

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of
Revisions of Parts 2 and 25 of the Commission's
Rules to Govern the Use of Earth Stations Aboard
Aircraft Communicating with Fixed-Satellite
Service Geostationary-Orbit Space Stations
Operating in the 10.95-11.2 GHz, 11.45-11.7 GHz,
11.7-12.2 GHz and 14.0-14.5 GHz Frequency
Bands
IB Docket No. 12-376

SECOND REPORT AND ORDER AND ORDER ON RECONSIDERATION

Adopted: April 17, 2014

Released: April 18, 2014

By the Commission:

TABLE OF CONTENTS

Heading Paragraph #
I. INTRODUCTION..... 1
II. BACKGROUND..... 2
III. SECOND REPORT AND ORDER..... 7
A. 14.0-14.5 GHz Band ..... 7
B. Section 25.227(b)(2)(i) ..... 11
IV. ORDER ON RECONSIDERATION ..... 13
A. U.S.-Registered Civil Aircraft ..... 14
B. Dynamic Power ESAA Systems ..... 18
1. Dynamic Power ESAA Operations that Exceed the Off-Axis EIRP-Density Limits ..... 18
2. Cessation of Emissions..... 22
C. Antenna Pointing Error Requirement ..... 27
V. PROCEDURAL MATTERS..... 30
A. Final Regulatory Flexibility Analysis..... 30
B. Final Paperwork Reduction Act and Congressional Review Act ..... 31
VI. ORDERING CLAUSES..... 32
Appendix A - Final Regulatory Flexibility Certification for the Second Report and Order
Appendix B - Final Regulatory Flexibility Certification for the Order on Reconsideration
Appendix C - List of Parties
Appendix D - Final Rules

I. INTRODUCTION

1. In this Second Report and Order and Order on Reconsideration for Earth Stations Aboard Aircraft (ESAA) (ESAA Second Order and Reconsideration Order), we promote regulatory parity by adopting a primary allocation for ESAA in the 14.0-14.5 GHz band. We also provide regulatory certainty by clarifying some of the ESAA rules, as a result of a petition for reconsideration and clarification filed by The Boeing Company (Boeing). These changes promote regulatory and operational certainty for ESAA systems sharing spectrum with other applications in the Fixed-Satellite Service (FSS).

## II. BACKGROUND

2. ESAA service is among the emerging mobile broadband applications in spectrum allocated to the FSS. The other mobile applications in FSS spectrum are Earth Stations on Vessels (ESV) and Vehicle-Mounted Earth Stations (VMES), providing broadband services to customers at sea and on land, respectively.<sup>1</sup> ESAAs are earth stations aboard aircraft that receive from and transmit to a geostationary orbit (GSO) FSS satellite.<sup>2</sup> ESAAs, when combined with technologies such as Wi-Fi inside the aircraft hull, offer broadband services for in-flight passengers and crew aboard commercial and private aircraft.

3. *ESAA NPRM & Order*. In 2012, the Commission adopted the *ESAA NPRM & Order*, which amended the U.S. Table of Frequency Allocations (Table of Allocations) in Part 2 of the Commission's rules and established service and licensing rules for ESAA operators in Part 25 of the Commission's rules.<sup>3</sup> With regard to the Table of Allocations, the Commission added non-Federal footnotes NG52, NG54 and NG55 and United States footnote US133 to the Table of Allocations.<sup>4</sup> Footnote NG52 authorizes ESAA operations in the 10.95-11.2 GHz and 11.45-11.7 GHz bands on an unprotected basis, which means that those earth stations are not allowed to claim protection from transmissions of non-Federal stations in the Fixed Service (FS). Footnote NG54 authorizes ESAA operations in the 14.0-14.5 GHz band on a secondary basis, and footnote NG55 authorizes ESAA operations in the 11.7-12.2 GHz band on a primary basis.<sup>5</sup> Footnote US133 requires ESAA licensees to coordinate with space research service and radio astronomy service in order to prevent harmful interference to those services.

4. With regard to the adoption of secondary status for ESAA in footnote NG54, the Commission determined that the *ad hoc* approach toward authorizing ESAA operations in the 14.0-14.5

---

<sup>1</sup> See generally *Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, IB Docket No. 02-10, Report and Order, FCC 04-286, 20 FCC Rcd 674 (2005) (*ESV Order*); see also *Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed-Satellite Service*, IB Docket No. 07-101, Report and Order, FCC 09-64, 24 FCC Rcd 10414 (2009) (*VMES Order*).

<sup>2</sup> See 47 C.F.R. § 25.103.

<sup>3</sup> See *Revisions to Parts 2 and 25 of the Commission's Rules to Govern the Use of Earth Stations Aboard Aircraft Communicating with Fixed-Satellite Service Geostationary-Orbit Space Stations Operating in the 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz and 14.0-14.5 GHz Frequency Bands*, IB Docket No. 12-376, Notice of Proposed Rulemaking and Report and Order, FCC 12-161, 27 FCC Rcd 16510 (2012) (*ESAA NPRM & Order*). Specifically, the ESAA licensees are authorized to operate in the 14.0-14.5 GHz band and the 11.7-12.2 GHz band, which are the conventional Ku-band uplink and downlink bands, respectively, and in the 10.95-11.2 GHz band and the 11.45-11.7 GHz band, which are part of the extended Ku-band. In the initial *Notice* released in 2005, the Commission considered communications between satellites and earth stations on aircraft to be part of the Aeronautical Mobile Satellite Service (AMSS), a mobile application of the Mobile Satellite Service. See generally *Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 05-20, Notice of Proposed Rulemaking, 20 FCC Rcd 2906 (2005) (*Notice*). In the *ESAA NPRM & Order*, the Commission agreed with commenters proposing to change the name of the service to be more consistent with other mobile users of FSS and, thus, the Commission adopted the acronym "ESAA." As part of that process, the Commission also closed out the AMSS docket, IB Docket No. 05-20, and created a new ESAA docket, IB Docket No. 12-376. See *ESAA NPRM & Order*, 27 FCC Rcd at 16516, ¶ 11, n.18.

<sup>4</sup> See 47 C.F.R. § 2.106.

<sup>5</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16518-19, ¶¶ 16-17.

GHz band should be replaced with an allocation.<sup>6</sup> The Commission concluded that there was a sufficient basis to give at least secondary status to ESAA as an application of FSS in this band, as it had proposed in the underlying *Notice*, and that the factors supporting such action could potentially justify allocating ESAA on a primary basis in this band.<sup>7</sup> Nevertheless, the Commission decided that a primary allocation would have been “premature” at that time, observing that the *Notice* “[had] not specifically s[ought] comment on allocating the [ESAA] uplink to primary status, and the record, while strongly suggesting that primary status would be appropriate, [was] not sufficiently developed at th[at] time to make such an allocation.”<sup>8</sup> As a result, the Commission decided to issue an *NPRM* along with the *Order*, seeking comment on its tentative conclusion to change the status of ESAA operations in the 14.0-14.5 GHz band from secondary status to primary status.<sup>9</sup> Eight parties filed comments on the *NPRM*, while no parties filed replies.<sup>10</sup>

5. In addition, the Commission established service and licensing rules for ESAA operations based on the rules adopted for the technically similar VSAT networks, as well as other mobile FSS networks, *i.e.*, ESV and VMES, noting that authorizing ESAA operations in the FSS Ku-band presented many technical issues that are similar to those adopted for such systems.<sup>11</sup> As part of the ESAA service rules, the Commission adopted technical measures to protect other radio services in the Ku-band, including the FSS and FS (in the extended Ku-band), from harmful interference. For example, to protect FSS satellites operating adjacent to the target satellite of an ESAA earth station, the Commission adopted: (1) off-axis EIRP-density limits,<sup>12</sup> which limit the power-density in directions away from the line connecting the focal point of the ESAA antenna to the orbital location of the target satellite, and (2) antenna pointing error limitations and shut-off requirements.<sup>13</sup> Further, the Commission established rules for licensing ESAA systems, providing ESAA applicants the option to choose between individual and blanket licensing and allowing ESAA systems to designate the Permitted List as the point of communication<sup>14</sup> if the ESAA operators comply with the off-axis EIRP-density limits.<sup>15</sup> The Commission

---

<sup>6</sup> See *ESAA NPRM & Order*, 27 FCC Rcd at 16521-22, ¶¶ 22-24 (discussing the various public interest benefits cited by the commenters at that stage of the proceeding, coupled with the fact that, over years of operation, these *ad hoc* ESAA authorizations had generated no reported instances of interference).

