Area of Operations and Waiver Request

Viasat seeks to operate the G-12 earth stations using the 17.7-18.3 GHz, 18.3-18.8 GHz, 18.8-19.3 GHz, and 19.7-20.2 GHz portions of the Ka band for downlinks, and 27.5-28.35 GHz, 28.35-28.6 GHz, 28.6-29.1 GHz, and 29.5-30 GHz portions of the Ka band for uplinks. The Commission’s Ka-band band plan designates (i) the 18.3-18.8 GHz, 19.7-20.2 GHz, 28.35-28.6 GHz and 29.5-30 GHz portions of the Ka band for GSO FSS on a primary basis, (ii) the 18.8-19.3 GHz and 28.6-29.1 GHz band segments on a primary basis for NGSO FSS and secondary for GSO FSS; (iii) the 27.5-28.35 GHz band segment on a primary basis for UMFU;<sup>2</sup> (iv) the 17.8-18.3 GHz band segment on a primary basis for terrestrial fixed services and on a secondary basis for FSS downlinks,<sup>3</sup> (v) the 17.7-17.8 GHz band segment on a co-primary basis to the terrestrial fixed service and BSS feeder links in the Earth-to-space direction.<sup>4</sup> Thus, consistent with the waiver already granted for market access for ViaSat-2,<sup>5</sup> Viasat requests a waiver to receive satellite downlink communications in the 17.7-17.8 GHz band segment.

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<sup>1</sup> See Viasat, Inc., File No. SES-LIC-20120427-00404, Call Sign E120075 (granted July 17, 2013) (authorizing Ka band aeronautical earth stations communicating with ViaSat-1, WildBlue-1 and ANIK-F2); Viasat, Inc., File No. SES-LIC-20180123-00055, Call Sign E180006 (granted Apr. 17, 2018) (“ViaSat-2 Aeronautical Authorization”) (authorizing Ka band aeronautical earth stations communicating with ViaSat-2).

<sup>2</sup> The G-12 earth station will communicate in this entire range with ViaSat-2, and in the 28.1-28.35 GHz segment with ViaSat-1. WildBlue-1 and ANIK-F2 do not operate using frequencies in this range.

<sup>3</sup> See *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Report and Order, 32 FCC Rcd 7809, ¶ 7 (2017) (“NGSO Order”).

<sup>4</sup> 47 C.F.R. § 2.106 n.US271.

<sup>5</sup> Viasat, Inc., File No. SAT-MOD-20160527-00053, Att. To Grant at ¶ 11 (granted Jan. 12, 2017).

These earth stations will communicate with the ViaSat-1 satellite at the 115.1 ° W.L. orbital location,<sup>6</sup> the WildBlue-1 and ANIK-F2 satellites at the 111.1° W.L. orbital location,<sup>7</sup> and the ViaSat-2 satellite at the 69.9° W.L. orbital location.<sup>8</sup> Each satellite is authorized to serve the United States. The G-12 earth stations will operate with (i) WildBlue-1 and ANIK-F2 in the 18.3-18.8 GHz, 19.7-20.2 GHz, 28.35-28.6 GHz, and 29.5-30 GHz bands; (ii) ViaSat-1 in the 18.3-19.3 GHz, 19.7-20.2 GHz, 28.1-29.1 GHz and 29.5-30 GHz frequency bands; and (iii) ViaSat-2 in the 17.7-19.3 GHz, 19.7-20.2 GHz, 27.5-29.1 GHz and 29.5-30 GHz bands.