<sup>7</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16522, ¶ 24; see also *Notice*, 20 FCC Rcd at 2918, ¶ 20.

<sup>8</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16522, ¶ 24.

<sup>9</sup> *Id.* at 16564-65, ¶ 142.

<sup>10</sup> Parties filing comments in response to the *NPRM* are listed in Appendix C.

<sup>11</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16528, ¶ 41.

<sup>12</sup> *Id.* at 16530-35, ¶¶ 44-56. The phrase “off-axis EIRP-density” is used synonymously with “off-axis power-density.”

<sup>13</sup> *Id.* at 16537-40, ¶¶ 62-71.

<sup>14</sup> In 2013, the Commission removed the term “ALSAT” (*i.e.*, all U.S.-licensed space stations providing FSS in the conventional C- and Ku-bands) from its satellite service rules and in the application procedures in favor of the broader term “Permitted List.” As a result, a licensed earth station with Permitted List as the authorized point of communications may communicate with, consistent with the technical parameters of its license, all U.S.-licensed GSO FSS space stations authorized to operate in the conventional C-, Ku-, and Ka-bands and all non-U.S.-licensed space stations operating in these bands that are included on the Permitted List. See *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, IB Docket No. 12-267, Report and Order, FCC 13-111, 28 FCC Rcd 12403, 12410 ¶ 13 (2013) (*Part 25 Review R&O*). See also *Amendment of the Commission’s Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Service in the United States*, IB Docket No. 96-111, First Order on Reconsideration, FCC 99-325, 15 FCC Rcd 7207, 7210-11, ¶ 6, 7214-16, ¶¶ 16-20 (1999). The current Permitted List is available at <http://www.fcc.gov/ib/sd/se/permitted.html>.

<sup>15</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16549-16555, ¶¶ 101-118.

also adopted a regulatory framework for ESAA systems on U.S.-registered aircraft operating in or near foreign nations and over international waters and non-U.S.-registered aircraft operating in U.S. airspace.<sup>16</sup>

6. *Boeing Petition for Reconsideration.* On January 28, 2013, Boeing filed a Petition for Reconsideration of the *ESAA NPRM & Order*, requesting that the Commission clarify and modify certain rules adopted for ESAA systems.<sup>17</sup> On June 24, 2013, ViaSat filed comments on the Boeing Petition.<sup>18</sup> Boeing did not file a reply to ViaSat's comments.

### III. SECOND REPORT AND ORDER

#### A. 14.0-14.5 GHz Band

7. *Background.* In the *ESAA NPRM & Order*, the Commission tentatively concluded that ESAA should be authorized on a primary basis in the 14.0-14.5 GHz uplink band, noting that several parties had argued that regulatory parity calls for ESAA to be primary, just like ESV and VMES are primary in that band.<sup>19</sup> The Commission proposed to revise footnote NG55 which would grant primary status to ESAA in the 14.0-14.5 GHz band, and, as an administrative matter, combine ESV, VMES and ESAA into the same footnote as applications of the FSS with primary status in the 11.7-12.2 GHz and 14.0-14.5 GHz bands.<sup>20</sup> As a result, footnotes NG54 (allocation status for ESAA in the 14.0-14.5 GHz band), NG183 (allocation status for ESVs), and NG187 (allocation status for VMES) would be removed. The proposed footnote NG55 reads as follows:

NG55 In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), Earth Stations on Vessels (ESV), Vehicle-Mounted Earth Stations (VMES), and Earth Stations Aboard Aircraft (ESAA) as regulated under 47 CFR part 25 are applications of the fixed-satellite service and may be authorized to communicate with geostationary satellites in the fixed-satellite service on a primary basis.

8. All commenters filed in support of the Commission's proposed footnote NG55 and the tentative conclusion to elevate ESAA to primary status in the 14.0-14.5 GHz band. None of the commenters argue for changes to the technical rules in order to elevate ESAA to primary status.<sup>21</sup> Some of the commenters argue that the Commission should grant primary status for ESAA before new services are allocated in the 14.0-14.5 GHz band, citing, in particular, the recent *Air-Ground NPRM*,<sup>22</sup> which seeks comment on establishing a new, terrestrial-based air-ground mobile broadband service for aircraft in that

---

<sup>16</sup> *Id.* at 16555-61, ¶¶ 119-131.

<sup>17</sup> See Petition of The Boeing Company for Reconsideration and Clarification (filed Jan. 28, 2013) (Boeing Petition). See also letter from Bruce A. Olcott, Counsel for The Boeing Company, to Marlene H. Dortch, Secretary, FCC (dated March 18, 2014) (Boeing Ex Parte).

<sup>18</sup> Comments of ViaSat, Inc. (filed June 24, 2013) (ViaSat Comments).

<sup>19</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16565, ¶ 142.

<sup>20</sup> *Id.* at 16565, ¶ 142.

<sup>21</sup> See Comments of The Boeing Company (May 22, 2013) (Boeing Comments); Comments of the Global VSAT Forum (May 22, 2013) (GVF Comments); Comments of Gogo LLC (dated May 22, 2013) (Gogo Comments); Comments of Panasonic Avionics Corporation (May 22, 2013) (Panasonic Comments); Comments of Row 44, Inc. (May 22, 2013) (Row 44 Comments); Comments of the Satellite Industry Association (dated May 22, 2013) (SIA Comments); Comments of the Telecommunications Industry Association (May 22, 2013) (TIA Comments); Comments of ViaSat, Inc. (May 22, 2013) (ViaSat Comments).

<sup>22</sup> See *Expanding Access to Broadband and Encouraging Innovation through Establishment of an Air-Ground Mobile Broadband Secondary Service for Passengers Aboard Aircraft in the 14.0-14.5 GHz Band*, GN Docket No. 13-114, Notice of Proposed Rulemaking, FCC 13-66, 28 FCC Rcd 6765 (2013) (*Air-Ground NPRM*).

band.<sup>23</sup> Boeing argues that elevating ESAA to primary status would promote reliability in ESAA service, which could lead to efficiency gains for the airline industry.<sup>24</sup> According to Boeing, reliable ESAA service would assist airlines in consolidating the multiple data streams that they currently receive from multiple communications systems<sup>25</sup> as well as help to monitor, in real-time, equipment and inventories, which could lead to quicker turn-around of aircraft at the gate.<sup>26</sup> Global VSAT Forum (GVF) claims that the Commission's rules for ESAA could serve as a model for rules adopted by other administrations, which in turn could promote U.S. competitiveness because U.S. manufacturers, airlines and satellite service providers are major participants in the in-flight broadband market.<sup>27</sup>

9. *Discussion.* Today we grant primary status for ESAA in the 14.0-14.5 GHz band, as the Commission proposed in the *ESAA NPRM & Order*. To this end, we revise footnote NG55 of the Table of Allocations, 47 C.F.R. § 2.106, by adding an authorization for ESAA to operate in this band on a primary basis. In addition, we consolidate, under the same footnote, ESV, VMES and ESAA, and authorize operations on a primary basis for all three applications in the 11.7-12.2 GHz and 14.0-14.5 GHz bands. We agree with many of the reasons that the commenters raise for granting primary status. In particular, we agree with commenters arguing that regulatory parity calls for ESAA to be on equal footing with ESV and VMES, both of which have primary status and both of which are technically and operationally similar to ESAA.<sup>28</sup> As we noted in the *ESAA NPRM & Order*, and, as commenters point out, primary status is justified because ESAA has a long history of operating without causing interference to other FSS providers.<sup>29</sup> We also agree with commenters contending that primary status would promote regulatory and operational certainty, which, in turn, would help services being offered in this band to continue to grow and improve.<sup>30</sup> Accordingly, in section 2.106, we revise footnote NG55 and remove footnotes NG54, NG183, and NG187.

10. By granting primary status to ESAA in the 14.0-14.5 GHz band, we ensure that ESAA has allocation parity with the comparable mobile applications of this FSS band. The revised rule adopted

---

<sup>23</sup> Boeing Comments at 2-5; Panasonic Comments at 3-4 (to ensure a successful spectrum sharing regime with the new secondary services); Row 44 Comments at 5 (to avoid confusion regarding the potential impact of new services on current services in the Ku-band). Boeing adds that establishing a primary allocation for ESAA would assist the Commission in determining whether new secondary status services will be able to tolerate interference from services with primary status. Boeing Comments at 6.

<sup>24</sup> *Id.* at 6-10.

<sup>25</sup> According to Boeing, passenger information and entertainment data typically goes through short range wireless local area network connections and critical data is transmitted over low-bandwidth systems such as Aircraft Communications Addressing and Reporting System and Very High Frequency Digital Link (VDL2). *Id.* at 6 n.16.

<sup>26</sup> *Id.* at 6-7. Boeing also argues that reliable ESAA service would promote the use of telemedicine to assist ailing passengers on the aircraft, maximize the use of Electronic Flight Bags, which provide pilots access to real-time data for weather and air traffic in their area, and assist aircraft mechanics in obtaining the data needed to make repairs in advance of the aircraft arriving at the gate. *Id.* at 7-9.

<sup>27</sup> GVF Comments at 2, 6.

<sup>28</sup> *See id.* at 2-4; GVF Comments at 5; Gogo Comments at 4; Panasonic Comments at 2; Row 44 Comments at 4-5; TIA Comments at 3, 5 (also arguing that the NPRM's proposal promotes technology neutrality); ViaSat Comments at 3-4 (arguing that the rationale used for granting primary status in the 11.7-12.2 GHz band – to promote the deployment of new services without causing harmful interference to other services in the band – applies to granting primary status in the 14.0-14.5 GHz band).

<sup>29</sup> *See, e.g.,* Boeing Comments at 3; GVF Comments at 2; Panasonic Comments at 2; Row 44 Comments at 3; SIA Comments at 2; ViaSat Comments at 2-3 (arguing that the Commission cited the history of non-interference in the 11.7-12.2 GHz band and, therefore, should do the same here). *See also ESAA NPRM & Order*, 27 FCC Rcd at 16522, ¶ 24.

<sup>30</sup> Gogo Comments at 3; Row 44 Comments at 4; SIA Comments at 3-4.

in this proceeding will provide the benefit of enhancing competition and we find no material costs. Along with VMES and ESV, ESAA extends broadband internet services seamlessly throughout land, sea and air.

#### B. Section 25.227(b)(2)(i)

11. In addition to the changes to the ESAA allocation rules we adopt above, we also are making a necessary minor administrative change to section 25.227(b)(2)(i) of the Commission's rules.<sup>31</sup> As stated above, the Commission in the *ESAA NPRM & Order* intended for the ESAA rules to be consistent with the VMES and ESV rules. If VMES and ESV license applicants request authority to operate at power levels that exceed the otherwise applicable EIRP-density envelope, the applicants must certify, among other things, that the proposed earth station has the potential to create harmful interference to adjacent satellite operators.<sup>32</sup> However, when adopting the comparable rules for ESAA in section 25.227(b)(2)(i), the rule erroneously states that target satellite operators should certify that the proposed ESAA operations have the potential to *receive* harmful interference instead of *create* harmful interference.<sup>33</sup> To be consistent with the certification language in the ESV and VMES rules, we revise section 25.227(b)(2)(i) to require target satellite operators to certify that the proposed ESAA operations have the potential to *create* harmful interference.<sup>34</sup>

12. This rule change corrects a minor error in section 25.227(b)(2)(i), and as such, it constitutes a routine, "clean-up" matter that entails no substantive decisions of any consequence or significance to industry or the general public. Accordingly, we find that this revision falls under section 553(b)(B) of the Administrative Procedure Act, 5 U.S.C. § 553(b)(B), which exempts rule changes from notice and comment procedures "when the agency for good cause finds (and incorporates the finding and a brief statement for reasons therefore in the rules issued) that notice and public procedures thereon are . . . unnecessary."<sup>35</sup>

#### IV. ORDER ON RECONSIDERATION

13. As noted above, Boeing filed a petition<sup>36</sup> seeking reconsideration and/or clarification of: (1) sections 25.103 (definition of ESAA) and 25.227(b)(14) (requiring ESAA terminals operating in U.S.

<sup>31</sup> 47 C.F.R. § 25.227(b)(2)(i).

<sup>32</sup> 47 C.F.R. §§ 25.222(b)(2)(i), 25.226(b)(2)(i).

<sup>33</sup> 47 C.F.R. § 25.227(b)(2)(i).

<sup>34</sup> This correction also is consistent with the similar rule applied to dynamic power ESAA systems that, in the aggregate, exceed the off-axis EIRP-density limits. *See infra* Section IV.B.1 (discussing 47 C.F.R. § 25.227(b)(3)(ii)(B)). Moreover, requiring a certification that ESAA operations may "receive" harmful interference would not make sense in this context, because the certification is designed to acknowledge the risk of harmful interference faced by adjacent satellite operators, and that the risk would be addressed by the target satellite operator completing coordination with those adjacent satellite operators.

<sup>35</sup> The "unnecessary" exception to the notice requirement is "confined to those situations in which the administrative rule is a routine determination, insignificant in nature and impact, and inconsequential to the industry and to the public." *Utility Solid Waste Activities Group v. EPA*, 236 F.3d 749, 755 (D.C. Cir., 2001) (citing *Texaco v. FPC*, 412 F.2d 740, 743 (3d Cir. 1969) (*Texaco*)). "'Unnecessary' refers to the issuance of a minor rule or amendment in which the public is not particularly interested." *Texaco*, 412 F.2d at 743 n.3. *See also Amendment of Parts 1, 2, 15, 74, 78, 87, 90, and 97 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2007) (WRC-07), Other Allocation Issues, and Related Rule Updates, Notice of Proposed Rulemaking and Order*, ET Docket No. 12-338, 27 FCC Rcd 14598, 14657, ¶ 158 (2012) (finding that minor clean-up revisions to the Table of Frequency Allocations, 47 C.F.R. § 2.106, fall within the "unnecessary" exception).

<sup>36</sup> We note that, in addition to the Petition for Reconsideration and Clarification filed by Boeing, six members of the public filed letters in this proceeding requesting that the Commission address the potential for exposure to radiofrequency energy from Wi-Fi to airplane passengers and crew. In addition, one member of the public filed a letter raising public safety and liability concerns related to Internet access on airplanes. We decline to address these

(continued....)

airspace to be licensed) of the Commission's rules, proposing that the Commission incorporate the phrase "or on U.S.-flagged aircraft" into those rules; (2) the certification requirements for dynamic power ESAA systems operating above the off-axis EIRP-density limits; (3) the cessation of emissions requirement for dynamic power ESAA systems; and (4) the meaning of sigma in section 27.227(b)(1)(iii)(A), which sets forth the licensing requirements for demonstrating compliance with the antenna pointing error limitations.