The earth stations will operate throughout the coverage area of the above satellites and can be operated with each of the gateway earth stations associated with them.<sup>9</sup>

In connection with this request, Viasat seeks a waiver to the extent necessary of the U.S. Table of Frequency Allocations (“U.S. Table”), and the Commission’s Ka-band band plan, to operate mobile earth stations in these bands. The Commission has granted such waivers to allow Viasat to operate aeronautical earth stations with ViaSat-2, as well as Viasat’s other spacecraft,<sup>10</sup> and has granted authority to other licensees to operate earth stations on mobile platforms in the Ka band.<sup>11</sup> “Good cause” exists for such a waiver,<sup>12</sup> which would serve the public interest by providing access to greater bandwidth and capacity for aeronautical broadband services, and

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<sup>6</sup> Viasat, Inc., Call Sign S2747, File No. SAT-LOA-20110722-00132, as amended (granted Oct. 14, 2011; SAT-LOI-20080107-00006, as amended (granted Aug. 18, 2009) (“ViaSat-1 Authorization”).

<sup>7</sup> See WB Holdings 1, LLC, Call Sign E050033, File No. SES-MFS-20060811-01347 (granted Oct. 10, 2006).

<sup>8</sup> Viasat, Inc., Call Sign S2902, File Nos. SAT-LOI-20130319-00040 (granted Dec. 12, 2013); SAT-MOD-20141105-00121; SAT-AMD-20150105-00002 (granted Apr. 15, 2015); SAT-MOD-20160527-00053 (granted Jan. 12, 2017) (“ViaSat-2 Authorization”).

<sup>9</sup> See 47 C.F.R. § 25.115(e).

<sup>10</sup> See ViaSat-2 Aeronautical License; Viasat, Inc., File No. SES-MOD-20160108-00029, Call Sign E120075 (granted June 29, 2016).

<sup>11</sup> See, e.g., ISAT US Inc., File No. SES-LIC-20141030-00832, Call Sign E140114 (granted Aug. 11, 2015) (granting waiver for aeronautical earth stations at 19.7-20.2 GHz and 29.5-30 GHz); ISAT US Inc., File No. SES-LIC-20140224-00098, Call Sign E140029 (granted Sept. 29, 2015) (granting waiver for maritime earth stations at 19.7-20.2 GHz and 29.5-30 GHz); see also O3b Limited, File No. SES-MS-20151021-00760 (granted Jan. 29, 2016) (granting a waiver to provide service to 30 foreign-flagged ships using earth stations at 27.6-28.35 GHz).

<sup>12</sup> See 47 C.F.R. § 1.3; see also *WAIT Radio v. FCC*, 418 F.2d 1153, 1157 (D.C. Cir. 1969) (granting waiver where such grant “would better serve the public interest than strict adherence to the general rule”); *Northeast Cellular Tel. Co. v. FCC*, 897 F.2d 1166 (D.C. Cir. 1990) (grant of a waiver is warranted where the requested waiver “would not undermine the policy objective of the rule in question and would otherwise serve the public interest”); *Fugro-Chance, Inc.*, 10 FCC Rcd 2860 ¶ 2 (1995) (waiver of U.S. Table appropriate “when there is little potential for interference into any service authorized under the Table of Frequency Allocations and when the non-conforming operator accepts any interference from authorized services.”).

thereby meeting consumer demand, and otherwise would be fully consistent with Commission precedent.

As an initial matter, it is now well-established in the industry and in the Commission's precedent that GSO FSS uplink spectrum resources can be used for service from mobile platforms without causing any more interference than a traditional FSS antenna. The Commission recently has adopted rules that authorize earth stations in motion in the 18.3-18.8 GHz, 19.7-20.2 GHz, 28.35-28.6 GHz and 29.25-30 GHz portions of the Ka-band.<sup>13</sup> Based on the Commission's conclusion that FSS earth stations in motion ("ESIMs") are no more interfering than operations in a fixed installation, the Commission has adopted a footnote to the U.S. Table to recognize the operation of ESIMs as an application of the FSS with primary status.<sup>14</sup>

In addition, the Commission is considering expanding ESIMs into other bands in which GSO FSS earth stations may be operated. The Commission issued a further notice of proposed rulemaking accompanying its *GSO FSS ESIM Order* proposing to allow GSO FSS ESIMs to operate in the 28.6-29.1 GHz and 18.8-19.3 GHz band segments on secondary basis with respect to NGSO FSS systems, and to receive signals from GSO FSS spacecraft in the 17.8-18.3 GHz band segment on a secondary basis with respect to fixed services.<sup>15</sup> To the extent the Commission adopts these proposed rules, Viasat requests that the proposed earth stations be authorized on that basis.