#### A. U.S.-Registered Civil Aircraft

14. *Background.* In the *ESAA NPRM & Order*, the Commission adopted a regulatory framework for U.S.-registered and non-U.S.-registered aircraft, recognizing that aircraft routes can extend beyond the borders of the United States.<sup>37</sup> For U.S.-registered aircraft entering foreign airspace, the Commission requires the ESAA airborne terminal to operate pursuant to the Commission's technical rules or the foreign administration's technical rules, whichever are stricter.<sup>38</sup> If the foreign administration has not adopted regulations for ESAA terminals, the operators of ESAA on U.S.-registered aircraft must coordinate their operations with any potentially affected operations.<sup>39</sup> Over international waters, the Commission noted that the adjacent satellite operators would need protection from the ESAA terminals on U.S.-registered aircraft. As a result, the Commission required these ESAA operators to certify that their target satellite operators have verified that the proposed ESAA operations are within the coordinated parameters.<sup>40</sup>

15. *Boeing Petition.* Boeing requests that the Commission modify the definition of ESAA in section 25.103<sup>41</sup> by adding the language "or on U.S.-flagged aircraft" (underlined below) as follows:

*Earth Stations Aboard Aircraft (ESAA).* ESAA is an earth station or earth stations, operating from an aircraft, that receives from and transmits to geostationary satellite orbit Fixed-Satellite Service

(Continued from previous page) \_\_\_\_\_

concerns here because the rules adopted in this proceeding relate only to transmissions between the FSS satellite and the ESAA terminal outside the passenger compartment of the airplane, and not to Wi-Fi inside the airplane. With regard to the six commenters raising radiofrequency radiation exposure concerns, we emphasize that the Commission's Equipment Authorization (EA) program ensures that unlicensed network devices, including Wi-Fi transmitters, are compliant with its rules, including those rules limiting human exposure to RF energy, before a Grant can be issued. To the extent that commenters express concern over potential exposures at levels below the Commission's limits, we note the Commission issued a Notice of Inquiry (Inquiry) in ET Docket No. 13-84, released March 29, 2013, examining whether it should consider any changes to its existing RF safety standards. We further note that all six commenters filing in this proceeding (IB Docket 12-376) filed separate comments in response to the Inquiry in ET Docket No. 13-84. The Commission will consider these comments together with the record developed in that proceeding. With regard to the commenter raising public safety concerns, we note that the Commission issued a Notice of Proposed Rulemaking (NPRM) in WT Docket No. 13-301, released December 13, 2013, proposing new rules governing mobile communications services aboard aircraft, which includes seeking comment on public safety issues and that the commenter filed a separate comment in response to the NPRM in WT Docket No. 13-301. Although the Commission observed in that proceeding that airline-related public safety issues fall within the jurisdiction of the Federal Aviation Administration, we invited comment on whether there is any aspect of the FAA's authority that we should appropriately consider in our aircraft communications proceeding. *Expanding Access to Mobile Wireless Services Onboard Aircraft, Notice of Proposed Rulemaking*, WT Docket No. 13-301, 28 FCC Rcd 17132, 17148, ¶ 40 (2013). The Commission will consider that comment, as appropriate, in the context of that proceeding.

<sup>37</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16555-61, ¶¶ 119-31.

<sup>38</sup> *Id.* at 16555-56, ¶¶ 121-22.

<sup>39</sup> *Id.*

<sup>40</sup> *Id.* at 16556, ¶¶ 123-24.

<sup>41</sup> Boeing Petition at 2-3. After the filing of Boeing's petition, the Commission consolidated the Part 25 definitions, including the definition for ESAA, into section 25.103. See *Part 25 Review R&O*, 28 FCC Rcd at 12407-12, ¶¶ 6-17.

space stations and operates within the United States or on U.S.-flagged aircraft pursuant to the requirements set out in § 25.227 of this part.

Boeing contends that this change would show that the definition includes ESAA networks that not only operate within U.S. airspace, but also those that operate on U.S.-registered aircraft outside U.S. airspace.<sup>42</sup> Boeing further argues that the Commission should add the same phrase (underlined below) to section 25.227(a)(14) so that it reads as follows: “[a]ll ESAA terminals operated in U.S. airspace or on U.S.-flagged aircraft must be licensed by the Commission.”<sup>43</sup> In its subsequent *ex parte* filing, Boeing stated that section 25.103 should “include earth stations operating on U.S. registered aircraft regardless of whether such aircraft are operating within the United States.”<sup>44</sup>

16. In support of its request, Boeing notes that, as acknowledged by the Commission, section 301(e) of the Communications Act requires operators of radio transmitters that are on an “aircraft of the United States” to secure a license from the Commission.<sup>45</sup> Boeing also notes that the Commission requires ESAA airborne terminals on U.S.-registered aircraft operating in foreign airspace to comply with the Commission’s technical rules or the rules of the foreign administration, whichever are more constraining.<sup>46</sup> Boeing claims that the proposed change is needed to ensure that the requirements adopted by the Commission in the *ESAA NPRM & Order* are adequately reflected in the Commission’s rules.<sup>47</sup> Viasat’s comments did not address Boeing’s request.

17. *Discussion.* As explained in the *ESAA NPRM & Order*, pursuant to section 301(e) of the Communications Act, “the Commission is responsible for licensing aircraft terminals on all U.S.-registered aircraft, regardless of whether the aircraft is within or outside U.S. territory.”<sup>48</sup> Accordingly, we agree with Boeing that sections 25.103 and 25.227(a)(14), to be consistent with this determination, should be revised. Instead of inserting language as Boeing proposes for the definition of ESAA in section 25.103, however, we remove the unnecessary language from that rule that may suggest that licensed operations are limited to U.S. airspace. Specifically, the definition of ESAA in section 25.103 will now read as follows: “Earth stations operating aboard aircraft that receive from and transmit to geostationary-orbit Fixed-Satellite Service space stations pursuant to the requirements in § 25.227 of this part.” In addition, we revise section 25.227(a)(14) to read as follows: “All ESAA terminals operated in U.S. airspace, whether on U.S.-registered civil aircraft or non-U.S.-registered civil aircraft, must be licensed by the Commission. All ESAA terminals on U.S.-registered civil aircraft operating outside of U.S. airspace must be licensed by the Commission, except as provided by section 303(t) of the Communications Act.”<sup>49</sup> Adopting these changes codifies in our rules the Commission’s conclusion from the *ESAA NPRM &*

---

<sup>42</sup> Boeing Petition at 2-3.

<sup>43</sup> *Id.* at 3.

<sup>44</sup> Boeing Ex Parte at 1.

<sup>45</sup> 47 U.S.C. § 301(e); *see also*, 47 U.S.C § 303(t). Section 301(e) contains an exception codified in Section 303(t) of the Communications Act. Section 303(t), in turn, provides the Commission with the authority to permit licensing of U.S.-registered aircraft by a foreign administration in certain limited circumstances. 47 U.S.C § 303(t).

<sup>46</sup> Boeing Petition at 2.

<sup>47</sup> *Id.*

<sup>48</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16555, ¶ 120, n.292. The Commission explained that section 301(e) of the Communications Act provides authority for licensing operations on U.S.-registered aircraft regardless of the location of the aircraft. *Id.* (citing *Notice*, 20 FCC Rcd at 2936, ¶ 57).

<sup>49</sup> We note that we use the phrase “or on U.S.-registered civil aircraft” instead of “or on U.S.-flagged aircraft” in section 25.227(a)(14) to be consistent with the terminology used in the *ESAA NPRM & Order* and in the *Part 25 Review R&O*. *See ESAA NPRM & Order*, 27 FCC Rcd at 16555-56, ¶¶ 119-24; *Part 25 Review R&O*, 28 FCC Rcd at 12416-18, ¶¶ 36-39.

*Order* that section 301(e) of the Communications Act obliges us to license aircraft terminals on all U.S.-registered civil aircraft, regardless of whether the aircraft is within or outside of U.S. territory.<sup>50</sup>

## B. Dynamic Power ESAA Systems

### 1. Dynamic Power ESAA Operations that Exceed the Off-Axis EIRP-Density Limits

18. Dynamic power ESAA systems consist of multiple, co-frequency terminals operating simultaneously at varying power levels. The off-axis EIRP-density limits applicable to dynamic power ESAA systems, in the aggregate, are one decibel (dB) less than the limits applicable to other ESAA systems.<sup>51</sup> Dynamic power ESAA applicants may operate above these limits as long as they file the requisite certifications and demonstrations.<sup>52</sup>

19. *Boeing Petition.* Boeing requests that the Commission clarify the intended purpose of the certification requirement in section 25.227(b)(3)(ii)(B), which requires a dynamic power ESAA applicant to provide “[a] statement from the target satellite operator certifying that the proposed operation of the ESAA has the potential to create harmful interference to satellite networks adjacent to the target satellite(s) that may be unacceptable.”<sup>53</sup> Boeing also seeks clarification of the certification requirement in section 25.227(b)(3)(ii)(D), which requires ESAA applicants to provide a statement from the target satellite operator certifying that the ESAA applicant’s aggregate off-axis EIRP-density levels will be included in all future coordination agreements.<sup>54</sup> Specifically, Boeing asks that the Commission clarify, in the rule, that this requirement applies only when the ESAA network is using the capacity of the target satellite by adding the phrase “during the period that the ESAA network is using the target satellite” to the end of that rule.<sup>55</sup> Viasat’s comments did not address Boeing’s requests.

20. *Discussion.* The Commission applied the concepts from the *Part 25 Streamlining* proceedings when it adopted licensing rules to allow dynamic power ESV and VMES applicants to request aggregate operations that exceeded the relevant off-axis EIRP-density limits.<sup>56</sup> In adopting the certification requirements for applicants requesting such operations, the Commission balanced a number of competing factors and recognized that requiring applicants to file a number of specific statements, in the form of a certification from the target satellite operator, was significantly less burdensome than requiring applicants to file entire coordination agreements.<sup>57</sup> The certifications that the Commission

---

<sup>50</sup> See *supra* note 48.

<sup>51</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16541, ¶ 76.

<sup>52</sup> See 47 C.F.R. § 25.227(b)(3)(ii).

<sup>53</sup> Boeing Petition at 7 (citing 47 C.F.R. § 25.227(b)(3)(ii)(B)).

<sup>54</sup> *Id.* at 7-8 (citing 47 C.F.R. § 25.227(b)(3)(ii)(D)).

<sup>55</sup> *Id.* at 8.

<sup>56</sup> See 2000 Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission’s Rules Governing the Licensing of, and Spectrum Usage By, Satellite Network Earth Stations and Space Stations; Amendment of Part 25 of the Commission’s Rules and Regulations to Reduce Alien Carrier Interference Between Fixed-Satellites at Reduced Orbital Spacings and to Revise Application Procedures for Satellite Communication Services, IB Docket No. 00-248, CC Docket No. 86-496, Fifth Report and Order in IB Docket No. 00-248 and Third Report and Order in CC Docket No. 86-496, 20 FCC Rcd 5666 (2005) (*Part 25 Streamlining 5th R&O*).

<sup>57</sup> See, e.g., *Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, IB Docket No. 02-10, Order on Reconsideration, FCC 09-63, 24 FCC Rcd 10369, 10376, ¶ 14 (2009); *VMES Order*, 24 FCC Rcd at 10446, ¶ 99. In the *Part 25 Streamlining 5th R&O*, the Commission chose to require applicants to file certifications instead of affidavits by the potentially affected satellite operators, which would have been a much more burdensome approach than filing certifications by the target satellite operator. See *Part 25 Streamlining 5th R&O*, 20 FCC Rcd at 5686, ¶ 46.

required include the minimal certification at issue in section 25.227(B)(3)(ii)(B) – an acknowledgement that a transmission above the off-axis EIRP density limits may cause unacceptable interference to other networks. We strive to maintain consistency in the service and technical rules for ESAA, ESV, and VMES in order to promote regulatory clarity, particularly taking into account that an operator could be providing more than one of these services. Therefore, the concepts and reasoning in the ESV and VMES proceedings supporting these certifications provide the intended purpose that Boeing seeks.<sup>58</sup>

21. With regard to section 25.227(b)(3)(ii)(D), we agree with Boeing that this rule only applies when the ESAA network is using the capacity of the target satellite, but we decline Boeing's request to add the additional phrase to this rule. Section 25.227(b)(3)(ii)(D) requires ESAA applicants to provide a statement from the target satellite operator certifying that the ESAA applicant's aggregate off-axis EIRP-density levels will be included in all future coordination agreements. As with the other certification obligations in the ESAA rules, the language of this rule is similar to the rules for ESV and VMES, and it is accepted in the satellite industry that a satellite operator need not coordinate technical parameters for transmissions that are no longer used on its satellite network. Therefore, modifying this certification requirement to reflect Boeing's request is unnecessary.

## 2. Cessation of Emissions

22. In the *ESAA NPRM & Order*, the Commission required dynamic power ESAA systems to cease transmissions under two scenarios.<sup>59</sup> First, if an individual transmitter's power-density exceeded the applicable off-axis EIRP-density limits, then the Commission required the ESAA system to cease transmissions within 100 milliseconds of detecting this violation. The Commission required the individual transmitter to be self-monitoring and capable of shutting itself off.<sup>60</sup> Second, if the power-density from one or more transmitters caused the aggregate EIRP-densities to exceed the applicable off-axis EIRP-density limits, then the Commission required the transmitter or transmitters to reduce or cease emissions within 100 milliseconds of receiving a command from the system's network control and monitoring center (NCMC).<sup>61</sup> In section 25.227(b)(3)(i) of the rules, the Commission required ESAA license applicants to demonstrate that they could cease transmitting under both scenarios.<sup>62</sup>

23. *Boeing Petition.* Boeing raises two issues with respect to section 25.227(b)(3)(i). First, Boeing argues that section 25.227(b)(3)(i) should not require applicants to demonstrate that individual terminals track the aggregate off-axis EIRP-density for the entire ESAA system. Boeing claims that this rule is contrary to section 25.227(a)(3)(ii)(B) which states that the entire system must be capable of shutting off an individual transmitter or the entire system if the aggregate off-axis EIRP-densities exceed those supplied to the target satellite.<sup>63</sup> Boeing, therefore, recommends that the Commission remove the phrase "an individual transmitter" in section 25.227(b)(3)(i) so that only "the entire system" is capable of monitoring the aggregate off-axis EIRP-density of an ESAA system.<sup>64</sup> In its *ex parte* filing, Boeing

---

<sup>58</sup> As noted, the Commission has adopted a number of licensing rules that allow earth station operators to seek authority for operations in excess of the relevant off-axis EIRP-density limits. We may review the certification requirements for all similar non-routine operations as part of our larger examination of our licensing rules in the open Part 25 proceeding, and any modifications to our rules resulting from this review may also apply to ESAA systems.

<sup>59</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16541, ¶ 78.

<sup>60</sup> *Id.*

<sup>61</sup> *Id.* The NCMC monitors entire system power allocations.

<sup>62</sup> See 47 C.F.R. § 25.227(b)(3)(i).

<sup>63</sup> Boeing Petition at 4.

<sup>64</sup> *Id.* at 4-5.

argues that the language in section 25.227(b)(3)(i) should closely reflect the language in section 25.227(a)(3)(ii)(B).<sup>65</sup>

24. Second, Boeing argues that the Commission should remove the time requirement, “100 milliseconds,” from section 25.227(b)(3)(i) because it is not clear what event triggers the 100 millisecond time requirement.<sup>66</sup> Boeing argues the rule’s language suggests that the dynamic power ESAA system must cease emissions at the time of the exceedance, which it argues is infeasible for these systems.<sup>67</sup> Boeing claims that such an interpretation would impose a stricter time limit than discussed in the *ESAA NPRM & Order*, where Boeing claims that the Commission stated that the NCMC must issue a command within 100 milliseconds.<sup>68</sup>

25. ViaSat supports Boeing’s request to clarify section 25.227(b)(3)(i) with respect to the reference point from which the 100 milliseconds is to be measured. ViaSat reasons that the ESAA rule is based on the ESV rule, section 25.222(b)(3)(ii), which states that the 100 millisecond time frame begins upon receiving a command from the system’s central control and monitoring station.<sup>69</sup>