As detailed below and in the attached Technical Description, the proposed operations would be compatible with the operations of other GSO systems in the 28.35-28.6 GHz and 29.5-30 GHz band segments. In addition, the proposed operations in the 18.8-19.3 GHz and 28.6-29.1 GHz band segments would be compatible with and would not cause harmful interference into any primary NGSO FSS operations or the operations of other GSO FSS operations in those bands. Consistent with Viasat's existing authority to operate ESIM in the 28.1-28.35 GHz band,<sup>16</sup> Viasat proposes that its ESIM operations in the 27.5-28.35 GHz band segment under this application be limited to operations above 10,000 feet above ground level, and on a secondary, non-harmful interference basis with respect to UMFU services. Finally, the already-authorized satellite downlink operations in the 17.7-18.3 GHz band segment are unaffected by the operation of the proposed earth stations.

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<sup>13</sup> See *Amendment of Parts 2 and 25 of the Commission's Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 17-95, Report and Order and Further Notice of Proposed Rulemaking, FCC 17-56 ¶¶ 17-18, 51 n.118 (rel. May 19, 2017) ("*GSO FSS ESIM Order*").

<sup>14</sup> *Id.* at ¶ 66. The rules adopted in the *GSO FSS ESIM Order* are not yet effective, and thus, out of an abundance of caution, Viasat seeks a waiver with respect to these frequencies to the extent necessary.

<sup>15</sup> See *id.* at ¶ 91.

<sup>16</sup> See Viasat, Inc., Call Sign E120075, File No. SES-MOD-20160108-00029 (granted June 29, 2016).

## **2. Antenna Performance and Compatibility with GSO FSS Operations**

The attached Technical Description in Attachment 1 describes the antenna specifications, network management, and other salient details of the G-12 antenna. In accordance with Section 25.115(g)(1), the antenna patterns for the G-12 are attached hereto as Exhibit B.

This application is consistent with the existing regulatory framework for the Ka band. As illustrated by the antenna patterns in Exhibit B, the G-12 antenna complies with the EIRP spectral density limits in Section 25.138. In addition, the downlink transmissions comply with the PFD levels in Section 25.138(a)(6).

## **3. Compatibility with NGSO FSS Operations**

In the 18.8-19.3 GHz and 28.6-29.1 GHz band segments, the Commission's band plan designates NGSO FSS as primary, and GSO FSS as secondary, and as discussed above, the Commission is contemplating rules allowing GSO FSS ESIMs as secondary to NGSO FSS operations. Viasat requests a waiver of the Commission's rules to allow the operation of the G-12 earth stations in the 18.8-19.3 GHz and 28.6-29.1 GHz band segments with the ViaSat-1 and ViaSat-2 satellites on a non-interference, unprotected basis.

The Technical Description in Attachment 1 includes an analysis of the off-axis EIRP density in the plane perpendicular to the GSO with respect to the NGSO FSS systems in the Commission's Ka-band processing round. Based on simulations conducted using the technical characteristics of Viasat's proposed earth stations under typical operating conditions and the information in the NGSO FSS applications, the proposed operations are unlikely to cause harmful interference into NGSO systems.

Moreover, Viasat has a long history of successfully operating earth stations in the 18.8-19.3 GHz and 28.6-29.1 GHz band segments while protecting NGSO FSS operations, including through operations of aeronautical earth stations in these bands with ViaSat-1. The Commission has approved ViaSat-1 and ViaSat-2 based on Viasat's demonstrated ability to protect primary NGSO FSS operations in these bands. Specifically, the Commission has approved Viasat's demonstrated capability to cease operations in these bands in the event of an in-line event between Viasat's communications and the NGSO system's communications. As with all other Viasat terminals operating within the ViaSat-1 and ViaSat-2 networks, each earth station is dynamically controlled and its operations can be suspended in the bands in which NGSO systems have priority when an NGSO satellite is within the minimum line-of-sight separation angle established either through coordination or calculated based on the system characteristics of each NGSO system operating, or expected to operate, in these bands. The Technical Description details the analysis of the predicted harmful interference from the proposed operations into each of the potentially affected NGSO systems and any separation angle necessary to protect those systems. As that analysis demonstrates and as discussed above, even without maintaining any angular separation, harmful interference would not reasonably be expected to occur.