26. *Discussion.* We agree with Boeing and ViaSat that section 25.227(b)(3)(i) should be clarified. Instead of revising section 25.227(b)(3)(i) to more closely reflect the language of section 25.227(a)(3)(ii)(B) as Boeing suggests,<sup>70</sup> however, we revise section 25.227(b)(3)(i) to more closely reflect the language in the *ESAA NPRM & Order* and in section 25.222(b)(3)(ii) of the ESV rules.<sup>71</sup> First, the language in the *ESAA NPRM & Order* and section 25.222(b)(3)(ii) clearly requires individual transmitters to be self-monitoring and capable of shutting themselves off. Significantly, the language in those items does not require individual transmitters to monitor the aggregate EIRP of the entire system. Second, we agree with ViaSat that the reference point from which the 100-millisecond requirement is to

---

<sup>65</sup> Boeing Ex Parte at 2. Section 25.227(a)(3)(ii)(B) provides that “[t]he ESAA shall operate in accordance with the off-axis EIRP spectral-densities that the ESAA supplied to the target satellite operator in order to obtain the certifications listed in paragraph (b)(3)(ii) of this section. The individual ESAA terminals shall automatically cease emissions within 100 milliseconds if the ESAA transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator. The overall system shall be capable of shutting off an individual transmitter or the entire system if the aggregate off-axis EIRP spectral-densities exceed those supplied to the target satellite operator.” 47 C.F.R. § 25.227(a)(3)(ii)(B).

<sup>66</sup> *Id.* at 5.

<sup>67</sup> *Id.*

<sup>68</sup> *Id.*

<sup>69</sup> ViaSat Comments at 2, n.6.

<sup>70</sup> Boeing Ex Parte at 2.

<sup>71</sup> See *ESAA NPRM & Order*, 27 FCC Rcd at 16541, ¶ 78; 47 C.F.R. § 25.222(b)(3)(ii). Paragraph 78 of the *ESAA NPRM & Order* provides that “[f]irst, if the power-density from an individual transmitter exceeds the applicable power-density limit, then that transmitter must cease emissions automatically within 100 milliseconds of detecting this violation. Under this scenario, the individual transmitter must be self-monitoring and capable of shutting itself off. Second, if the power of one or more transmitters causes the aggregate off-axis EIRP densities to exceed the applicable power-density limit, then the transmitter or transmitters must cease or reduce emissions within 100 milliseconds of receiving the appropriate command from the system’s NCMC.” Section 25.222(b)(3)(ii) provides that: “[t]he ESV applicant shall provide a detailed showing that an individual ESV terminal is capable of automatically ceasing emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP-density limit specified in paragraph (a)(3)(i) of this section and that the individual transmitter is self-monitoring and capable of shutting itself off. The ESV applicant shall also provide a detailed showing that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving the appropriate command from the system’s central control and monitoring station if the aggregate off-axis EIRP spectral-densities of the transmitter or transmitters exceed the off-axis EIRP-density limits specified in paragraph (a)(3)(i) of this section.” 47 C.F.R. § 25.222(b)(3)(ii).

be measured for exceeding the ESAA system's aggregate off-axis EIRP-density is upon receiving a command from the ESAA system's NCMC.<sup>72</sup> The language in section 25.227(a)(3)(ii)(B) does not specify a 100 millisecond requirement for ceasing aggregate transmissions. Thus, we find that adopting language based on the *ESAA NPRM & Order* and section 25.222(b)(3)(ii) provides a clear road map for ESAA applicants demonstrating their ability to comply with the cessation of emission requirements. Accordingly, we revise section 25.227(b)(3)(i) as follows:

The ESAA applicant shall provide a detailed showing that an individual ESAA terminal is self-monitoring and capable of shutting itself off automatically within 100 milliseconds if the ESAA transmitter exceeds the off-axis EIRP-density limit specified in paragraph (a)(3)(i) of this section. The ESAA applicant also shall provide a detailed showing that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving a command from the system's network control and monitoring center that the aggregate off-axis EIRP spectral-densities of the transmitter or transmitters exceed the off-axis EIRP-density limits specified in paragraph (a)(3)(i) of this section. The International Bureau will place this showing on public notice along with the application.

### C. Antenna Pointing Error Requirement

27. Section 25.227(a)(1)(ii)(A) requires ESAA operators to maintain an antenna pointing error that is less than or equal to 0.2 degrees. In the *ESAA NPRM & Order*, the Commission stated that, as part of the application process, the ESAA applicant must demonstrate that the antenna pointing error is within three sigma ( $\sigma$ ) from the mean value. This requirement is codified in section 25.227(b)(1)(iii)(A).

28. *Boeing Petition.* Boeing requests that the Commission add the following underlined phrase to section 25.227(b)(1)(iii)(A): “[a]s part of the engineering analysis the ESAA applicant must show that the antenna pointing error is within three sigma ( $\sigma$ ) from the mean value (*i.e.*, that the antenna maintains a pointing error of 0.2 degrees for 99.7 percent of the time).”<sup>73</sup> The phrase that Boeing requests we add to the rule is used in the *ESAA NPRM & Order* to explain what the Commission meant by the expression “within three sigma from the mean value.”<sup>74</sup> Boeing argues that such a change would ensure that the rule reflects the Commission's intent as discussed in the *ESAA NPRM & Order*. ViaSat agrees with Boeing's proposal.<sup>75</sup>

29. *Discussion.* We agree with Boeing that section 25.227(b)(1)(iii)(A) should include language clarifying the intended meaning of the phrase “the ESAA applicant must show that the antenna pointing error is within three sigma ( $\sigma$ ) from the mean value.” However, instead of granting Boeing's proposal to adopt the exact language used in the *ESAA NPRM & Order*, we revise the rule to more accurately reflect the intended meaning of this phrase. In particular, we modify the last sentence of section 25.227(b)(1)(iii)(A) as follows:

As part of the engineering analysis, the ESAA applicant must show that the antenna pointing error is within three sigma ( $\sigma$ ) from the mean value, *i.e.*, that there is a 0.997 probability the antenna maintains a pointing error within 0.2°; and

We adopt this language because it is consistent with the intended meaning of maintaining the pointing error within three sigma from the mean value, which is to provide a statistical measurement of the antenna pointing error. As a result, such language ensures the ESAA applicant demonstrates the antenna's ability

<sup>72</sup> See ViaSat Comments at 2, n.4 & n.6 (citing the *ESAA NPRM & Order*, 27 FCC Rcd at 16541-42, ¶¶ 76, 78, and section 25.222(b)(3)(ii)).

<sup>73</sup> Boeing Petition at 6; Boeing Ex Parte at 2.

<sup>74</sup> See *ESAA NPRM & Order*, 27 FCC Rcd at 16538, ¶ 65.

<sup>75</sup> ViaSat Petition at 3.

to maintain an antenna pointing error that is less than or equal to 0.2 degrees with the probability of 0.997, which is the equivalent to the three sigma ( $\bar{\sigma}$ ) value.

## **V. PROCEDURAL MATTERS**

### **A. Final Regulatory Flexibility Analysis**

30. The Commission has prepared a Final Regulatory Flexibility Certification in Appendix A for the Second Report and Order and a Final Regulatory Flexibility Certification for the Order on Reconsideration in Appendix B.

### **B. Final Paperwork Reduction Act and Congressional Review Act**

31. This document does not contain new or modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. In addition, it does not contain any new or modified information collection burden for small business concerns with fewer than 25 employees, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4). The Commission will send a copy of this Second Report and Order and Order on Reconsideration to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. 801(a)(1)(A).

## **VI. ORDERING CLAUSES**

32. IT IS ORDERED that, pursuant to sections 4(i), 7, 302, 303(c), 303(e), 303(f) and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. sections 154(i), 157, 302a, 303(c), 303(e), 303(f) and 303(r), this Second Report and Order and Order on Reconsideration IS ADOPTED. Part 25 of the Commission's rules IS AMENDED, as specified in Appendix D, effective 30 days after publication in the Federal Register.

33. IT IS FURTHER ORDERED that the Petition for Reconsideration filed by The Boeing Company IS GRANTED IN PART to the extent described above and IS DENIED in all other respects.

34. IT IS FURTHER ORDERED that the Final Regulatory Flexibility Certifications, as required by section 604 of the Regulatory Flexibility Act, ARE ADOPTED.

35. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Second Report and Order and Order on Reconsideration including the Final Regulatory Flexibility Certifications, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch  
Secretary

## APPENDIX A

## Final Regulatory Flexibility Certification for the Second Report and Order

1. The Regulatory Flexibility Act of 1980, as amended (RFA),<sup>1</sup> requires that a regulatory flexibility analysis be prepared for notice-and-comment rule making proceedings, unless the agency certifies that “the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities.”<sup>2</sup> The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”<sup>3</sup> In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.<sup>4</sup> A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the U.S. Small Business Administration (SBA).<sup>5</sup>

2. In light of the rules adopted in the *Order on Reconsideration*, we find that there are only two categories of licensees that would be affected by the new rules. These categories of licensees are Satellite Telecommunications and Fixed-Satellite Transmit/Receive Earth Stations. The SBA has determined that the small business size standard for Satellite Telecommunications is a business that has \$30 million or less in average annual receipts.<sup>6</sup> Commission records reveal that there are 20 space station licensees and operators in the Ku-band. We do not request or collect annual revenue information concerning such licensees and operators, and thus are unable to estimate the number of geostationary space station licensees and operators that would constitute a small business under the SBA definition cited above, or apply any rules providing special consideration for geostationary space station licensees and operators that are small businesses. Currently there are approximately 2,879 operational fixed-satellite transmit/receive earth stations authorized for use in the Ku-band. The Commission does not request or collect annual revenue information, and thus is unable to estimate the number of earth stations that would constitute a small business under the SBA definition. Of the two classifications of licensees, we estimate that approximately 6 entities will provide ESAA service. For the reasons described below, we certify that the clarification to the rules adopted in this *Order on Reconsideration* will not have a significant economic impact on a substantial number of small entities.

3. In the *ESAA NPRM & Order*, the Commission tentatively concluded that ESAA should be authorized on a primary basis in the 14.0-14.5 GHz uplink band, noting that several parties had argued that regulatory parity calls for ESAA to be primary, just like ESV and VMES are primary in that band.<sup>7</sup> The Commission proposed to revise footnote NG55 which would grant primary status to ESAA in the

---

<sup>1</sup> The RFA, *see* 5 U.S.C. §§ 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

<sup>2</sup> 5 U.S.C. § 605(b).

<sup>3</sup> 5 U.S.C. § 601(6).

<sup>4</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

<sup>5</sup> 15 U.S.C. § 632.

<sup>6</sup> 13 C.F.R. § 121.201, NAICS code 517410.

<sup>7</sup> *ESAA NPRM & Order*, 27 FCC Rcd at 16565, ¶ 142.

14.0-14.5 GHz band, and, as an administrative matter, combine ESV, VMES and ESAA into the same footnote as applications of the FSS with primary status in the 11.7-12.2 GHz and 14.0-14.5 GHz bands.

4. In the *ESAA Second Report and Order*, the Commission adopted its tentative conclusion to grant primary status to ESAA operators in the 14.0-14.5 GHz band. The Commission also made a minor administrative change to section 25.227(b)(2)(i) of the Commission's rules by replacing the word "receive" with the word "create" in that rule, acknowledging that the term "receive" was incorrectly put into the rule originally. The Commission does not expect a substantial number of small entities to incur significant costs associated with the changes adopted in this *Second Report and Order*. The change from secondary status to primary status in the 14.0-14.5 GHz band will benefit both large and small entities by allowing greater regulatory certainty in providing ESAA service. In addition, the administrative change to section 25.227(b)(2)(i) is a "clean-up" change involving no substantive decision of significance to small business or the industry in general. Overall, we believe these changes do not impose a significant economic impact on small entities. Therefore, we certify that the requirements adopted in this *Second Report and Order* will not have a significant economic impact on a substantial number of small entities.

## APPENDIX B

## Final Regulatory Flexibility Certification for Order on Reconsideration

1. The Regulatory Flexibility Act of 1980, as amended (RFA),<sup>1</sup> requires that a regulatory flexibility analysis be prepared for notice-and-comment rule making proceedings, unless the agency certifies that “the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities.”<sup>2</sup> The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”<sup>3</sup> In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.<sup>4</sup> A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the U.S. Small Business Administration (SBA).<sup>5</sup>

2. In light of the rules adopted in the *Order on Reconsideration*, we find that there are only two categories of licensees that would be affected by the new rules. These categories of licensees are Satellite Telecommunications and Fixed-Satellite Transmit/Receive Earth Stations. The SBA has determined that the small business size standard for Satellite Telecommunications is a business that has \$30 million or less in average annual receipts.<sup>6</sup> Commission records reveal that there are 20 space station licensees and operators in the Ku-band. We do not request or collect annual revenue information concerning such licensees and operators, and thus are unable to estimate the number of geostationary space station licensees and operators that would constitute a small business under the SBA definition cited above, or apply any rules providing special consideration for geostationary space station licensees and operators that are small businesses. Currently there are approximately 2,879 operational fixed-satellite transmit/receive earth stations authorized for use in the Ku-band. The Commission does not request or collect annual revenue information, and thus is unable to estimate the number of earth stations that would constitute a small business under the SBA definition. Of the two classifications of licensees, we estimate that approximately 6 entities will provide ESAA service. For the reasons described below, we certify that the clarification to the rules adopted in this *Order on Reconsideration* will not have a significant economic impact on a substantial number of small entities.

3. The *ESAA Order* established service and licensing rules for ESAA operations based on the rules adopted for VSAT networks as well as ESV and VMES networks, noting that authorizing ESAA operations in the FSS Ku-band presented many technical issues that are similar to authorizing the ESV and VMES operations in that band. ESAA terminals communicate with FSS GSO space stations operating in the extended Ku-band (10.95-11.2 GHz and 11.45-11.7 GHz bands) and conventional Ku-band (11.7-12.2 GHz and 14.0-14.5 GHz bands). As part of the ESAA service rules, the Commission adopted technical measures to protect other radio services in the Ku-band, including the FSS and FS (in

---

<sup>1</sup> The RFA, *see* 5 U.S.C. §§ 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

<sup>2</sup> 5 U.S.C. § 605(b).

<sup>3</sup> 5 U.S.C. § 601(6).

<sup>4</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

<sup>5</sup> 15 U.S.C. § 632.

<sup>6</sup> 13 C.F.R. § 121.201, NAICS code 517410.

the extended Ku-band), from harmful interference. The Commission also adopted a regulatory framework for ESAA systems on U.S.-registered aircraft operating in or near foreign nations and over international waters and non-U.S.-registered aircraft operating in U.S. airspace.

4. The Commission does not expect small entities to incur significant costs associated with the changes adopted in this *Order on Reconsideration*. The changes will benefit both large and small entities by allowing greater regulatory certainty in providing ESAA service. We believe these changes are nominal and do not impose a significant economic impact on small entities. Therefore, we certify that the requirements adopted in this *Order on Reconsideration* will not have a significant economic impact on a substantial number of small entities.

**APPENDIX C**

**List of Parties**

Petition for Reconsideration and Clarification of the Order, Comments and Ex Partes

The Boeing Company (Boeing)

ViaSat, Inc. (ViaSat)

Comments for the Second Report and Order

Boeing

Global VSAT Forum (GVF)

Gogo LLC

Panasonic Avionics Corporation

Row 44 Inc.

Satellite Industry Association

Telecommunications Industry Association

ViaSat

**APPENDIX D****Final Rules**

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR parts 2 and 25 as follows:

**PART 2 – Frequency Allocations And Radio Treaty Matters; General Rules And Regulations**

1. The authority citation for Part 2 continues to read as follows:  
AUTHORITY: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.
2. Section 2.106, the Table of Frequency Allocations, is amended as follows:
  - a. Pages 47 and 49 are revised.
  - b. In the list of non-Federal Government (NG) Footnotes, footnote NG55 is revised and footnotes NG54, NG183 and NG187 are removed.