Notably, Viasat has coordinated its aeronautical earth station in these bands with OneWeb and will continue these coordinations with any other potentially affected NGSO operators authorized by the Commission.

## **4. Compatibility with UMFU Services in the 27.5-28.35 GHz Band Segment**

In the 27.5-28.35 GHz band segment, UMFU is designated as primary with protections for certain FSS earth stations pursuant to Section 25.136 of the Commission's rules. Those protections extend to a maximum of three individually-licensed earth stations per county, and that are sited in accordance with the requirements of Section 25.136.<sup>17</sup> The area around the earth station in which it generates a PFD, at 10 meters above ground level, of greater than or equal to -77.6 dBmW/m<sup>2</sup>/MHz may not cover certain population thresholds or certain roadways or venues, and must coordinate with any UMFU operations within the covered area.

Viasat seeks operate G-12 antennas with ViaSat-1<sup>18</sup> and ViaSat-2 in the 27.5-28.35 GHz band on aircraft flying at 10,000 feet or more above ground level. Viasat does not seek to operate these earth stations in this band segment while on the ground or at altitudes lower than 10,000 feet for purposes of this application. Viasat seeks a waiver of Section 25.136 and the U.S. Table as needed to allow ESIM operations at 27.5-28.35 GHz on a blanket basis and without regard to the number of authorized earth stations.

The Commission has previously authorized ESIMs in the 28.1-28.35 GHz portion of this band based on a technical showing that such operations at 10,000 feet or more above ground level would not cause harmful interference into primary terrestrial wireless services in the band.<sup>19</sup> The attached Technical Description demonstrates that earth station transmissions at 27.5-28.35 GHz on aircraft flying 10,000 feet or more above the ground, which are pointed upward toward the satellite, will have a PFD measured 10 meters above the ground that is far below the protection level for UMFU stations.<sup>20</sup> Because the PFD measured at 10 meters above ground level would not exceed -77.6 dBmW/m<sup>2</sup>/MHz anywhere, the proposed operations would not cover any population or any restricted site, and do not require coordination with any licensed UMFU operations.<sup>21</sup> Further, as a non-conforming user of this band segment, Viasat accepts the risk of interference from conforming spectrum uses.

In addition, to the extent necessary to authorize the operation of the earth stations at 27.5-28.35 GHz without specifying their locations, Viasat seeks a waiver of Section 25.115(e)(2) of the Commission's rules.<sup>22</sup> Licensing multiple earth stations through a single authorization serves the public interest by reducing administrative costs and delays and by accelerating system deployment, and thereby facilitating the delivery of expanded services to end users. The Commission has previously issued licenses for GSO earth stations in segments of the Ka band other than those identified in Section 25.114(e) without specifying the locations of the earth stations in advance, including aeronautical earth stations operating in the 28.1-28.35 GHz portion

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<sup>17</sup> 47 C.F.R. § 25.136(a)

<sup>18</sup> The earth stations will operate with ViaSat-1 operate only in the 28.1-28.35 GHz portion of this band.

<sup>19</sup> See Viasat, Inc., File No. SES-MOD-20160108-00029, Call Sign E120075 (granted June 29, 2016).

<sup>20</sup> Alternative approaches with respect to protecting co-frequency terrestrial services are appropriate in other circumstances not present here.

<sup>21</sup> See 47 C.F.R. § 25.136(a)(ii)-(iv).