**§ 2.106 Table of Frequency Allocations.**

The revisions and additions read as follows:

\* \* \* \* \*

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
10-10.45 FIXED MOBILE RADIOLOCATION Amateur 5.479	10-10.45 RADIOLOCATION Amateur 5.479 5.480	10-10.45 FIXED MOBILE RADIOLOCATION Amateur 5.479	10-10.5 RADIOLOCATION US108 G32	10-10.45 Amateur Radiolocation US108 5.479 US128 NG50	Private Land Mobile (90) Amateur Radio (97)
10.45-10.5 RADIOLOCATION Amateur Amateur-satellite 5.481			5.479 US128	10.45-10.5 Amateur Amateur-satellite Radiolocation US108 US128 NG50	
10.5-10.55 FIXED MOBILE Radiolocation	10.5-10.55 FIXED MOBILE RADIOLOCATION		10.5-10.55 RADIOLOCATION US59		Private Land Mobile (90)
10.55-10.6 FIXED MOBILE except aeronautical mobile Radiolocation			10.55-10.6	10.55-10.6 FIXED	Fixed Microwave (101)
10.6-10.68 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive) Radiolocation 5.149 5.482 5.482A			10.6-10.68 EARTH EXPLORATION- SATELLITE (passive) SPACE RESEARCH (passive)	10.6-10.68 EARTH EXPLORATION- SATELLITE (passive) FIXED US265 SPACE RESEARCH (passive)	
10.68-10.7 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.483			10.68-10.7 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US131 US246		
10.7-11.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 5.484A (Earth-to-space) 5.484 MOBILE except aeronautical mobile	10.7-11.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 5.484A MOBILE except aeronautical mobile		10.7-11.7 US131 US211	10.7-11.7 FIXED FIXED-SATELLITE (space-to- Earth) 5.441 US131 US211 NG52	Satellite Communications (25) Fixed Microwave (101)
11.7-12.5 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492	11.7-12.1 FIXED 5.486 FIXED-SATELLITE (space-to-Earth) 5.484A 5.488 Mobile except aeronautical mobile 5.485 12.1-12.2 FIXED-SATELLITE (space-to-Earth) 5.484A 5.488 5.485 5.489	11.7-12.2 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492 5.487 5.487A	11.7-12.2	11.7-12.2 FIXED-SATELLITE (space-to- Earth) 5.485 5.488 NG55 NG143	Satellite Communications (25)

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
14-14.25 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.504C 5.506A Space research			14-14.2 Space research US133	14-14.2 FIXED-SATELLITE (Earth-to-space) NG55 Mobile-satellite (Earth-to-space) Space research US133	Satellite Communications (25)
5.504A 5.505 14.25-14.3 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.508A Space research			14.2-14.4	14.2-14.47 FIXED-SATELLITE (Earth-to-space) NG55 Mobile-satellite (Earth-to-space)	
14.3-14.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radionavigation-satellite	14.3-14.4 FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B Mobile-satellite (Earth-to-space) 5.506A Radionavigation-satellite	14.3-14.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radionavigation-satellite			
5.504A	5.504A	5.504A			
14.4-14.47 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Space research (space-to-Earth)			14.4-14.47 Fixed Mobile		
5.504A 14.47-14.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radio astronomy			14.47-14.5 Fixed Mobile	14.47-14.5 FIXED-SATELLITE (Earth-to-space) NG55 Mobile-satellite (Earth-to-space)	
5.149 5.504A			US133 US203 US342	US133 US203 US342	
14.5-14.8 FIXED FIXED-SATELLITE (Earth-to-space) 5.510 MOBILE Space research			14.5-14.7145 FIXED Mobile Space research	14.5-14.8	
			14.7145-14.8 MOBILE Fixed Space research		
14.8-15.35 FIXED MOBILE Space research			14.8-15.1365 MOBILE SPACE RESEARCH Fixed US310	14.8-15.1365  US310	

\* \* \* \* \*

NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

\* \* \* \* \*

NG55 In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), Earth Stations on Vessels (ESV), Vehicle-Mounted Earth Stations (VMES), and Earth Stations Aboard Aircraft (ESAA) as regulated under 47 CFR part 25 are applications of the fixed-satellite service and may be authorized to communicate with geostationary satellites in the fixed-satellite service on a primary basis.

\* \* \* \* \*

PART 25 – SATELLITE COMMUNICATIONS

3. The authority citation for Part 25 continues to read as follows:

AUTHORITY: Interprets or applies Sections 4, 301, 302, 303, 307, 309, 319, 332, 705 and 721 of the Communications Act as amended, 47 U.S.C. Sections 154, 301, 302, 303, 307, 309, 319, 332, 605 and 721, unless otherwise noted.

4. Amend Section 25.103 as follows:

§ 25.103 Definitions

\* \* \* \* \*

*Earth Stations Aboard Aircraft (ESAA)*. Earth stations operating aboard aircraft that receive from and transmit to geostationary-orbit Fixed-Satellite Service space stations pursuant to the requirements in § 25.227 of this part.

\* \* \* \* \*

5. Amend Section 25.227 as follows:

- a. Revise paragraph (a)(14);
- b. Revise paragraph (b)(1)(iii)(A);
- c. Revise paragraph (b)(2)(i); and
- d. Revise paragraph (b)(3)(i).

§ 25.227 Blanket Licensing provisions for Earth Stations Aboard Aircraft (ESAAs) receiving in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), and 11.7-12.2 GHz (space-to-Earth) frequency bands and transmitting in the 14.0-14.5 GHz (Earth-to-space) frequency band, operating with Geostationary Satellites in the Fixed-Satellite Service

(a) \* \* \*

(14) All ESAA terminals operated in U.S. airspace, whether on U.S.-registered civil aircraft or non-U.S.-registered civil aircraft, must be licensed by the Commission. All ESAA terminals on U.S.-registered civil aircraft operating outside of U.S. airspace must be licensed by the Commission, except as provided by Section 303(t) of the Communications Act.

\* \* \*

(b) \* \* \*

(1) \* \* \*

(iii) \* \* \*

(A) demonstrate that the total tracking error budget of their antenna is within 0.2° or less between the orbital location of the target satellite and the axis of the main lobe of the ESAA antenna. As part of the engineering analysis, the ESAA applicant must show that the antenna pointing error is within three sigma ( $\sigma$ ) from the mean value, *i.e.*, that there is a 0.997 probability the antenna maintains a pointing error within 0.2°; and

\* \* \*

(2) \* \* \*

(i) A statement from the target satellite operator certifying that the proposed operation of the ESAA has the potential to create harmful interference to satellite networks adjacent to the target satellite(s) that may be unacceptable.

\* \* \*

(3) \* \* \*

(i) The applicant shall make a detailed showing of the measures it intends to employ to maintain the effective aggregate EIRP density from all simultaneously transmitting co-frequency terminals operating with the same satellite transponder at least 1 dB below the off-axis EIRP density limits defined in paragraph (a)(1)(i)(A) through (C) of this section. In this context, the term “effective” means that the resultant co-polarized and cross-polarized EIRP density experienced by any GSO or non-GSO satellite shall not exceed that produced by a single ESAA transmitter operating at 1 dB below the limits defined in paragraphs (a)(1)(i)(A) through (C) of this section. The ESAA applicant shall provide a detailed showing that an individual ESAA terminal is self-monitoring and capable of shutting itself off automatically within 100 milliseconds if the ESAA transmitter exceeds the off-axis EIRP-density limit specified in paragraph (a)(3)(i) of this section. The ESAA applicant also shall provide a detailed showing that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving a command from the system’s network control and monitoring center that the aggregate off-axis EIRP spectral-densities of the transmitter or transmitters exceed the off-axis EIRP-density limits specified in paragraph (a)(3)(i) of this section. The International Bureau will place this showing on public notice along with the application.

(ii) \* \* \*

\* \* \* \* \*