<sup>22</sup> See *id.* at § 25.115(e)(2).

of the spectrum requested in this application.<sup>23</sup> Therefore, grant of the waiver request would be consistent with Commission precedent.

## **5. Compatibility with Terrestrial Operations and BSS in the 17.7-18.3 GHz Band Segment**

Viasat requests authority for receive operations using the proposed earth stations from the ViaSat-2 satellite in the 17.7-18.3 GHz band segment. The U.S. Table allocates the 17.8-18.3 GHz band segment on a primary basis for fixed services and on a secondary basis for FSS.<sup>24</sup> The 17.7-17.8 GHz portion of the band segment is allocated to FSS on a co-primary basis with fixed services, but this FSS allocation is limited by footnote US271 to broadcasting-satellite service feeder links in the Earth-to-space direction.<sup>25</sup>

In seeking market access for ViaSat-2, Viasat demonstrated that its FSS downlinks in the 17.7-18.3 GHz band segment are compatible with primary fixed service operations and neighboring BSS operations.<sup>26</sup> More specifically, Viasat demonstrated that downlink transmissions from ViaSat-2 will be within the power-flux density limits at the earth's surface set forth in Article 21 of the ITU Radio Regulations<sup>27</sup> and would not cause harmful interference into primary fixed service operations throughout the 17.7-18.3 GHz band segment.

Because the 17.7-17.8 GHz band segment is not allocated for the FSS downlinks proposed in this application, Viasat requests a waiver with respect to this band segment. The Commission granted a waiver of the U.S. Table to authorize ViaSat-2 for U.S. market access based on a showing that the ViaSat-2 downlinks at 17.7-17.8 GHz would not cause harmful interference into primary fixed service operations or neighboring BSS spacecraft. A corresponding waiver to allow the proposed earth stations to receive ViaSat-2 downlinks at 17.7-17.8 GHz would have no impact on the authorized RF environment. To the extent necessary, Viasat seeks a corresponding waiver to allow the proposed earth stations to receive signals from ViaSat-2 at 17.7-17.8 GHz. As a non-conforming user of this band segment, Viasat accepts the risk of interference from conforming spectrum uses.

In addition, to the extent necessary to authorize the operation of the proposed earth stations at 17.7-18.3 GHz without specifying their locations, Viasat seeks a waiver of Section 25.115(e) of the Commission's rules.<sup>28</sup> For the same reasons stated above with respect to the

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<sup>23</sup> See Viasat, Inc., File No. SES-MOD-20160108-00029, Call Sign E120075 (granted June 29, 2016).

<sup>24</sup> 47 C.F.R. § 25.206.

<sup>25</sup> *Id.* at § 2.106 n.US271.

<sup>26</sup> See ViaSat-2 Authorization, File No. SAT-MOD-20160527-00053, Call Sign S2902, Technical Annex at 7-10 (filed May 27, 2016).

<sup>27</sup> *Id.* Att. to Grant at ¶ 12 (granted Jan. 12, 2017).

<sup>28</sup> See 47 C.F.R. § 25.115(e).

27.5-28.35 GHz band, grant of this waiver request would be in the public interest and consistent with Commission precedent.<sup>29</sup>

## **6. Control Point**

The control point for all earth stations will be Viasat's network operations center (NOC) located at 349 Inverness Drive South, Englewood, Colorado 80112, and can be contacted 24/7 at (720) 493-7300. This single point of contact will have the capability of shutting down any of the earth stations operated within the network, which can occur through communications with the appropriate spacecraft gateways.

## **7. Radiation Hazard Analysis**

The radiation hazard analysis for the G-12 antenna is provided in Exhibit C. As discussed in that analysis, the proposed earth station would not operate in scenarios where the potential for exposure would exceed the applicable maximum permissible exposure limits (MPE).

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<sup>29</sup> See, e.g., Viasat, Inc., File No. SES-LIC-20170401-00357, Call Sign E170088 (granted Nov. 9, 2017) (authorizing large numbers of GSO earth stations at 17.7-18.3 GHz to communicate with ViaSat-2).